

# Cost and Management Accounting

(As per the Revised Syllabus of M.Com., 2016-17, Semester I, University of Mumbai)

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## **Lion Dr. Nishikant Jha**

ICWA, PGDM (MBA), M.Com., Ph.D., D.Litt. [USA],  
CIMA Advocate [CIMA U.K.], BEC [Cambridge University],  
International Executive MBA [UBI Brussels, Belgium, Europe],  
Recognised UG & PG Professor by University of Mumbai.  
Recognised M.Phil. & Ph.D. Guide by University of Mumbai.  
Assistant Professor in Accounts & HOD, BAF, Thakur College of Science & Commerce.  
Visiting Faculty- JBIMS for MBA & K.P.B. Hinduja College for M.Phil. M.Com. University of Mumbai.  
CFA & CPF (USA), CIMA (UK), Indian & International MBA, CA & CS Professional Course.

## **Prof. Rajiv S. Mishra**

M.Com., MBA, M.Phil., UGC NET,  
Assistant Professor at N.E.S. Ratnam College of Arts,  
Science & Commerce for BBI & Coordinator for M.Com., Bhandup (W), Mumbai-400078.  
Visiting Faculty at Nitin Godiwala,  
Chandrabhan Sharma, S.M. Shetty College,  
N.G. Acharya, V.K. Menon College,  
Sikkim Manipal University &  
Vikas College for M.Com., MBA, BBI, BMS, BFM & BAF

## **Sunita Sherifani**

M.Com., M.Phil., MBA, SET  
Head, Dept. of Accountancy and Associate Professor,  
V.E.S. College of Arts, Science and Commerce,  
Chembur.



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- New Delhi** : “Pooja Apartments”, 4-B, Murari Lal Street, Ansari Road, Darya Ganj,  
New Delhi - 110 002. Phon e: 011-23270392, 23278631; Fax: 011-23256286
- Nagpur** : Kundanlal Chandak Industrial Estate, Ghat Road, Nagpur - 440 018.  
Phone: 0712-2738731, 3296733; Telefax: 0712-2721216
- Bengaluru** : Plot No. 91-33, 2nd Main Road Seshadripuram, Behind Nataraja Theatre,  
Bengaluru-560020. Phone: 08041138821, 9379847017, 9379847005
- Hyderabad** : No. 3-4-184, Lingampally, Besides Raghavendra Swamy Matham, Kachiguda,  
Hyderabad - 500 027. Phone: 040-27560041, 27550139
- Chennai** : New-20, Old-59, Thirumalai Pillai Road, T. Nagar, Chennai - 600 017.  
Mobile: 9380460419
- Pune** : First Floor, "Laksha" Apartment, No. 527, Mehunpura, Shaniwarpath  
(Near Prabhat Theatre), Pune - 411 030. Phone: 020-24496323/24496333;  
Mobile: 09370579333
- Lucknow** : House No. 731, Shekhupura Colony, Near B.D. Convent School, Aliganj,  
Lucknow - 226 022. Phone: 0522-4012353; Mobile: 09307501549
- Ahmedabad** : 114, “SHAIL”, 1st Floor, Opp. Madhu Sudan House, C.G. Road, Navrang Pura,  
Ahmedabad - 380 009. Phone: 079-26560126; Mobile: 09377088847
- Ernakulam** : 39/176 (New No.: 60/251) 1<sup>st</sup> Floor, Karikkamuri Road, Ernakulam,  
Kochi – 682011. Phone: 0484-2378012, 2378016 Mobile: 09387122121
- Bhubaneswar** : 5 Station Square, Bhubaneswar - 751 001 (Odisha).  
Phone: 0674-2532129, Mobile: 09338746007
- Kolkata** : 108/4, Beliaghata Main Road, Near ID Hospital, Opp. SBI Bank,  
Kolkata - 700 010, Phone: 033-32449649, Mobile: 7439040301
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# Preface

It is a matter of great pleasure to present this new edition of the book on Cost and Management Accountancy to the students and professors of First Year Master of Commerce, University of Mumbai. This book is written on lines of syllabus instituted by the Mumbai University. The book presents the subject matter in a simple and convincing language.

We owe a great many thanks to a great many people who helped and supported us during the writing of this book which includes Principals, Professors and Students of M.Com. Section.

The syllabus contains a list of the topics covered in each chapter which will avoid the controversies regarding the exact scope of the syllabus. The text follows the term-wise, chapter-topic pattern as prescribed in the syllabus. We have preferred to give the text of the section and rules as it is and thereafter added the comments with the intention of explaining the subject to the students in a simplified language. While making an attempt to explain in a simplified language, any mistake of interpretation might have crept in.

This book is an unique presentation of subject matter in an orderly manner. This is a student-friendly book and tutor at home. We hope the teaching faculty and the student community will find this book of great use. We welcome constructive suggestions for improvement.

We are extremely grateful to Shri K.N. Pandey of Himalaya Publishing House Pvt. Ltd. for their devoted and untiring personal attention accorded by them to this publication. We gratefully acknowledge and express my sincere thanks to the following people without whose inspiration and support, constructive suggestions of this book would not have been possible.

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**Dr. Chaitaly Chakraborty (Principal, Thakur College)**

**Mrs. Janki Nishikant Jha**

— **Authors**

# Syllabus

## Modules at a Glance

| Sr. No. | Module   | No. of Hrs. |
|---------|--|-------------|
| 1       | Marginal Costing, Absorption Costing and Management Decision | 15          |
| 2       | Standard Costing   | 15          |
| 3       | Budgetary Control  | 15          |
| 4       | Operating Costing  | 15          |

| Sr. No.  | Module  |
|----------|---|
| <b>1</b> | <b>Marginal Costing, Absorption Costing and Management Decision</b>   |
|          | <ul style="list-style-type: none"> <li>● Meaning of Absorption Costing - Distinction between Absorption Costing and Marginal Costing - Problems on Breakeven Analysis - Cost Volume Profit Analysis - Breakeven Charts - Contribution Margin and Various Decision Making Problems</li> <li>● Managerial Decisions through Cost Accounting such as Pricing Accepting Special Offer - Profit Planning - Make or Buy Decisions - Determining Key Factors - Determining Sales Mix - Determining Optimum Activity Level - Performance Evaluation - Alternative Methods of Production, Cost Reduction &amp; Cost Control</li> </ul> |
| <b>2</b> | <b>Standard Costing</b>   |
|          | <ul style="list-style-type: none"> <li>● Standard Costing as an Instrument of Cost Control and Cost Reduction - Fixation of Standards - Theory and Problems based on Analysis of Variances of Materials, Labour Overheads and Sales, including Sub-variances</li> </ul>   |
| <b>3</b> | <b>Budgetary Control</b>  |
|          | <ul style="list-style-type: none"> <li>● Budget and Budgetary Control - Zero Based Budget - Performance Budgets - Functional Budgets Leading to the Preparation of Master Budgets - Capital Expenditure Budget – (Fixed and Flexible Budgets - Preparation of Different Types of Budgets</li> </ul>   |
| <b>4</b> | <b>Operating Costing</b>  |
|          | <ul style="list-style-type: none"> <li>● Meaning of Operating Costing - Determination of Per Unit Cost - Collection of Costing Data - Practical Problems based on Costing of Goods &amp; Passenger Transport, Hospital, and Hotel</li> </ul>  |

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# MARGINAL COSTING AND ABSORPTION COSTING

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## Introduction

Costing is the process of determining the cost of doing something. Costing includes the techniques and processes of ascertaining cost. We dealt with different methods of costing, different techniques of costing and finally classification of costs under various heads.

Marginal Cost determines the rate of change in costs if the volume of output is increased or decreased by one unit. Marginal costing is a technique of costing concerned with the changes in costs and profits resulting from changes in the volume of output. Marginal costing is very helpful in decision-making and it most widely used profit planning techniques. The cost-volume-profit analysis shows the relationship among unit sale price, variable cost, sales volume, sales mix and fixed cost.

## Concept of Marginal Costing

According to Institute of Cost and Management Accounting, London, Marginal costing is defined as “the ascertainment of marginal cost and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable cost”. Marginal costing is a technique of costing concerned with the changes in costs and profits resulting from changes in the volume of output. Marginal costing is also known as ‘**Variable Costing**’.

## Features of Marginal Costing

The technique of marginal costing is based on the distinction between product costs and period costs. Only the variable costs are regarded as the cost of the product while the fixed cost is treated as period costs. The main c

haracteristics of marginal costing are:

1. It is a technique of analysis and determination of costs to help management in decision making.
2. All elements of costs are classified into variable and fixed components. Even semi-variable costs are classified into variable and fixed components.
3. The variable costs are regarded as the cost of the products.
4. Fixed costs are treated as period cost and are charged to profit and loss account for the period for which they are incurred.
5. The stock of finished goods and work-in-progress are valued at marginal costs only.

Variable and Absorption costing are techniques of costing wherein variable costing considers only variable costs for the purpose of product costing, inventory valuation and for other important management decisions. In absorption costing, total costs are taken into consideration for these

purposes. Direct material, direct labour and variable overheads constitute the only relevant costs in variable costing whereas the full/absorption costing technique recognises fixed overheads also as a product costs in addition to material, labour and variable overheads.

The two techniques are not mutually exclusive. Full costing is needed while preparing income statements for external reporting and for tax purpose, while variable costing is extensively used for internal purpose in decision-making.

## **Advantages and Disadvantages of Marginal Costing Technique**

### **Advantages**

1. Marginal costing is simple to understand.
2. By not charging fixed overhead to cost of production, the effect of varying charges per unit is avoided.
3. It prevents the illogical carry forward in stock valuation of some proportion of current year's fixed overhead.
4. The effects of alternative sales or production policies can be more readily available and assessed, and decisions taken would yield the maximum return to business.
5. It eliminates large balances left in overhead control accounts which indicate the difficulty of ascertaining an accurate overhead recovery rate.
6. Practical cost control is greatly facilitated. By avoiding arbitrary allocation of fixed overhead, efforts can be concentrated on maintaining a uniform and consistent marginal cost. It is useful to various levels of management.
7. It helps in short-term profit planning by breakeven and profitability analysis, both in terms of quantity and graphs. Comparative profitability and performance between two or more products and divisions can easily be assessed and brought to the notice of management for decision making.

### **Disadvantages**

1. The separation of costs into fixed and variable is difficult and sometimes gives misleading results.
2. Normal costing systems also apply overhead under normal operating volume and this shows that no advantage is gained by marginal costing.
3. Under marginal costing, stocks and work in progress are understated. The exclusion of fixed costs from inventories affect profit, and true and fair view of financial affairs of an organisation may not be clearly transparent.
4. Volume variance in standard costing also discloses the effect of fluctuating output on fixed overhead. Marginal cost data becomes unrealistic in case of highly fluctuating levels of production, e.g., in case of seasonal factories.
5. Application of fixed overhead depends on estimates and not on the actuals and as such there may be under or over absorption of the same.
6. Control affected by means of budgetary control is also accepted by many. In order to know the net profit, we should not be satisfied with contribution and hence, fixed overhead is also

a valuable item. A system which ignores fixed costs is less effective since a major portion of fixed cost is not taken care of under marginal costing.

7. In practice, sales price, fixed cost and variable cost per unit may vary. Thus, the assumptions underlying the theory of marginal costing sometimes becomes unrealistic. For long term profit planning, absorption costing is the only answer.

**Illustration 1:** Hydro Electric Ltd. furnishes the following information from its cost records for the first quarter of the current year.

|   |       |
|---|-------|
| Normal production (units)                         | 1,000 |
| Actual production (units)                         | 1,100 |
| Actual overheads per quarter at normal production | 4,000 |
| Other expenses per quarter                        | 300   |
| Standard fixed overhead rate per unit             | 4     |
| Variable costs per unit                           | 6     |
| Sales volume (selling price is ₹ 14)              | NIL   |

Prepare the income statement under absorption and variable costing.

**Solution:**

**Income Statement (Absorption Costing)**

| Particulars  | ₹       | ₹   |
|--|---------|-----|
| Sales Revenue  |         | NIL |
| <i>Less:</i> Total Cost of Manufacturing:                            |         |     |
| Variable Costs (1,100 × ₹ 6)   | ₹ 6,600 |     |
| Fixed Overheads (1 100 × ₹ 4)  | 4,400   |     |
|  | 11,000  |     |
| <i>Less:</i> Cost of Inventory at the end of the year (1,100 × ₹ 10) | 11,000  |     |
| Cost of Goods Manufactured and Sold                                  |         | NIL |
| Gross Margin (Unadjusted)  |         | NIL |
| Capacity Variance (Favourable) (Overabsorbed 100 × ₹ 4)              |         | 400 |
| Gross Margin (Adjusted)  |         | 400 |
| <i>Less:</i> Other Expenses  |         | 300 |
| Net Income before Taxes  |         | 100 |

**Income Statement (Variable Costing)**

| Particulars   | ₹       | ₹   |
|---|---------|-----|
| Sales Revenue   |         | NIL |
| <i>Less:</i> Variable Costs (Production Costs) (1,100 × ₹ 6)        | ₹ 6,600 |     |
| <i>Less:</i> Cost of Inventory at the end to the year (1,100 × ₹ 6) | 6,600   |     |
| Cost of Goods Manufactured and Sold                                 |         | NIL |
| Contribution  |         | NIL |
| <i>Less:</i> Fixed Costs:   |         |     |

|                                |       |         |
|--------------------------------|-------|---------|
| Fixed Overheads                | 4,000 |         |
| Other Expenses                 | 300   | (4,300) |
| Net Income before Taxes (Loss) |       | (4,300) |

**Inference:** Under absorption costing, the net income before taxes is ₹ 100 while in marginal costing, net income before taxes is (₹ 4300) (loss). This significant difference can be attributed to the fact that under absorption costing, the fixed manufacturing overheads are included in inventory, whereas in variable costing, inventory carries only variable costs.

#### Inventory Valuation

|  |              |
|--|--------------|
| Underabsorption Costing                    | 11,000       |
| Inventory Valuation under Variable Costing | <u>600</u>   |
| Difference                                 | <u>4,400</u> |

(This difference is equal to difference between net income before taxes under absorption costing and variable costing.)

### Difference between Absorption Costing and Marginal Costing

| Absorption Costing   | Marginal Costing   |
|--|--|
| It is known as full costing. Both fixed and variable are included to ascertain the cost.   | Only variable costs are included. Fixed costs are recovered from contribution.   |
| Different unit costs are obtained at different levels of output because of fixed expenses remaining the same.  | Marginal cost per unit remain same at different levels of output because variable expenses vary in the same proportion in which output varies.   |
| Difference between sales and total cost (marginal cost and fixed cost) is profit.  | Difference between sales and marginal cost is contribution and difference between contribution and fixed cost is profit or loss.   |
| A portion of fixed cost is carried forward to the next period because closing stock of work-in-progress and finished goods is valued at cost of production which is inclusive of fixed cost. | Stock of work-in-progress and finished goods are valued at marginal cost. Fixed cost of a particular period is charged to that very period and is not carried over to the next period. |
| The apportionment of fixed expenses on an arbitrary basis gives rise to overabsorption or underabsorption of overheads   | Only variable cost are charged to products hence marginal costing does not lead to overabsorption or underabsorption of fixed overheads.   |
| It affects managerial decisions in the areas such as whether to accept the export order or not., whether to buy or manufacture, etc.   | It is very helpful in taking managerial decisions because it takes into consideration the additional cost involved only assuming fixed expenses remaining constant.                    |
| Costs are classified according to functional basis such as production cost, office and administrative cost and selling and distribution costs.   | Costs are classified according to the behaviour of costs – fixed costs and variable costs.   |
| It fails to establish relationship of cost, volume and profit  | CVP relationship is an integral part of marginal costing.  |

**Marginal Cost:** According to C.I.M.A. London, “Marginal Cost means the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit”. Marginal cost per unit remains unchanged irrespective of the level of activity or output. It is also known as Variable Cost. Marginal cost is the sum total of direct material cost, direct labour cost, variable direct expenses and all variable overheads. The marginal cost of producing a unit declines as output increases.

### Advantages of Marginal Costing

1. In order to forecast profits accurately, it is essential to ascertain the relationship between cost and profit on one hand and volume on the other.
2. Marginal Costing is helpful in setting up flexible budget which indicates cost at various levels of activities.
3. Marginal Costing assist in evaluating performance for the purpose of control.
4. Marginal Costing may assist management in formulating pricing policies by projecting the effect of different price structures on cost and profit.

**Cost Drivers:** The activities that cause costs to be incurred are called “Cost Drivers”. A fixed cost remains unchanged in total as the level of activity (cost drivers) varies. If activity increases or decreases say by 20%, the total fixed costs remain the same, e.g., depreciation, property tax, rent to landlord, etc. But fixed costs per unit will change.

A variable cost changes in total in direct proportion to a change in the level of activity or cost driver. If activity increases, say by 20%, total variable cost also increases by 20%. The total variable cost increases proportionately with activity. Variable cost is fixed per unit but varies in total.

**Contribution:** It is the difference between sales and variable cost. It may be defined as the excess of selling price over variable cost per unit. It is also termed as Contribution Margin or Gross Margin.

**Contribution = Sales – Variable Cost**

**Contribution (per unit) = Selling Price – Variable Cost per unit**

**Contribution = Fixed Cost + Profit (– Loss)**

**Advantages of Contribution:** The concept of contribution is a valuable aid to management in making managerial decisions. It includes:

1. It helps the management in the fixation of selling prices.
2. It assists in determining the break-even point.
3. It helps management in the selection of a suitable product mix for profit maximisation.
4. It helps in choosing from among alternative methods of production.
5. It helps the management in deciding whether to purchase or manufacture, add a new product or not, etc.

**Cost-Volume-Profit (CVP) Analysis:** This technique summarises the effects of changes in an organisation’s volume of activity on its costs, revenue and profit. CVP analysis can be extended to cover the effects on profit of changes in selling prices, changes in sales volume, changes in product mix, etc. It provides management with a comprehensive overview of the effects on revenue and costs of all types of short-run financial changes. Since CVP analysis explores the fundamental relationship

between cost-volume-profit variables, it becomes easier to recognise certain level of output or a certain volume of sales that equates cost with revenue. Such level is termed as break-even point. Break-even analysis is an integral part of CVP analysis.

**Break-even Chart:** It is a graphic or visual presentation of the relationship between cost, volume and profit. It indicates the point of production at which there is neither profit nor loss. It also indicates the estimated profit or loss at different levels of production. While constructing the chart, the following assumption is normally considered.

- (a) Costs are classified into fixed and variable costs.
- (b) Fixed costs shall remain fixed during the relevant volume range of graph.
- (c) Variable cost per unit will remain constant during the relevant volume range of graph.
- (d) Selling price per unit will remain constant.
- (e) Sales mix remains constant.
- (f) Production and sales volume are equal.
- (g) There exists a linear relationship between costs and revenue.
- (h) Linear relationship is indicated by way of straight line.

**Break-even Point:** BEP is the volume of activity where the organisation's revenues and expenses are equal. At a particular amount of sales, the organisations have no profit or loss. It normally breaks even.

The general formula for computing the break-even sales volume in units is:

$$\text{BEP (in units)} = \frac{\text{Fixed expenses}}{\text{Contribution margin per unit}}$$

$$\text{BEP (in Rupee)} = \frac{\text{Fixed expenses}}{\text{Contribution sales ratio}}$$

## Limitations of Marginal Costing

There are certain limitations which can be described as follows:

1. **Suitability:** The techniques of marginal costing cannot be applied to all the concerns. When a concern needs to carry large stocks by way of work-in-progress, the technique becomes redundant. In addition, the marginal costing techniques are not suitable to industries working on contract basis.
2. **Inventory valuation difficulties:** Since the work-in-progress and the closing inventories are valued at marginal cost basis, it will not be a sound decision from the Balance Sheet point of view. The main focus on the true and fair value concept gets diluted and the very purpose of exhibiting the financial position will get defeated.
3. **Segregation of costs:** Though the marginal costing principles call for the differentiation of costs into fixed and variable, in actual practice, it becomes difficult to classify them precisely. Many overheads which appear to be fixed and variable may not exactly align at various levels of production. There is no logical method to segregate semi-variable expenses into fixed and variable.

4. **Time factor:** The marginal costing ignores the time factor which is very important in all managerial decisions. Ignoring the time value factor would naturally relate to unreliable and incomplete basis for comparing two alternative jobs.
5. **Sales emphasis:** Marginal costing principles are basically a sales-oriented concept. While the selling function gets the prominence, other functions are not given equal weightage. This would be a major setback.

**Revenue Statement**

| Particulars         | Amount ₹ | P.U. |
|---------------------|----------|------|
| Sales               | XX       |      |
| Less: Variable Cost | (X)      |      |
| Contribution        | XX       |      |
| Less: Fixed Cost    | (X)      |      |
| Profit              |          |      |

1. Profit Volume Ratio

A. When sales and variable cost given, P/V Ratio =  $\frac{\text{Contribution}}{\text{Sales}} \times 100$

Where, Contribution = Sales – Variable Cost

B. When sales and profit for two consecutive term given, P/V Ratio

$$= \frac{\Delta \text{ in Profit}}{\Delta \text{ in Sales}} \times 100$$

2. Break-even Point

A. Break-even Point (in Unit) =  $\frac{\text{Fixed Cost}}{\text{Contribution Per Unit}}$

B. Break-even Point (in Sales) =  $\frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

3. Desired Sales =  $\frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P/V Ratio}}$

**Margin of Safety (MOS)**

Every enterprise tries to know how much above they are from the breakeven point. This is technically called margin of safety. It is calculated as the difference between sales or production units at the selected activity and the breakeven sales or production.

Margin of safety is the difference between the total sales (actual or projected) and the breakeven sales. It may be expressed in monetary terms (value) or as a number of units (volume). It can be expressed as profit / P/V ratio. A large margin of safety indicates the soundness and financial strength of business.

Margin of safety can be improved by lowering fixed and variable costs, increasing volume of sales or selling price and changing product mix, so as to improve contribution and overall P/V ratio.

$$\begin{aligned} \text{Margin of safety} &= \text{Sales at selected activity} - \text{Sales at BEP} \\ &= \frac{\text{Profit at selected activity}}{\text{P/V ratio}} \end{aligned}$$

Margin of safety is also presented in ratio or percentage as follows:

$$= \frac{\text{Margin of safety (sales)} \times 100}{\text{Sales at selected activity}}$$

The size of margin of safety is an extremely valuable guide to the strength of a business. If it is large, there can be substantial falling of sales and yet a profit can be made. On the other hand, if margin is small, any loss of sales may be a serious matter. If margin of safety is unsatisfactory, possible steps to rectify the causes of mismanagement of commercial activities as listed below can be undertaken.

- (a) Increasing the selling price – It may be possible for a company to have higher margin of safety in order to strengthen the financial health of the business. It should be able to influence price, provided the demand is elastic. Otherwise, the same quantity will not be sold.
- (b) Reducing fixed costs
- (c) Reducing variable costs
- (d) Substitution of existing product(s) by more profitable lines
- (e) Increase in the volume of output
- (f) Modernisation of production facilities and the introduction of the most cost effective technology

## Illustrations

**Illustration 2:** Following information is available.

| Year | Sales     | Profit   |
|------|-----------|----------|
| 2013 | 10,00,000 | 1,00,000 |
| 2014 | 15,00,000 | 2,00,000 |

Calculate:

- (a) Profit Volume Ratio.
- (b) Sales required to earn profit of ₹ 4,00,000.
- (c) Profit when sales are 20,00,000.

**Solution:**

$$\begin{aligned} \text{(a) P/V Ratio} &= \frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100 \\ &= \frac{2,00,000 - 1,00,000}{15,00,000 - 10,00,000} \times 100 \\ &= \frac{1,00,000}{5,00,000} \times 100 \\ &= 20\% \end{aligned}$$

$$\begin{aligned}
 \text{(b) Desired Sales} &= \frac{\text{Fixed Cost} + \text{Profit}}{\text{P/V Ratio}} \\
 \text{Fixed Cost} &= \text{Contribution} - \text{Profit} \\
 \therefore \text{Contribution} &= \text{Sales} \times \text{P/V Ratio} \\
 \therefore \text{Contribution} &= 15,00,000 \times 20\% \\
 &= 3,00,000 \\
 \text{Fixed Cost} &= 3,00,000 - 2,00,000 \\
 &= 1,00,000 \\
 \therefore \text{Desired sales} &= \frac{1,00,000 + 4,00,000}{20\%} \\
 &= \frac{5,00,000}{20\%} \\
 &= 25,00,000 \\
 \text{(c) Sales} &= \frac{\text{Fixed Cost} + \text{Profit}}{\text{P/V Ratio}} \\
 20,00,000 &= \frac{1,00,000 + \text{Profit}}{20\%} \\
 20,00,000 \times 20\% &= 1,00,000 + \text{Profit} \\
 4,00,000 &= 1,00,000 + \text{Profit} \\
 \therefore \text{Profit} &= 3,00,000
 \end{aligned}$$

**Illustration 3:** If sales ₹ 20,00,000, variable cost 15,00,000 and fixed cost 2,00,000, calculate the following:

- Profit Volume Ratio
- Break-even Point
- Sales required to earn profit of ₹ 5,00,000

**Solution:**

$$\begin{aligned}
 \text{(a) P/V Ratio} &= \frac{\text{Contribution}}{\text{Sales}} \times 100 \\
 &= \frac{\text{Sales} - \text{Variable Cost}}{\text{Sales}} \times 100 \\
 &= \frac{20,00,000 - 15,00,000}{20,00,000} \times 100 \\
 &= \frac{5,00,000}{20,00,000} \times 100 = 25\% \\
 \text{(b) Break-even Point} &= \frac{\text{Fixed Cost}}{\text{P/V Ratio}}
 \end{aligned}$$

$$= \frac{2,00,000}{25\%}$$

$$= 8,00,000$$

(c) Sales required to earn profit of ₹ 5,00,000

$$\text{Desired Sales} = \frac{\text{Fixed Cost} + \text{Profit}}{\text{P/V Ratio}}$$

$$\therefore \text{Desired Sales} = \frac{2,00,000 + 5,00,000}{25\%}$$

$$= \frac{2,00,000 + 5,00,000}{25\%}$$

$$= 28,00,000$$

**Illustration 4:**

| Year | Sales     | Cost      |
|------|-----------|-----------|
| 2013 | 16,00,000 | 15,76,800 |
| 2014 | 20,52,000 | 19,22,400 |

From the above information, calculate: (A) P/V Ratio, (B) Fixed Ratio, (C) Break-even Point and (D) Profit/loss when sales 12,96,000.

**Solution:**

| Year | Sales     | Cost      | Print (Sales – Cost) |
|------|-----------|-----------|----------------------|
| 2013 | 16,20,000 | 15,76,800 | 43,200               |
| 2014 | 20,52,000 | 19,22,400 | 1,29,600             |

(a) P/V Ratio =  $\frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100$

$$= \frac{1,29,600 - 43,200}{20,52,000 - 16,20,000} \times 100$$

$$= \frac{86,400}{4,32,000} \times 100$$

$$= 20\%$$

(b) Fixed Cost = Contribution – Print

$$= \text{Sales} \times \text{P/V Ratio} - \text{Print}$$

$$= 16,20,000 \times 20\% - 43,200$$

$$= 2,80,800$$

(c) Break-even Point =  $\frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

$$= \frac{2,80,800}{20\%}$$

$$= 14,04,000$$

$$\begin{aligned}
 \text{(d) Derived Sales} &= \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P/V Ratio}} \\
 96,000 &= \frac{2,80,800 + \text{Profit}}{\text{P/V Ratio}} \\
 12,96,000 \times 20\% &= 2,80,800 + \text{Profit} \\
 2,59,200 - 2,80,800 &= \text{Profit/Loss} \\
 \therefore \text{Profit/Loss} &= (21,600) \\
 \therefore \text{Loss} &= \text{₹ } 21,600
 \end{aligned}$$

**Illustration 5:** From the following particulars, you are required to calculate:

1. Profit Volume Ratio;
2. Break-even Point;
3. Profit when sale is ₹ 2,00,000;
4. Sales required to earn to earn a profit of ₹ 40,000;
5. Margin of safety in the 2nd year.

| Year | Sales ₹  | Profit ₹ |
|------|----------|----------|
| I    | 2,40,000 | 18,000   |
| II   | 2,80,000 | 26,000   |

You may assume that the cost structure and selling prices remain constant in the two years.

**Solution:**

1. Profit Volume Ratio (PVR) =  $\frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100 = \frac{8,000}{40,000} \times 100 = 20\%$
2. Break-even Point (BEP) =  $\frac{\text{Fixed Cost}}{\text{P/V Ratio}} \times 100 = \frac{30,000}{20} \times 100 = \text{₹ } 1,50,000$

**Notes:**

1. Contribution = Sales × P/V Ratio = 2,40,000 × 20% = ₹ 48,000
2. Fixed Cost (FC) = Contribution – Profit = 48,000 – 18,000 = 30,000
3. Profit when sale is ₹ 2,00,000  
 Contribution = Sales × P/V Ratio = 2,00,000 × 20% = ₹ 40,000  
 Profit = Contribution – FC = 40,000 – 30,000 = ₹ 10,000
4. Sales required to earn profit of ₹ 40,000 =  $\frac{\text{FC} + \text{Desired Profit}}{\text{PVR}} = \frac{30,000 + 40,000}{20\%} = \text{₹ } 3,50,000$
5. Margin of safety in second year = Actual sales – BE sales = ₹ 2,80,000 – ₹ 1,50,000 = ₹ 1,30,000

**Illustration 6:** KT & Co. has prepared the following budget estimates for the year 2014-2015:

Sales 15,000.

You are required to find:

1. Profit Volume Ratio.

2. Break-even Point.
3. Margin of safety.

Also create revised Profit Volume Ratio, Break-even Point and Margin of Safety, if selling price per unit is reduced by 10%.

**Solution:**

| Particulars   | Present                          |               | Projected                              |               |
|---|----------------------------------|---------------|--|---------------|
|   | Given                            | 15,000        | Given                                  | 15,000        |
| Units (U)   |                                  | 15,000        |  | 15,000        |
| Sale Price (SP)                                       |                                  | 10            |  | 9             |
| Sale (S)  |                                  | 1,50,000      |  | 1,35,000      |
| Variable Cost   |                                  | <u>90,000</u> |  | <u>90,000</u> |
| Contribution (S – V)                                  |                                  | 60,000        |  | 45,000        |
| (i) Profit Volume Ratio (PVR)                         | $= \frac{34,000}{40} \times 100$ |               | $= \frac{45,000}{1,35,000} \times 100$ |               |
| $\frac{\text{Contribution} \times 100}{\text{Sales}}$ | = 40.00%                         |               | = 33.33%                               |               |
| (ii) Break-even Point (BEP) (₹)                       | = 85,000                         |               | = 1,02,000                             |               |
| $\frac{\text{Fixed Costs} \times 100}{\text{PVR}}$    |                                  |               |  |               |
| (iii) Margin of Safety (₹)                            | = 1,50,000 – 85,000              |               | = 1,35,000 – 1,02,000                  |               |
| = Actual Sales – Break-even sales                     | = 65,000                         |               | = 33,000                               |               |
| (iv) Contribution Per Unit                            | 60,000 ÷ 15,000 = 4              |               | 45,000 ÷ 15,000 = 3                    |               |
| Contribution ÷ Units                                  |                                  |               |  |               |
| (v) Break-even Point (BEP) (Units)                    | 85,000 ÷ 10 = 8,500              |               | 1,02,000 ÷ 9 = 11,333                  |               |
| BEP ÷ SP  |                                  |               |  |               |
| (vi) Margin of Safety (Units)                         | 15,000 – 8,500 = 6,500           |               | 15,000 – 11,333 = 3,667                |               |
| Actual Sales – Break-even Sales                       |                                  |               |  |               |

**Illustration 7:** The following data have been extracted from the books of Alfa Ltd.

| Year | Sales ₹  | Profit ₹ |
|------|----------|----------|
| 2014 | 5,00,000 | 50,000   |
| 2015 | 7,50,000 | 1,00,000 |

You are required to calculate:

- (i) P/V Ratio
- (ii) Fixed Cost
- (iii) Break-even Sales
- (iv) Profit on Sales of ₹ 4,00,000
- (v) Sales to earn of profit of ₹ 1,25,000.

**Solution:**

$$1. \text{ P/V Ratio (PVR)} = \frac{\text{Change in Profit}}{\text{Change in Sales}}$$

$$\begin{aligned}
&= \frac{\text{₹ } 1,00,000 - 50,000}{\text{₹ } 7,50,000 - 5,00,000} \times 100 \\
&= \frac{50,000}{2,50,000} \times 100 \\
&= 20\% \\
2. \text{ Fixed Cost} &= \text{Contribution} - \text{Profit} \\
&= (a) 1,00,000 - 50,000 = \text{₹ } 50,000 \\
&\quad (b) 1,50,000 - 1,00,000 = \text{₹ } 50,000 \\
\text{Contribution} &= \text{Sales} \times \text{P/V Ratio} \\
&= 5,00,000 \times 20\% = \text{₹ } 1,00,000 \text{ OR} \\
&= 7,50,000 \times 20\% = \text{₹ } 1,50,000 \\
3. \text{ Break-even Sales} &= \frac{\text{Fixed Cost}}{\text{P/V Ratio}} = 50,000 \times \frac{100}{20} = \text{₹ } 2,50,000 \\
4. \text{ Profit on Sales of ₹ } 4,00,000 & \\
\text{Contribution} &= \text{Sales} \times \text{P/V Ratio} = 4,00,000 \times 20\% = \text{₹ } 80,000 \\
\text{Profit} &= \text{Contribution} - \text{Fixed Cost} = 80,000 - 50,000 = \text{₹ } 30,000 \\
5. \text{ Sales to earn profit of ₹ } 1,25,000 & \\
\text{Required sales} &= \frac{\text{Fixed Cost}}{\text{P/V Ratio}} \\
&= \frac{50,000 + 1,25,000}{20/100} \\
&= 1,75,000 \times \frac{100}{20} \\
&= \text{₹ } 8,75,000
\end{aligned}$$

**Illustration 8:** Z Ltd. produces and sells a single article at ₹10 each. The marginal cost of production is ₹ 6 each and fixed cost is ₹ 400 per annum.

**Calculate:**

1. P/V Ratio
2. The break-even sales (in ₹ and numbers)
3. The sales to earn profit of ₹ 500.
4. Profit at sales of ₹ 3000.
5. New break-even point if sales price is reduced by 10%.
6. Margin of safety at sales of ₹ 1,500.
7. Selling price per unit if the break-even point is reduced to 80 units.

**Solution:**

$$1. \text{ P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{4}{10} \times 100 = 40\%$$

## 2. Break-even Sales

$$(a) \text{ In ₹} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}} = \frac{400}{40\%} = 400 \times \frac{100}{40} = ₹ 1,000$$

$$(a) \text{ In Nos.} = \frac{\text{Fixed Cost}}{\text{Contribution Per Unit}} = \frac{400}{40\%} = 100 \text{ units}$$

$$3. \text{ Sales to earn profit of ₹ 500} = \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P/V Ratio}}$$

$$= \frac{400 + 500}{40\%} = \frac{900}{1} \times \frac{100}{40} = ₹ 2,250$$

## 4. Profit on Sale of ₹ 3000

$$\text{Profit} = \text{Contribution} - \text{Fixed Cost} = 1,200 - 400 = ₹ 800$$

$$\text{Contribution} = 40\% \text{ of ₹ } 3,000 = ₹ 1,200$$

## 5. New Break-even Point if sales price is reduced by 10%

Old Sales Price ₹ 10

$$\text{New Sales Price } 10 - 10\% \text{ of } 10 = 10 - 1 = ₹ 9$$

$$\text{New Contribution} = S - VC = 9 - 6 = 3$$

New P/V Ratio

$$\text{New BEP (₹)} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}} = \frac{400}{\%} = 400 \times 100 \times \frac{3}{100} = ₹ 1,200$$

$$\text{New BEP (Units)} = \frac{\text{Fixed Cost}}{\text{Contribution Per Unit}} = \frac{400}{3} = 134(r/o)$$

## 6. Margin of Safety at Sales ₹ 1,500

$$\begin{aligned} \text{(Old) Margin of Safety} &= \text{Actual Sales} - \text{BEP Sales} \\ &= 1,500 - 1,000 = ₹ 500, \text{ i.e., } 50 \text{ units } (500 \div 10) \end{aligned}$$

$$\text{(New) Margin of Safety} = 1,500 - 1,200 = ₹ 300, \text{ i.e., } 34 \text{ units } (300 \div 9; r/o)$$

## 7. Selling Price per unit if BEP is reduced to 80 units

$$\text{Break-even Point in units} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$$

$$80 = \frac{400}{\text{Contribution per unit}}$$

$$\text{Contribution per unit} = \frac{400}{80} = ₹ 5$$

$$\begin{aligned} \text{Selling Price per unit} &= \text{Contribution Per Unit} + \text{Variable Cost per unit} \\ &= 5 + 6 = ₹ 11 \text{ per unit} \end{aligned}$$

**Illustration 9:** A product is sold at ₹ 80 per unit. Its variable cost is ₹ 60 and fixed cost is ₹ 6,00,000. Compute the following:

1. P/V Ratio
2. Break-even Point

3. Margin of safety at a sale of 50,000 units.
4. At what sale, the producer will earn profit at 15% on sales?

**Solution:**

|               | ₹            |
|---------------|--------------|
| Sale          | 80.00        |
| Variable Cost | <u>60.00</u> |
| Contribution  | <u>20.00</u> |

$$1. \text{ P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{20}{80} \times 100 = 25\%$$

$$2. \text{ Break-even Point} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}} = \frac{6,00,000}{25\%} = ₹ 24,00,000$$

3. Margin of Safety (MOS) at a Sale of 50,000 Units

$$\text{BEP Units} = \frac{\text{BEP (₹)}}{\text{Sale Price}} = \frac{24,00,000}{80} = 30,000$$

$$\begin{aligned} \text{MOS} &= \text{Sale Units} - \text{BEP Units} \\ &= 50,000 - 30,000 = 20,000 \text{ Units} \end{aligned}$$

1. Sale to earn a profit of 15% on sale

$$\text{Sales} = ₹ 80 \text{ per unit}$$

$$\text{Variable Cost} = ₹ 60 \text{ per unit}$$

$$\text{Profit} = 15 \times 80 \div 100 = 12 \text{ per unit}$$

$$\text{Fixed Cost} = ₹ 6,00,000$$

Let units sold be  $x$

Sale =  $80 \times x$ ; since Sales = Variable Cost + Fixed Cost + Profit

$$\text{Therefore, } 80X = 60X + 6,00,000 + 12X$$

$$80X = 72X + 6,00,000$$

$$8X = 6,00,000$$

$$X = 6,00,000 \div 8$$

$$X = 75,000 \text{ units}$$

**Illustration 10:** From the following data, compute:

1. P/V Ratio
2. BEP in rupees and unit.
3. Number of units to be sold to earn a profit of ₹ 7,50,000.

$$\text{Sales Price} \quad \quad \quad ₹ 20 \text{ per unit}$$

$$\text{Direct Material} \quad \quad \quad ₹ 5 \text{ per unit}$$

$$\text{Direct Wages} \quad \quad \quad ₹ 6 \text{ per unit}$$

$$\text{Variable Administration Overheads} \quad \quad \quad ₹ 3 \text{ per unit}$$

$$\text{Fixed Factory Overheads} \quad \quad \quad ₹ 6,40,000 \text{ per year}$$

Fixed Administration Overhead ₹ 1,52,000 per year

**Solution:**

- Sale per Unit = ₹ 20
- Variable Cost Per Unit = Direct Expenses + Variable Expenses = 5 + 6 + 3 = ₹ 14
- Contribution Per Unit = Sale – Variable Cost = 20 – 14 = ₹ 14
- Fixed Cost = Factory Overhead + Administrative Overhead  
= 6,40,000 + 1,52,000 = ₹ 7,92,000
- Profit Volume Ratio (PVR) =  $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{6}{20} \times 100 = 30\%$
  - Break-even Point (BEP) =  $\frac{\text{Fixed cost}}{\text{Pr ofit Volume Ratio}} = \frac{7,92,000}{30\%} = ₹ 26,40,000$
  - BEP (Units) =  $\frac{\text{Break - even Point}}{\text{Sales Price}} = \frac{26,40,000}{20} = ₹ 1,32,000$
  - Number of units to be sold to earn profit of ₹ 7,50,000 =  $\frac{\text{Fixed Cost} + \text{Pr ofit}}{\text{Contribution per unit}}$   
=  $\frac{7,92,000 + 7,50,000}{6} = ₹ 1,32,000$

**Illustration 11:** The XL Ltd. furnish the following information:

|        | Ist Period | IInd Period |
|--------|------------|-------------|
| Sales  | 20,00,000  | 30,00,000   |
| Profit | 2,00,000   | 4,00,000    |

You are required to calculate:

- P/V Ratio
- Fixed Expenses
- BEP
- Sales to earn profit ₹ 5,00,000
- Profit when sales are ₹ 15,00,000

**Solution:**

- P/V Ratio =  $\frac{\text{Change in Pr ofit}}{\text{Change in Sales}} \times 100 = \frac{2,00,000}{10,00,000} \times 100 = 20\%$
- Fixed Expenses = Contribution – Profit = 4,00,000 – 2,00,000 = ₹ 2,00,000  
Contribution = Sales × P/V Ratio = 20,00,000 × 20% = 4,00,000
- Break-even Point (in ₹) =  $\frac{\text{Fixed Cost}}{\text{P/V Ratio}} \times 100 = \frac{2,00,000}{20} \times 100 = ₹ 10,00,000$

Sales to earn profit of ₹ 5,00,000

Desired Contribution = Fixed Cost + Required Profit

$$= 2,00,000 + 5,00,000 = ₹ 7,00,000$$

$$\text{Required Sales} = \frac{\text{Desired Contribution}}{\text{P/V Ratio}} \times 100 = \frac{7,00,000}{20} \times 100 = ₹ 35,00,000$$

4. Profit when sales are ₹ 15,00,000

$$\text{Desired Contribution} = \text{Sales} \times \text{P/V Ratio} = 15,00,000 \times 20\% = ₹ 3,00,000$$

$$\begin{aligned} \text{Desired Profit} &= \text{Desired Contribution} - \text{Fixed Cost} \\ &= 3,00,000 - 2,00,000 \\ &= ₹ 1,00,000 \end{aligned}$$

**Illustration 12:** Following particulars are available for A Ltd. and B Ltd.:

| Particulars | A Ltd.     | B Ltd.     |
|-------------|------------|------------|
| Sales       | ₹ 6,00,000 | ₹ 6,00,000 |
| P/V Ratio   | 25%        | 20%        |
| Fixed Cost  | ₹ 90,000   | ₹ 80,000   |

Calculate for each company:

- Break-even Point
- Margin of Safety
- Sales required to earn profit of ₹ 90,000

**Solution:**

| Particulars  | A Ltd.   | B Ltd.   |
|--|--|--|
| (a) Break-even Point = $\frac{\text{Fixed Cost}}{\text{P/V Ratio}}$  | $\frac{90,000}{25\%}$<br>= ₹ 3,60,000          | $\frac{80,000}{20\%}$<br>= ₹ 4,00,000          |
| (b) Margin of Safety = Actual Sales – Break-even Sales   | 6,00,000 – 3,60,000<br>= ₹ 2,40,000            | 6,00,000 – 4,00,000<br>= ₹ 2,00,000            |
| (c) Sales required to earn profit ₹ 90,000<br>= $\frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P/V Ratio}}$ | $\frac{90,000 + 90,000}{25\%}$<br>= ₹ 7,20,000 | $\frac{80,000 + 90,000}{20\%}$<br>= ₹ 8,50,000 |

**Illustration 13:** M/s EAR Enterprises furnishes the following information:

| Year | Sales (₹) | Profit (₹) |
|------|-----------|------------|
| 2013 | 6,00,000  | 60,000     |
| 2014 | 8,00,000  | 1,00,000   |

From the above, calculate the following information:

- P/V Ratio
- Fixed Cost
- Break-even Cost
- Sales to earn profit ₹ 2,00,000

(v) Margin of Safety of 2014.

**Solution:**

$$\begin{aligned}
 1. \text{ P/V Ratio} &= \frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100 \\
 &= \frac{1,00,000 - 60,000}{8,00,000 - 6,00,000} \times 100 \\
 &= 20\% \\
 2. \text{ Fixed Cost} &= \text{Contribution} - \text{Profit} \\
 &= (\text{P/V Ratio} \times \text{Sales}) - \text{Profit} \\
 &= (20\% \times 6,00,000) - 60,000 = ₹ 60,000 \\
 &= 20\% \times 8,00,000 - 1,00,000 = ₹ 60,000 \\
 3. \text{ Break-even Sales} &= \frac{\text{Fixed Cost}}{\text{P/V Ratio}} = \frac{₹ 60,000}{20\%} = ₹ 3,00,000 \\
 4. \text{ Sales to Earn Profit ₹ 2,00,000} &= \text{Desired Sales} = \frac{\text{Desired Contribution}}{\text{P/V Ratio}} \\
 \text{Desired Contribution} &= \text{Fixed Cost} + \text{Desired Profit} \\
 &= 60,000 + 2,00,000 = 2,60,000 \\
 \text{Desired Sales} &= \frac{2,60,000}{20\%} = ₹ 13,00,000 \\
 5. \text{ Margin of Safety for 2014} \\
 \text{MOS Sales} &= \text{Total Sales} - \text{Break-even Sales} \\
 &= 8,00,000 - 3,00,000 = ₹ 5,00,000 \\
 \text{MOS Margin} &= \frac{\text{MOS Sales}}{\text{Total Sales}} \times 100 \\
 &= \frac{5,00,000}{8,00,000} \times 100 \\
 &= 62.5\%
 \end{aligned}$$

**Illustration 14:** From the following particulars, you are required to calculate:

- (i) Fixed Cost
- (ii) Profit Volume Ratio
- (iii) Break-even Sales
- (iv) Sales to earn profit of ₹ 6,00,000
- (v) Margin of Safety of the year 2012

| Particulars | 2012 (₹)  | 2013 (₹)  |
|-------------|-----------|-----------|
| Total Cost  | 12,96,000 | 18,72,000 |
| Sales       | 14,40,000 | 21,60,000 |

**Solution:**

$$\text{Profit (1st Period)} = 14,40,000 - 12,96,000 = 1,44,000$$

$$\text{Profit (2nd Period)} = 21,60,000 - 18,72,000 = 2,88,000$$

$$\begin{aligned} \text{(a) P/V Ratio} &= \frac{\text{Change in Profit}}{\text{Change Sales}} \times 100 \\ &= \frac{(2,88,000 - 1,44,000)}{(21,60,000 - 14,40,000)} \times 100 \\ &= \frac{1,44,000}{7,20,000} \times 100 = 20\% \\ \text{(b) Fixed Cost (2012)} &= \text{Contribution} - \text{Profit} \\ &= (\text{P/V Ratio} \times \text{Sales}) - \text{Profit} \\ &= (\text{₹ } 14,40,000 \times 20\%) - 1,44,000 \\ &= \text{₹ } 2,88,000 - \text{₹ } 1,44,000 = \text{₹ } 1,44,000 \\ \text{(c) Break-even Sales} &= \frac{\text{Fixed Cost}}{\text{PV Ratio}} = \frac{1,44,000}{20\%} = \text{₹ } 7,20,000 \end{aligned}$$

**Illustration 15:** The following is the cost structure of a product Selling price ₹ 100 per unit.

**Variable cost per unit:**

|                 |      |
|-----------------|------|
| Material        | ₹ 38 |
| Labour          | ₹ 14 |
| Direct Expenses | ₹ 8  |

**Fixed overheads for the year:**

|                                |            |
|--------------------------------|------------|
| Factory Overheads              | ₹ 2,80,000 |
| Office Overheads               | ₹ 2,20,000 |
| No. of Units Produced and Sold | ₹ 40,000   |

Calculate:

1. P/V Ratio
2. Break-even Point in units
3. Margin of Safety Amount
4. Break-even Point if fixed overheads increased by 20%.
5. Revised P/V Ratio when selling price increased by 20%.

**Solution:**

| Particulars       | Total ₹   | Per Unit ₹ |
|-------------------|-----------|------------|
| (A) Sales         | 40,00,000 | 100        |
| (B) Variable Cost |           |            |
| – Material .....  | 15,20,000 | 38         |
| – Labour .....    | 5,60,000  | 14         |

|                          |       |           |    |
|--------------------------|-------|-----------|----|
| - Expenses               | ..... | 3,20,000  | 8  |
| Subtotal                 | ..... |           |    |
| (C) Contribution (A – B) | ..... |           |    |
| (D) Fixed Cost           |       | 24,00,000 | 60 |
| Factory                  | ..... | 16,00,000 | 40 |
| Office                   | ..... |           |    |
| Subtotal                 | ..... | 2,80,000  |    |
| (E) Profit (C – D)       | ..... | 2,20,000  |    |
|                          |       | 5,00,000  |    |
|                          |       | 11,00,000 |    |

- P/V Ratio =  $\frac{\text{Contribution}}{\text{Sales}} = \frac{40}{100} = 40\%$
- Break-even Point in Units =  $\frac{\text{Fixed Cost}}{\text{Contribution per Unit}} = \frac{5,00,000}{40} = 12,500 \text{ Units}$
- Margin of Safety Amount = Units =  $40,000 - 12,500 = 27,500 \text{ Units}$   
= Amount =  $40,00,000 - 12,50,000 = 27,50,000$
- Break-even Point is fixed overheads increased by 20%
 

|                           |   |   |
|---------------------------|---|---|
| Contribution              | = | 16,00,000   |
| New Fixed Overheads       | = | 6,00,000  |
| Profit                    | = | 10,00,000   |
| Break-even Point in Units | = | $\frac{\text{Fixed Cost}}{\text{Contribution per Unit}} = \frac{6,00,000}{40} = 15,000 \text{ units}$ |
| Break-even Point in ₹     | = | 15,00,000   |
- Selling Price increased by 20% = P/V Ratio =  $\frac{\text{Sales} - \text{Variable Cost}}{\text{Sales}} = \frac{120 - 60}{120} = 50\%$

**Illustration 16:** A company produces and sells 1,500 units of a commodity at ₹ 20 each. The variable cost of the production is ₹ 12 per unit and fixed cost ₹ 8,000 per annum.

Calculate:

- P/V Ratio
- Sales at break-even point
- Additional sales required to earn the same amount of profit if selling price is reduced by 10%.

**Solution:**

| Particulars                   | Original (1500 units) |        | Working Revised |          |
|-------------------------------|-----------------------|--------|-----------------|----------|
|                               | Sales per Unit [S]    | 20     | 30,000          | 20 – 10% |
| Variable Cost per Unit [V]    | 12                    | 18,000 | 12              |          |
| Contribution per Unit [S – V] | 8                     | 12,000 |                 | 6        |
| Fixed Costs (FC)              | 8,000                 | 8,000  |                 | 8,000    |
| Profit                        |                       | 4,000  |                 |          |

**Equations:**

$$1. \text{ Profit Volume Ratio (PVR)} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{C}{S} \times 100 = \frac{12,000}{30,000} \times 100 = 40\%$$

$$2. \text{ Break-even Point in Units} = \frac{\text{Fixed Cost}}{\text{Profit Volume Ratio}} = \frac{8,000}{40\%} = ₹ 20,000$$

$$\text{BEP (Units)} = \frac{\text{Break - even Point}}{\text{Sale Price}} = \frac{20,000}{20\%} = 10,000 \text{ units}$$

**Work-Back:**

1. Number of units to be sold to earn same profit of ₹ 4,000 =  $\frac{\text{Fixed cost} + \text{Profit}}{\text{Contribution per unit}}$   
 $= \frac{8,000 + 4,000}{6}$   
 $= 2,000$
2. Units sold earlier = 1,500
3. Additional units to be sold = 2,000 – 1,500 = 500

**Exercise**

1. You are given the following information for the next year.

|                      |            |
|----------------------|------------|
| Sales (10,000 units) | ₹ 1,20,000 |
| Variable cost        | ₹ 48,000   |
| Fixed cost           | ₹ 60,000   |

Find out the P/V ratio, Break-even point and the margin of safety.

2. Products

| Particulars   | X      | Y      | Z      |
|---------------|--------|--------|--------|
| Units         | 10,000 | 15,000 | 20,000 |
| Selling price | 4      | 4      | 4      |
| Variable cost | 2.5    | 3      | 3.5    |
| Fixed cost    | 12,000 | 9,000  | 7,500  |

Find Profit, Break-even point and Margin of safety of each product as well as that of the company.

3. KT & Co. has prepared the following budget estimated for the year 2005-06: sales 15,000 units, sales value ₹ 1,50,000, fixed expenses ₹ 34,000 and variable per unit ₹ 6/-.

You are required to find: (i) Profit Volume Ratio, (ii) Break-even Point and (iii) Margin of safety.

Also calculate revised Profit Volume Ratio, Break-even Point and Margin of Safety, if selling price per unit is reduced by 10%.

4.

| Period           | I   | II  |
|------------------|-----|-----|
| Sales (₹ lakhs)  | 150 | 200 |
| Profit (₹ lakhs) | 30  | 50  |

Find P/V Ratio, Fixed Cost, Break-even Point; Sales to earn profit of ₹ 90 lakhs and Profit at sales of ₹ 280 lakhs.

5. From the following particulars, you are required to calculate: (i) Profit volume ratio, (ii) Break-even point, (iii) Profit when sale is ₹ 2,00,000, (iv) Sales required to earn profit of ₹ 40,000 and (v) Margin of safety in the year 2nd year.

| Year | Sales ₹  | Profit ₹ |
|------|----------|----------|
| I    | 2,40,000 | 18,000   |
| II   | 2,80,000 | 26,000   |

6. EXE Ltd. manufactures and sells four types of products A, B, C and D. The sales mix in value comprises of  $33\frac{1}{3}\%$ ,  $41\frac{2}{3}\%$ ,  $16\frac{2}{3}\%$  and  $8\frac{1}{3}\%$  of products A, B, C and D respectively.

The total budgeted sales (100 per cent) are ₹ 60,000 per month.

Operations costs are:

Variable costs:

Product A            60% of selling price

Product B            68% of selling price

Product C            80% of selling price

Product D            40% of selling price

Fixed cost            ₹ 14,700 of selling price

Calculate the break-even point for the products on an overall basis. It is proposed to change the sales mix as follows:

Product A            25%

Product B            40%

Product C            30%

Product D            5%

The total sales per month at ₹ 60,000. If this proposal is implemented, what will be the break-even point?

7. Jayashree Enterprises present the following information to you relating to the half year ended 30-6-2004:

Fixed Expenses        :        ₹    45,000

Sales                    :        ₹ 1,45,000

Profit                    :        ₹    30,000

During the second half year of 2004, the company had projected a loss of ₹ 10,000. You are required to calculate:

- (i) The break-even point and margin of safety for the six months ended 30.6.2004.

- (ii) Expected sales in the second half year assuming that P/V ratio and fixed expenses remain constant in the second half year also.
- (iii) The break-even point and margin of safety for the whole of 2004.
8. A customer produces and sells 100 units of A per month at ₹ 20. Marginal cost per unit is ₹ 12.00 and fixed costs are ₹ 300 per month. It is proposed to reduce the selling price by 20%. Find the additional sales required to earn the same profit as before.

## Objective Questions

### I. Fill in the Blanks

1. Elements of costs are classified into \_\_\_\_\_ and \_\_\_\_\_.
2. Fixed Cost is treated as \_\_\_\_\_ and charged to P& L account
3. \_\_\_\_\_ costs are treated as product cost.
4. The \_\_\_\_\_ shows the relationship among unit sale price, variable cost, sales volume, sales mix and fixed cost.
5. Fixed cost remains constant \_\_\_\_\_.
6. Those activities that results in cost are known as \_\_\_\_\_.
7. Variable cost is fixed \_\_\_\_\_ but varies in \_\_\_\_\_.
8. Contribution is also known as contribution margin or \_\_\_\_\_.
9. Fixed cost – Loss = \_\_\_\_\_.

[Ans.: 1. Variable cost, fixed cost, 2. Period cost, 3. Variable, 4. CVP analysis, 5. In total, 6. Cost drivers, 7. Per unit, total, 8. Gross margin, 9. Contribution.]



## MANAGERIAL DECISIONS

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The marginal costing helps the management in taking many policy decisions. The vital areas where these concepts are applied directly are as follows:

- 1. Level of activity planning:** Normally, the managements will consider different levels of production or selling activities to decide optimum level of activity. Such periodic exercise shall put the organisation in the right track to achieve its goal. Since the optimum level of activity results in the maximum contribution per unit, the planning can become a perfect execution tool.
- 2. Alternative methods of production:** With the help of marginal costing techniques, it is possible to undertake decision about the alternate methods of production. All the decisions should be focused at the greater contribution so that profit can be maintained at a balanced level.
- 3. Make or buy decision:** Depending upon the situational ambience, the management can have a blueprint on a vital decision. Management can think of outsourcing the production activities or to undertake it within its purview. Based on the comparative statement of cost of manufacture with the purchase price, decisions can be taken.
- 4. Fixation of selling price:** While pricing a product, the marginal costing techniques can come handy. While fixing a price for a product, it is prudent to take into account the recovery of marginal cost in addition to get a reasonable contribution to cover fixed overheads. Pricing will be at ease once the marginal cost and overall profitability of the concern are known.
- 5. Selection of optimum sales mix:** The product mix plays an important role when a firm produces more than one product. The main focus will on profit maximisation. With the help of marginal costing techniques, it is possible to decide the best product mix which will result in maximum profits to the firm.
- 6. New product introduction:** When a firm intends to diversify its activities or to expand its existing markets with the help of marginal costing techniques, by fixing the time horizon to recover the fixed costs and profit, decisions can be taken for the introduction of new products.
- 7. Balancing of profits:** As the economic trends gets changed on account of government fiscal policies and regulations, competition at the regional, national, and international levels, marginal costing techniques can aid to bring out facts with regard to maintaining a desired level of profits.
- 8. Final balancing decisions:** If the sales of the product were not encouraging to cover the fixed costs, it is quite natural that the firm may decide about its continuance. This may lead to dovetailing or completely closing down the operations. Marginal costing helps the management to take a sound decision.

## Decision-making

Decision-making is the process of evaluating two or more alternatives leading to a final choice known as alternative choice decisions. Decision-making is closely associated with planning for the future and is directed towards a specific objective or goal. Decision model contains the following decision-making steps or elements:

1. Identify and define the problem.
2. Identify alternative as possible solutions to the problem.
3. Eliminate alternatives that are clearly not feasible.
4. Collect relevant data (costs and benefits) associated with each feasible alternative.
5. Identify cost and benefits as relevant or irrelevant and eliminate irrelevant costs and benefits from consideration.
6. Identify to the extent possible, non-financial advantages and disadvantages about each feasible alternative.
7. Total the relevant cost and benefits for each alternative.
8. Select the alternative with the greatest overall benefits to make a decision.
9. Implement or execute the decision.
10. Evaluate the results of the decision made.

## Types of Costs

A decision involves selecting among various choices. Non-routine types of decisions are crucial and critical to the firm as it involves huge investments and involve much uncertainty. Short-term decision-making is based on relevant data obtained from accounting information.

Relevant cost are costs which would change as a result of the decision.

Opportunity costs are monetary benefits foregone for not pursuing the alternative course. When a decision to follow one course of action is made, the opportunity to pursue some other course is foregone.

Sunk costs are historical cost that cannot be recovered in a given situation. These costs are irrelevant in decision-making.

Avoidable costs are costs that can be avoided in future as a result of managerial choice. It is also known as discretionary costs. These costs are relevant in decision-making.

Incremental/differential costs are costs that include variable costs and additional fixed costs resulting from a particular decision. They are helpful in finding out the profitability of increased output and give a better measure than the average cost.

## Types of Choices Decisions

The application of incremental/differential costs and revenues for decision-making is known as decision situations or types of choice decisions.

1. Make or buy decisions
2. Addition or discontinuance of a product line or process
3. Sells or process further, etc

**Make or Buy Decisions:** Make or buy decisions arise when a company with unused production capacity consider the following alternatives:

- To buy certain raw materials or subassemblies from outside suppliers.
- To use available capacity to produce the items within the company.
- The quality and type of item which affects the production schedule.
- The space required for the production of item.
- Any transportation involved due to the location of production facility.
- Cost of acquiring special know how required for the item.

**Addition or Discontinuance of a Product Line or Process:** The decision to add or eliminate an unprofitable product is a special case of product profitability evaluation. When a firm is divided into multiple sales outlets, product lines, divisions and departments, it may have to evaluate their individual performance to decide whether or not to continue operations of each of these segments.

**Sells or Process Further:** A firm is frequently faced with the problem of continuing with the existing policies or plans or change to new ones. Such change could be in the form of selling a partially processed product (semi-finished) or process further. While taking a decision about such matters, the management must keep in mind the long-term consequence and the interest of the firm.

## Illustrations

**Illustration 1:** Following information is available:

| Particulars        | Product A<br>(Per Unit) (₹) | Product A<br>(Per Unit) (₹) |
|--------------------|-----------------------------|-----------------------------|
| Direct Materials   | 160                         | 120                         |
| Direct Wages       | 120                         | 80                          |
| Variable Overheads | 180                         | 120                         |
| Selling Price      | 500                         | 400                         |

Fixed Overheads ₹ 15,000.

From the following alternatives, which sales mixes will bring higher profits.

- 250 units of A and 250 units of B
- 400 units of A and 100 units of B
- 150 units of A and 350 units of B
- 400 units of B.

Support the answer with workings.

**Solution:**

### Statement of Contribution per Unit

| Particulars        | Product A<br>(₹) | Product B<br>(₹) |
|--------------------|------------------|------------------|
| Direct Materials   | 100              | 120              |
| Direct Wages       | 120              | 80               |
| Variable Overheads | 180              | 120              |

|                     |     |     |
|---------------------|-----|-----|
| Total Variable Cost | 400 | 320 |
| Selling Price       | 500 | 400 |
| Contribution        | 100 | 80  |

| Particulars             | Option (a)<br>250 of A and<br>250 of B | Option (b)<br>400 of A and 100<br>of B | Option (c)<br>150 of A<br>and 350 of B | Option (d)<br>400 of B |
|-------------------------|--|--|--|------------------------|
| Units Produced and Sold | (250 × 100) +<br>(250 × 80)            | (400 × 100) +<br>(100 × 80)            | (150 × 100) +<br>(350 × 80)            | 400                    |
| Contribution            | 45,000                                 | 48,000                                 | 43,000                                 | 32,000                 |
| Less: Fixed Cost        | 15,000                                 | 15,000                                 | 15,000                                 | 15,000                 |
| Profit                  | 30,000                                 | 33,000                                 | 28,000                                 | 17,000                 |

Option (b) will result into higher profit.

**Illustration 2:** A manufacturing company is operating at 75% of its full capacity. It is proposed to offer a price reduction of 5% to 100% depending upon volume desired. Given below are the relevant data:

| Capacity               | 75     | 85      | 100     |
|------------------------|--------|---------|---------|
| Output (Units)         | 75,000 | 85,000  | 1,00,00 |
| Selling Price Unit     | ₹ 96   | 5 off   | 10 off  |
| Material Cost Per Unit | ₹ 40   | 10 less | 15 less |
| Wages Cost Per Unit    | ₹ 10   | ₹ 10    | ₹ 10    |

Fixed Overheads:

Production ₹ 14,00,000

Selling and Distribution ₹ 5,00,000

Variable Overheads (at full capacity):

Selling and Administration 4,40,000

Production 14,00,000

- Prepare a statement showing variable cost, fixed cost, total cost and profit/loss in terms of ₹ and per unit at 75%, 85% and 100% capacity.
- Indicate which of the three levels is most profitable.

**Solutions:**

| Capacity                                     | 75%<br>75,000 |           | 85%<br>85,000 |           | 100%<br>1,00,000 |           |
|--|---------------|-----------|---------------|-----------|------------------|-----------|
|  |               | Amt       |               | Amt       |                  | Amt       |
| Sales  | 96            | 72,00,000 | 91.20         | 77,52,000 | 86.40            | 86,40,000 |
| Less: Variable Costs:                        |               |           |               |           |                  |           |
| Material                                     | 40            | 30,00,000 | 36            | 30,60,000 | 34               | 34,00,000 |
| Wages  | 10            | 7,50,000  | 10            | 8,50,000  | 10               | 10,00,000 |
| Variable Production Overhead                 | 14            | 10,50,000 | 14            | 11,90,000 | 14               | 14,00,000 |
| Variable Selling and Administration Overhead | 4.40          | 3,30,000  | 4.40          | 33,74,000 | 4.40             | 4,40,000  |

|                            |       |           |       |           |       |           |
|----------------------------|-------|-----------|-------|-----------|-------|-----------|
| Total Variable Cost        | 68.4  | 51,30,000 | 64.4  | 54,74,000 | –     | 62,40,000 |
| Contribution               | 27.6  | 20,70,000 | 26.8  | 22,78,000 | 62.40 | 24,00,000 |
| <b>Fixed Overheads:</b>    |       |           |       |           |       |           |
| Production                 | 18.67 | 14,00,000 | 16.47 | 14,00,000 | 24    | 14,00,000 |
| Selling and Administration | 6.67  | 5,00,000  | 5.88  | 5,00,000  | 14    | 5,00,000  |
| Profit                     | 2.27  | 1,70,000  | 4.47  | 3,78,000  | 5     | 5,00,000  |

**Recommendation:** Operating at 100. i at full capacity is most profitable.

**Illustration 3:** ABC Ltd. manufactures staplers. All parts of the staplers are manufactured by the company except its metal base plate which is bought from Metal Kings & Co. at a price of ₹ 300 per thousand plates. All sales are in units and these are expected to remain at the same level. Metal Kings & Co. have informed that they would be increasing the price of the plates to ₹ 400 per thousand plates. ABC Ltd. has also now received an offer for use of the unutilised plant space and capacity and is thinking to use the same for manufacture of as an alternative to buying from Metal Kings & Co. ABC Ltd. has also now received an offer use of same unutilised plant space at an annual rent of 5,000. The cost department of ABC Ltd. has the following relevant data for self-manufacture of the 1,00,000 plates:

| Particulars               | ₹      |
|---------------------------|--------|
| Raw Materials             | 8,500  |
| Direct Labour             | 8,000  |
| Variable Overheads        | 10,500 |
| General (Fixed) Overheads | 14,000 |

You are required to advise ABC Ltd. giving detailed working and reasoning as to whether it should buy the plates or manufacture them.

**Solution:**

**Statement Showing the cost of Making/Buying and Consequential Effects on Cost 1,00,000 Units**

| Particulars        | Annual Cost |            | Cost Increase or (Saving) |
|--------------------|-------------|------------|---------------------------|
|                    | Make Plates | Buy Plates | If Plates are Produced    |
| Raw Materials      | 8,500       | –          | 8,500                     |
| Direct Labour      | 8,000       | –          | 8,000                     |
| Variable Overheads | 10,500      | –          | 10,500                    |
| Fixed Overheads    | 14,000      | 14,000     | –                         |
| Purchase Plates    | –           | 40,000     | (–) 40,000                |
| Rent Receivable    | –           | (–) 5,000  | 5,000                     |
| (Opportunity Cost) | 41,000      | 49,000     | (–) 8,000                 |

Cost will reduce by ₹ 8,000 or profit will increase by ₹ 8,000 if the company makes the plates. (General overhead is irrelevant and it has no effect on the decision).

**Illustration 4:** M/s Alok Industries has given the following details. Find the most profitability product mix and prepare a statement of the product mix.

| Particulars                            | Product X | Product Y | Product Z |
|--|-----------|-----------|-----------|
| Units budgeted to be produced and sold | 1,800     | 3,000     | 1,200     |
| Selling price per unit (₹)             | 60        | 55        | 50        |
| Requirements per unit:                 |           |           |           |
| Direct materials                       | 5 kg      | 3 kg      | 4 kg      |
| Direct labour                          | 4 hrs.    | 3 hrs     | 2 hrs     |
| Variable overheads                     | ₹ 7       | ₹ 13      | ₹ 8       |
| Fixed overheads                        | ₹ 10      | ₹ 10      | ₹ 10      |
| Cost of direct material per kg         | ₹ 4       | ₹ 4       | ₹ 4       |
| Direct labour hour rate                | ₹ 2       | ₹ 2       | ₹ 2       |
| Maximum possible units of sales        | 4,000     | 5,000     | 1,500     |

All the above products are produced from the same direct materials using the same type of machines and labour. Direct labour, which is the key factor, is limited to 18,600 hours.

**Solution:**

**M/s Alok Industries**  
**Calculation of Contribution per Direct Labour Hours and Ranking**

| Particulars                              | Products |    |    |
|--|----------|----|----|
|  | X        | Y  | Z  |
| A. Selling Price per (₹)                 | 60       | 55 | 50 |
| <i>Less:</i> Variable Cost per unit (₹): |          |    |    |
| Direct Materials                         | 20       | 12 | 16 |
| Direct Labour                            | 8        | 6  | 4  |
| Variable Overheads                       | 7        | 13 | 8  |
| B. Total Variable Cost per unit (₹)      | 35       | 31 | 28 |
| Contribution (A – B) (₹)                 | 25       | 24 | 22 |
| Direct Labour Hours per unit             | 4        | 3  | 2  |
| Contribution per Hour (C/DLH)            | 6.25     | 8  | 11 |
| Ranking                                  | III      | II | I  |

**Statement of Profitability**

| Particulars  | Products |          |        |
|--|----------|----------|--------|
|  | X        | Y        | Z      |
| Units Produced and Sold                                | 150      | 5,000    | 1,500  |
| Contribution per unit (₹)                              | 25       | 24       | 22     |
| Total Contribution                                     | 3,750    | 1,20,000 | 33,000 |
| <i>Less:</i> Fixed Overheads @ ₹ 10 for Budgeted Units | 18,000   | 30,000   | 12,000 |

**Working Note:**

|   |        |
|---|--------|
| Allocation of Direct Labour Hours for Most Profitable Product Mix |        |
| Total Direct Labour Hours Available                               | 18,600 |
| <i>Less:</i> Utilised for 1,500 Units of Product Z (1,500*2)      | 3,000  |
| Balance hrs available   | 15,600 |
| <i>Less:</i> Utilised for 5,000 units of Product Y (5,000*3)      | 15,000 |
| Balance Utilised for 150 units of Product X (150*4)               | 600    |

**Illustration 5:** The following is the data of M Ltd relating to two type of machines:

| Particulars              | Existing Machines<br>₹ | New Machines<br>₹ |
|--------------------------|------------------------|-------------------|
| Output per annum (units) | 2000                   | 4000              |
| Capital Cost             | 25,000                 | 1,00,000          |
| Marginal Cost            | 15,000                 | 13                |
| Selling Price            | 30,000                 | 30                |
| Fixed Expenses per annum | 12,000                 | 32,000            |
| Life                     | 10 years               | 10 years          |

The existing machines has completed five years of services and the present resale value is ₹ 10,000. Advice, on the basis of 'annual' comparative data analysis taking into account all aspects and assuming 15% p.a. as the rate of interest, whether the company should go for the new machine or not and also highlight subjective/qualitative factors for consideration of the management in regard thereto.

**Solution:**

#### Statement of Profitability

| Particulars   | Existing Machine<br>2000 units<br>₹ | New Machines<br>4000 units<br>₹ |
|---|-------------------------------------|---------------------------------|
| Sales   |                                     |                                 |
| Marginal Cost p.a.  | 30,000                              | 52,000                          |
| Fixed Expenses p.a.   | 12,000                              | 32,000                          |
| Interest on Additional Capital Required for New Machinery (1,00,000 – 10,000) 15% |                                     | 13,500                          |
| Depreciation  | 2,500                               | 10,000                          |
| Loss on Sale of old Machine over Ten Years (2,500/10)                             |                                     | 250                             |
| Total Cost  | 44,500                              | 1,07,750                        |
| Total Sales   | 60,000                              | 1,20,000                        |
| Profit per annum  | 15,500                              | 12,250                          |
| CPU   | 22.25                               | 2,69,375                        |
| Profit per unit   | 7.75                                | 30,625                          |

**Comments:**

- (i) The above analysis shows that it will be better to continue with existing machine than replacing it by a new one.
- (ii) Qualitative features:
  - (a) New machine may be of better quality and the output may be doubled to 4,000 and there are chances to increase in the profit if we can raise the selling price of the product.
  - (b) Also there is a possibility of larger market share and hence we can capture the market as the output is doubled.

If we look at short-term point of view, we should go with the existing machine but if we look from long-term perspective, it is advisable to go for the new machine.

**Illustration 6:** A Firm already in production gives to you its following detail:

| Annual Capacity<br>(Units) | Unit Cost<br>₹ | Unit Price<br>₹ |
|----------------------------|----------------|-----------------|
| 6,000                      | 80             | 100             |
| 7,000                      | 75             | 97              |
| 8,000                      | 74             | 95              |
| 9,000                      | 72             |                 |
| 10,000                     | 71             |                 |

The firm is operating at 8,000 units capacity at present and cannot exceed, in any case, totally 15,000 units capacity level by any means. Under the circumstances, the firm receives two alternative additional order, only one of which it can accept:

- For 2,000 units from an export market at a price of ₹ 70 per unit.
- For 7,000 units from another export market at a price of ₹ 75 per unit and it is given that the firm has to increase its establishment for going from 10,000 units to 15,000 units which would result into additional fixed cost of ₹ 30,000 per annum in addition to the per unit cost of ₹ 71 at 10,000 units level which would remain the same even subsequently, i.e., at the level of 15,000 units.

Advise the firm as to whether any of the alternative additional export orders should be accepted or not, and if yes, which one?

**Solution:**

**Operating at 8,000 units**

| Units            | Cost                                   | Sales revenue              | Additional profit |
|------------------|--|----------------------------|-------------------|
| (a) 2000         | 1,18,000                               | 1,40,000                   | 22,000 (₹11/unit) |
|                  | (7,10,000 – 5,92,000)                  | (2,000 * 70)               | (70 – 59) * 2,000 |
| 8,000            | 5,92,000                               | 7,60,000                   | 1,68,000          |
| 10,000           | 7,10,000                               | 9,00,000                   | 1,90,000          |
|                  |  | [7,60,000 + (2,000 * 70)]  |                   |
| (b) Additional   | 15,03,000                              | 5,25,000                   | 22,000            |
|                  | [10,65,000 – 5,92,000<br>+30,000 (FC)] | (7,000*75)                 |                   |
| 7,000            | 10,95,000                              | 12,85,000                  |                   |
| (c) Total 15,000 | (19,65,000 + 30,000)                   | [(7,60,000 + (7,000 * 75)] |                   |

Additional profit is ₹ 22,000.

**Advice:** Any of the above two alternative export orders may be accepted, as both are equally profitable. However, (a) is more advisable in case of double as to stability of demand as fixed cost do not rise.

**Conclusion:** In both the cases, additional profit will be ₹ 22,000. Hence, any of the export order may be accepted.

However, 'a' is preferable as additional fixed cost is not incurred in the case of 'b'.

**(Acceptance or Rejection of Special Export Order)**

**Illustration 7:** Silver Line Ltd. market two brands (A and B) of same product line. Relevant figures about its operations during the year 2009 were.

| Particulars                     | A      | B      |
|---------------------------------|--------|--------|
| Units Sold                      | 80,000 | 60,000 |
| Selling Price per unit (₹)      | 170    | 120    |
| Materials Cost per unit ₹       | 50     | 40     |
| Direct Labour per unit ₹        | 30     | 20     |
| Production overhead (50% Fixed) | 40     | 40     |

Marketing manager proposes two alternatives plans for the year 2010.

- Increase product A market by 40% (no growth for product B).
- Increase product B market by 100% (no growth for product A).

Company can manage either of the plans without any increase in the current level of fixed expenses. Further, selling and distribution expenses are 5% of sales realisation.

You are required to present the detailed calculations of costs and revenues of the alternate plans and advise the management – which one to accept?

**Solution:****Calculation of Costs and Revenues of the Alternate Plans**

| Product  | A Per Unit | B Per Unit | CPU       |
|--|------------|------------|-----------|
| A. Selling Price                               | 170        | 120        |           |
| B. Variable Cost:                              |            |            |           |
| Material                                       | 50         | 40         |           |
| Labour   | 30         | 20         |           |
| Variable Overheads                             | 20         | 20         |           |
| Selling & Distribution Overheads               | 8.50       | 6          |           |
| Total VC                                       | 108.50     | 86         |           |
| C. Contribution (A – B)                        | 61.50      | 34         |           |
| Units Sold                                     | 80,000     | 60,000     |           |
| Total Contribution                             | 49,20,000  | 20,40,000  | 69,60,000 |
| Less: Fixed Cost (20 * 80,000) + (20 * 60,000) |            |            | 28,00,000 |
| Profit   |            |            | 41,60,000 |

**Plan A: Increase Product A market by 40%**

| Particulars           | A                       | B         | Total (₹) |
|-----------------------|-------------------------|-----------|-----------|
| Units                 | 80,000 + 40% = 1,12,000 | 60,000    |           |
| Contribution per unit | 61.50                   | 34        |           |
| Total Contribution    | 68,88,000               | 20,40,000 | 89,28,000 |

|                  |  |           |
|------------------|--|-----------|
| Less: Fixed Cost |  | 28,00,000 |
| Profit           |  | 61,28,000 |

**Plan B: Increase Product B market by 100%**

| Particulars        | A         | B                        | Total (₹) |
|--------------------|-----------|--------------------------|-----------|
| Units              | 80,000    | 60,000 + 100% = 1,20,000 |           |
| Contribution p.u.  | 61.50     | 34                       |           |
| Total Contribution | 49,20,000 | 40,80,000                | 90,00,000 |
| Less: Fixed Cost   |           |                          | 28,00,000 |
| Profit             |           |                          | 62,00,000 |

**Conclusion:** Proposal B should be accepted, i.e., increase the Product B by 100%. It increase the profit to ₹ 60,00,000 as compared to the existing profit which is ₹ 41,60,000.

**Illustration 8:** X Ltd. manufactured and sold 14,000 units in the first year and the second year respectively. The selling price per unit was ₹ 100 in both the years. In the first year, it suffered a loss of ₹ 20,000 and in the second year earned a profit of ₹ 20,000/-.

Calculate the following:

- (a) The amount of fixed cost.
- (b) The BEP in units and in sales value.
- (c) Profit when 26,000 units are sold.
- (d) The number of units to be sold to earn post-tax profit of ₹ 30,000. Tax rate is 40%.

X Ltd. estimates that its sale will be ₹ Nil in the next year. The competitors has made an offer that it would buy the products of X Ltd. At present, selling price less 10% with a condition that X Ltd. should purchase competitor's product equal to double of the units purchased by the competitors from X Ltd. The competitor's product selling price is ₹ 90 and fetches contribution ₹ 25 per unit. If the competitor's offer is purchased, calculate:

- (a) BEP in units purchased and sold by X Ltd.
- (b) Number of units to be purchased and sold to earn profit of ₹ 40,000.

**Solution:**

$$\begin{aligned}
 \text{Contribution per unit} &= \text{Change in Profit/Change in Sales (Quantity)} \\
 &= -20,000 - 20,000/14,000 - 18,000 \\
 &= -40,000/-4,000 \\
 &= ₹ 10/- \text{ unit}
 \end{aligned}$$

**(a) Ascertainment of Fixed Cost**

| Particulars               | 1st Year  | 2nd Year  |
|---------------------------|-----------|-----------|
| Sales                     | 14,00,000 | 18,00,000 |
| Less: Variable Cost (90%) | 12,60,000 | 16,20,000 |
| Contribution              | 1,40,000  | 1,80,000  |
| Less: Fixed Cost          | 1,60,000  | 1,60,000  |
| Profit (Loss)             | (20,000)  | (20,000)  |

**(b) Break-even Point**

$$\begin{aligned} \text{P/V Ratio} &= \text{Contribution/Sales} * 100 \\ &= 10/100 * 100 \\ &= 10\% \end{aligned}$$

$$\begin{aligned} \text{(i) BEP units} &= \text{FC/Contribution per unit} \\ &= 1,60,000/10 \\ &= 16,000 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{(ii) BEP Sales value} &= \text{FC/P/V Ratio} \\ &= 1,60,000/60\% \\ &= ₹ 16,00,000 \end{aligned}$$

**(c) Profit when 26,000 units are sold**

$$\begin{aligned} \text{Margin of Safety} &= \text{Actual Sales} - \text{Break-even Sales} \\ &= 26,000 - 16,000 \\ &= 10,000 \end{aligned}$$

$$\begin{aligned} \text{Profit} &= \text{MOS} * \text{Contribution per unit} \\ &= 10,000 * 10 \\ &= ₹ 1,00,000 \end{aligned}$$

**(d) No. of units to be sold to earn post-tax profit of ₹ 30,000**

Tax rate is 40%

$$\begin{aligned} \text{Pre-tax profit} &= 30,000 / (100 - 40)\% \\ &= ₹ 50,000 \end{aligned}$$

$$\begin{aligned} \text{Contribution required to earn pre-tax profit of ₹ 50,000} &= \text{Fixed Cost} + \text{Profit Required} \\ &= 1,60,000 + 50,000 \\ &= 2,10,000 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Hence, Number of units to be sold to earn post-tax profit of ₹ 30,000} &= 2,10,000 / \text{Contribution per unit} \\ &= 2,10,000 / 10 \\ &= 21,000 \text{ units} \end{aligned}$$

Received selling price as per competitor's offer

$$\begin{aligned} \text{Present Selling price} &= 100 - 10 \\ &= ₹ 90 \end{aligned}$$

Revised (S - V)

$$\text{Contribution} = 90 - 90 = \text{Nil}$$

Contribution on sale of competitor's product = ₹ 25

Let X be the number of units sold by X to competitors

Number of competitor's units to be purchased would be 2%

Whereas fixed cost is ₹ 1,60,000

$$\begin{aligned} 0 * x / 25 * 2x &= 1,60,000 \\ 50x &= 1,60,000 \end{aligned}$$

$$X = 3,200 \text{ units}$$

- (a) X Ltd. should purchase 6400 (double the units purchased by competitor's) and sell 3200 units for BEP

$$\begin{aligned} \text{Contribution} & \quad \text{₹} \\ 3,200 \times 0 & = \text{Nil} \\ \text{Contribution} = 6,400 \times 25 & = 1,60,000 \\ \text{Total Contribution} & = 1,60,000 \end{aligned}$$

- (b) Number of units to be purchased and sold to earn a profit of ₹ 40,000

$$\begin{aligned} \text{Desired Contribution} & = \text{FC} + \text{Required Profit} \\ & = 1,60,000 + 40,000 = \text{₹ } 2,00,000 \\ 0 \times x / 25 \times 2x & = 2,00,000 \\ 50x & = 2,00,000 \\ X & = 4,000 \text{ units} \end{aligned}$$

X Ltd. should purchase 8000 units from the competitors and sell 4000 units for earning a profit of ₹ 40,000.

**Illustration 9:** A manufacturer has planned his level of operation at 5% of his plant capacity of 30,000 units. His expenses are estimated as follows, if 50% of the plant capacity is utilized:

- (i) Direct Materials ₹ 8,280/-
- (ii) Direct Wages ₹ 11,160/-
- (iii) Variable and other manufacturing expenses ₹ 3,860/-
- (iv) Total Fixed Expenses irrespective of capacity utilization ₹ 6,000/-

The expected selling price in the domestic market is ₹ 2/- per unit. Recently, the manufacturer has received a trade enquiry from an Overseas Organisation interested in purchasing 6000 units at a price of ₹ 1.45 per unit.

As a professional Management Accountant, what would be your suggestions regarding acceptance or rejection of the order?

**Solution:**

**Marginal Contribution Analysis Showing Present and Proposed Position**

| Particulars                             | Per Unit<br>₹ | Present<br>Position<br>50% | Proposed<br>Offer<br>20% | Total<br>70% |
|---|---------------|----------------------------|--------------------------|--------------|
|   |               | 15,000<br>Units            | 6,000<br>@1.45           | 21,000       |
| Sales                                   | 2,000         | 30,000                     | 8,700                    | 38,700       |
| <i>Less: Variable Cost:</i>             |               |                            |                          |              |
| Direct Material                         | 0.552         | 8,280                      | 3,312                    | 11,592       |
| Direct Labour                           | 0.774         | 11,160                     | 4,464                    | 15,624       |
| Variable & Other Manufacturing Overhead | 0.264         | 3,960                      | 1,584                    | 5,544        |
| Total Variable Cost                     | 1.560         | 23,400                     | 9,360                    | 32,760       |

|                      |       |       |       |         |
|----------------------|-------|-------|-------|---------|
| Contribution (S – V) | 0.440 | 6,600 | (660) | 5,940   |
| Less: Fixed Cost     |       | 6,000 | —     | (6,000) |
| Profit               |       | 600   | (660) | (60)    |

The proposed offer at lower price, i.e., at ₹ 1.45 is lower than the Marginal Cost which comes out to be ₹ 1.56 per unit. If the proposal is accepted, there will be loss of ₹ 0.11 (1.56 – 1.45) per unit. Hence, the total contribution lost on 6000 units would be ₹ 660. Therefore, the proposal should not be accepted. The following factors should be kept in mind:

- (i) Additional export costs to be incurred.
- (ii) Opportunity cost.
- (iii) Risk of dumping, i.e., re-export by the foreign customer so that the company will be faced with competition with itself.
- (iv) Effect of the reduced export price on the home market.

**Illustration 10:** A factory engaged in manufacturing plastic buckets is working at 40% capacity and produces 10000 buckets per month. The present cost break-up is as under:

|           |                  |
|-----------|------------------|
| Material  | ₹ 20             |
| Labour    | ₹ 6              |
| Overheads | ₹ 10 (60% fixed) |

The selling price is ₹ 40/- per bucket. If it is decided to work the factory at 50% capacity, the selling price falls by 3% and at 90% capacity by 5% accompanied by a similar fall in the price of materials.

You are required to prepare a statement showing the profit of 50% and 90% capacities and also determine the break-even point at each of these production levels.

**Solution:**

**Statement Showing profit and BEP at Different Level of Capacity**

| Particulars          | Existing | 50% capacity 12500 units |          | 90% Capacity 2500 Units |          |
|----------------------|----------|--------------------------|----------|-------------------------|----------|
|                      | P.U. ₹   | P.U. ₹                   | Total ₹  | P.U. ₹                  | Total ₹  |
| Sales (A)            | 40       | 38.80                    | 4,85,000 | 38.00                   | 8,55,000 |
| Less: Variable Cost: |          |                          |          |                         |          |
| Materials            | 20       | 19.40                    | 2,42,500 | 19.00                   | 4,27,500 |
| Labour               | 6        | 6.00                     | 75,000   | 6.00                    | 1,35,000 |
| Overhead (Variance)  | 4        | 4.00                     | 50,000   | 4.00                    | 90,000   |
| (B)                  | 30       | 29.40                    | 3,67,500 | 29.00                   | 6,52,000 |
| Contribution (A – B) | 10.00    | 9.40                     | 1,17,500 | 9.00                    | 2,02,500 |
| Less: Fixed Cost     |          |                          | 60,000   |                         | 60,000   |
|                      |          |                          | 57,500   |                         | 1,42,500 |

At 40% Fixed Cost = 6\*10,000 = ₹ 60,000

| At 50% |  | At 90% |  |
|--------|--|--------|--|
| BEP =  | Fixed Cost* Selling Price/Units/<br>Contribution/Units | BEP =  | Fixed Cost* Selling Price/Units/<br>Contribution/Units |
| =      | 60000 * 38.80/9.40                                     | =      | 60000 * 38/9   |
| =      | ₹ 2,47,660   | =      | ₹ 2,53,333   |
| Or     |  | Or     |  |
| =      | 6,383 buckets  | =      | 6,667 buckets  |

**Illustration 11:** Shantibai Sweet Softness has introduced a new product ‘Suyash’ consisting of square sweet bars which are wrapped in aluminium foil and packed in attractive cartoons containing 50 bars, which is considered as sales unit. Revenue statements for the last two quarters which are assumed to be representative of the efficiency expected in the next few quarters, reflect the following position assuming no closing stocks at each quarter end:

| Particulars                      | First Quarter (₹) | Second Quarter (₹) |
|----------------------------------|-------------------|--------------------|
| Sales:                           |                   |                    |
| 50,000 Cartoons @ ₹ 24           | 12,00,000         | –                  |
| 70,000 Cartoons @ ₹ 24           | –                 | 16,80,000          |
| Cost of Goods Sold               | 7,00,000          | 8,80,000           |
| Gross Margin                     | 5,00,000          | 8,00,000           |
| Selling and Administration Costs | 6,50,000          | 6,90,000           |
| Net Profit (Loss) before Taxes   | (1,50,000)        | 1,10,000           |
| Tax (Negative)                   | (60,000)          | 44,000             |
| Net Profit (Loss)                | (90,000)          | 66,000             |

The firm’s overall marginal and average income tax rate is 40% which has been used to estimate the tax liability arising from sweet operations:

**Required:**

1. The break-even point in terms of quarterly cartoon sales for the sweet (Suyash) both quantity and value wise.
2. With quarterly cartoon, quantity sales and total revenue are required in each quarter to earn an after-tax return of 20% p.a. on an investment of ₹30 lakhs in this product line.
3. It is estimated that sales quantity will increase by 20% over the second quarter sales if the selling price is reduced by ₹ 1.50 per cartoon and ₹ 1,50,000 advertising incurred. Should the plan be implemented?

**Solution:**

1. Break-even Point (Quantity and Value)

Calculation of Variable and Fixed Costs:

(a) Variable Cost of Goods Sold =  $\frac{\text{Change in Cost}}{\text{Change in Output}} = \frac{\text{₹ 1,80,000}}{20,000} = \text{₹ 9 per cartoon}$

- (b) Fixed Cost of Goods Sold

Total Cost = Fixed Cost – Variable Cost

$$7,00,000 = \text{Fixed Cost} + (50,000 \times 9)$$

$$\text{Fixed Cost of Goods Sold} = ₹ 2,50,000$$

$$(c) \text{ Variable Selling and Administration Cost} = \frac{\text{Change in Cost}}{\text{Change in Output}} = \frac{40,000}{20,000} = ₹ 2 \text{ per Cartoon}$$

$$(d) \text{ Fixed Cost of Selling and Administration Cost}$$

$$\text{Total Cost} = \text{Fixed Cost} + \text{Variable Cost}$$

$$6,50,000 = \text{Fixed Cost} + (50,000 \times 2)$$

$$\text{Fixed Cost of Selling and Administration Cost} = ₹ 5,50,000$$

$$\text{Total Variable Cost} = 9 + 2 = ₹ 11 \text{ per Cartoon}$$

$$\text{Total Fixed Cost} = 2,50,000 + 5,50,000 = ₹ 8,00,000 \text{ per Quarter}$$

$$\text{BEP (Quantity)} = \frac{\text{Fixed Cost per Quarter}}{\text{Contribution per Quarter}} = \frac{8,00,000}{(24 - 11)} = \frac{8,00,000}{13} = 61,539 \text{ cartoons}$$

$$\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{13}{24} \times 100 = 54.166\%$$

$$\text{BEP (Value)} = \frac{\text{Fixed Cost per Quarter}}{\text{P/V Ratio}} = \frac{8,00,000}{54.1666\%} = ₹ 14,76,923$$

$$2. \text{ Annual after Tax Return} = 30,00,000 \times 20/100 = ₹ 6,00,000$$

$$\text{Quarterly after Tax Return} = 6,00,000 \times 1/4 = ₹ 2,50,000$$

$$\text{Profit} = \text{Contribution} - \text{Fixed Cost}$$

$$2,50,000 = (\text{Sales} \times \text{P/V Ratio}) - 8,00,000$$

$$\therefore \text{Sales} \times 54.1666\% = ₹ 10,50,000$$

$$\therefore \text{Sales} = \frac{10,50,000}{54.1666\%} = ₹ 19,38,463$$

$$\therefore \text{Sales (quantity)} = \frac{19,38,463}{24} = 80.770 \text{ Cartoons}$$

$$3. \text{ Contribution in Second Quarter} = 13 - 1.50 = 11.50 \text{ per Cartoon}$$

$$\text{Revised Fixed Cost} = 8,00,000 + 1,50,000 = ₹ 9,50,000 \text{ per Quarter}$$

$$\text{The Sales Quantity} = 70,000 - 20\% \text{ Increase} = 84,000 \text{ cartoons}$$

$$\text{Profit before Taxes} = \text{Contribution} - \text{Fixed Cost}$$

$$= (84,000 \times 11.50) - 9,50,000$$

$$= 9,66,000 - 9,50,000 = ₹ 16,000$$

The profit before tax is decreasing from ₹ 1,10,000 to ₹ 16,000 and hence the plan should not be implemented.

**(Determination of the Product to be Product to be Pushed)**

**Illustration 12:** The following data are expected from the annual planning budget.

| Particulars             | Product A | Product B | Product C | Product D |
|-------------------------|-----------|-----------|-----------|-----------|
|                         | (₹)       | (₹)       | (₹)       | (₹)       |
| <b>Sales :</b>          |           |           |           |           |
| 5,000 units @ ₹ 2 each  | 10,000    | –         | –         | –         |
| 10,000 units @ ₹ 6 each | –         | 60,000    | 80,000    | 1,50,000  |
| 20,000 units @ ₹ 4 each | –         | –         | –         | –         |
| <b>Cost:</b>            |           |           |           |           |
| Fixed                   | 1,000     | 13,500    | 12,000    | 26,500    |
| Variable                | 3,000     | 12,000    | 48,000    | 63,000    |
| Total                   | 4,000     | 25,500    | 60,000    | 89,500    |
| Net Profit              | 6,000     | 34,500    | 20,000    | 60,500    |

You are required to compute break-even points for each product and the company's break-even points assuming a constant. Sales mix quantity ratio of 1:2:4, based on the data given, what product should be pushed and why? Also compute the company's break-even points assuming a constant sales mix as follows:

**Case I:** Product A 10,000 units and product B 10,000, Product C 15,000 units.

**Case II:** Product A 5,000 units and product B 15,000, Product C 10,000 units.

**Solution:**

**Contribution to Break-even Point**

| Particulars           | Product A                         | Product B                          | Product C                           | Product D                            |
|-----------------------|-----------------------------------|------------------------------------|-------------------------------------|--------------------------------------|
| Sales                 | 10,000                            | 60,000                             | 80,000                              | 1,50,000                             |
| Less: Variable Cost   | 3,000                             | 12,000                             | 48,000                              | 63,000                               |
| Contribution          | 7,000                             | 48,000                             | 32,000                              | 87,000                               |
| Less: Fixed Cost      | 1,000                             | 13,500                             | 12,000                              | 26,500                               |
| Profit                | 6,000                             | 34,500                             | 20,000                              | 60,500                               |
| P/V Ratio = C/S × 100 | $\frac{7,000}{10,000} \times 100$ | $\frac{48,000}{60,000} \times 100$ | $\frac{32,000}{80,000} \times 100$  | $\frac{87,000}{1,50,000} \times 100$ |
| BEP = FC/P/V Ratio    | $\frac{1,000}{70\%}$<br>= ₹ 1429  | $\frac{13,500}{80\%}$<br>= ₹ 16875 | $\frac{12,000}{40\%}$<br>= ₹ 30,000 | $\frac{26,500}{58\%}$<br>= ₹ 45,000  |

∴ Company should push up product as the P/V ratio is highest.

**Case I (Product A 10,000, Product B 10,000 and Product C 15,000 units)**

| Particulars         | A      | B      | C      | Total    |
|---------------------|--------|--------|--------|----------|
| Sales               | 20,000 | 60,000 | 60,000 | 1,40,000 |
| Less: Variable Cost | 6,000  | 12,000 | 36,000 | 54,000   |
| Contribution        | 14,000 | 48,000 | 24,000 | 86,000   |

$$\text{Company's P/V Ratio} = C/S \times 100 = \frac{86,000}{1,40,000} \times 100 = 61.43\%$$

$$\text{Company's BEP Ratio} = \frac{FC}{\text{P/V ratio}} \times 100 = \frac{26,500}{61.43\%} \times 100 = ₹ 43,139$$

**Case II (Product A 5,000, Product B 15,000 and Product C 10,000 units)**

|                     | A      | B      | C      | Total    |
|---------------------|--------|--------|--------|----------|
| Sales               | 10,000 | 90,000 | 40,000 | 1,40,000 |
| Less: Variable Cost | 3,000  | 18,000 | 24,000 | 45,000   |
| Contribution        | 7,000  | 72,000 | 16,000 | 95,000   |

$$\text{Company's P/V Ratio} = C/S \times 100 = \frac{95,000}{1,40,000} \times 100 = 67.86\%$$

$$\text{Company's BEP Ratio} = \frac{FC}{\text{P/V ratio}} = \frac{26,500}{67.86\%} = ₹ 39,050$$

**(Determination of Profitable Sales Mix)**

**Illustration 13:** Following information has been made available from the cost records of the company manufacturing spare parts:

| Direct Materials | Per Unit |
|------------------|----------|
| A                | ₹ 8      |
| B                | ₹ 6      |

| Direct Wages       |                         |
|--------------------|-------------------------|
| A                  | 4 hours at ₹ 2 per hour |
| B                  | 6 hours at ₹ 2 per hour |
| Variable Overheads | 150% of wages           |
| Fixed Overheads    | ₹ 750                   |
| Selling Price of A | ₹ 30                    |
| Selling Price of B | ₹ 35                    |

The directors want to be acquainted with the desirability of adopting any one of the following alternative sales mixes in the budget for the next period:

- 250 units of A and 250 units of B
- 400 units of B only.
- 400 units of A and 350 units of B
- 150 units of A and 350 units of B

State which of the alternative sales mixes you should recommend to the management.

**Solution:****Statement of Contribution ( per unit)**

| Particulars        | A  | B   |
|--------------------|----|-----|
| Selling Price      | 30 | 35  |
| Variable Expenses  |    |     |
| Direct Material    | 8  | 6   |
| Direct Wages       | 8  | 12  |
| Variable Overheads | 12 | 18  |
| Contribution       | 2  | (1) |

| Particulars          | (a)   | (b)                           | (c)   | (d)   |
|----------------------|---|-------------------------------|---|---|
|                      | 250 units of A<br>and 250 units of B<br>(₹) | 400 units of B<br>only<br>(₹) | 400 units of A and<br>350 units of B<br>(₹) | 150 units of A and<br>350 units of B<br>(₹) |
| Contribution of A    | 500   | -                             | 800   | 300   |
| Contribution of B    | -250  | -400                          | -100  | -350  |
| Total Contribution   | 250   | (400)                         | 700   | (50)  |
| Less: Fixed Overhead | 750   | 750                           | 750   | 750   |
| Profit/Loss          | (500)                                       | (1,150)                       | (50)  | (800)                                       |

**Conclusion:** Alternative (C) with 400 units of A and 100 units of B is recommended to the management, as the loss is minimum.

**(Statement Showing Profits)**

**Illustration 14:** Company makes and sells three products normally X, Y and Z. The unit cost and selling prices are as given below:

| Particulars        | X (₹)  | Y (₹)  | Z (₹)  |
|--------------------|--------|--------|--------|
| Direct Material    | 30.00  | 60.00  | 80.00  |
| Direct Labour      | 40.00  | 40.00  | 100.00 |
| Variable Overheads | 30.00  | 150.00 | 70.00  |
| Selling Price      | 180.00 | 250.00 | 480.00 |

The fixed costs are ₹ 2,70,000

In the month of March and April, number of units sold were as under:

| Month | x units | y units | z units |
|-------|---------|---------|---------|
| March | 1,000   | 1,000   | 1,000   |
| April | 2,000   | 1,300   | 500     |

You are required to prepare the statement showing the sales and profits for the month of March and April and explain why the profits have fallen down in the month of April inspite of increased sales.

**Solution:****Statement for Sale and Profit for March**

| Units Sold               | X<br>1,000 (₹) | Y<br>1,000 (₹) | Z<br>1,000 (₹) | Total<br>(₹) |
|--------------------------|----------------|----------------|----------------|--------------|
| Sales                    | 1,80,000       | 2,50,000       | 4,80,000       | 9,10,000     |
| Less: Direct Material    | 30,000         | 60,000         | 80,000         | 1,70,000     |
| Less: Direct Labour      | 40,000         | 40,000         | 1,00,000       | 1,80,000     |
| Less: Variable Overheads | 30,000         | 1,50,000       | 70,000         | 2,50,000     |
| Contribution             | 80,000         |                | 2,30,000       | 3,10,000     |
| Less: Fixed Cost         |                |                |                | 2,70,000     |
| Profit                   |                |                |                | 40,000       |

| Units Sold               | X<br>2,000 (₹) | Y<br>1,350 (₹) | Z<br>500 (₹) | Total<br>(₹) |
|--------------------------|----------------|----------------|--------------|--------------|
| Sales                    | 3,60,000       | 3,25,000       | 2,40,000     | 9,25,000     |
| Less: Direct Material    | 60,000         | 78,000         | 40,000       | 1,78,000     |
| Less: Direct Labour      | 80,000         | 52,000         | 50,000       | 1,82,000     |
| Less: Variable Overheads | 60,000         | 1,95,000       | 35,000       | 2,90,000     |
| Contribution             | 1,60,000       | 1,15,000       |              | 2,75,000     |
| Less: Fixed Cost         |                |                |              | 2,70,000     |
| Profit                   |                |                |              | 5,000        |

**Conclusion:** The profits have decreased from ₹ 40,000 in March to ₹ 5,000 in April. The contribution is highest for Product Z (i.e. ₹ 230 p.u.). However, in April month sales of Product Z have decreased by 50% and therefore, the profits have also decreased. The contribution in ₹ 80 p.u. for Product X and ₹ Nil p.u. for Product Y.

**Illustration 15:** The cost sheet of product as follows:

| Particulars                        | Per unit (₹) |
|------------------------------------|--------------|
| Direct Materials                   | 10.00        |
| Direct Wages                       | 05.00        |
| Factory Overheads:                 |              |
| Fixed                              | 01.00        |
| Variable                           | 02.00        |
| Administrative Expenses            | 1.5          |
| Selling and Distribution Expenses: |              |
| Fixed                              | 00.50        |
| Variable                           | 01.00        |
| Cost of Sales                      | 21.00        |

The selling price per unit is ₹ 25.00. The above cost information is for an output of 50,000 units whereas the capacity of firm is 60,000 units. A foreign customer is desirous of buying 10,000 units at a price of 19.00 ₹ per unit. The extra cost of exporting the product is ₹ 0.50 per unit. You are required to advise the manufacturer whether the order should be accepted.

### Evaluation of Export Offer

| Particulars                  | 50,000 Units |               | 60,000 Units |               |
|------------------------------|--------------|---------------|--------------|---------------|
|                              | Amount<br>₹  | Per Unit<br>₹ | Amount<br>₹  | Per Unit<br>₹ |
| Sales (50,000 * 25)          | 12,50,000    | .             | 2,50,000     |               |
| (10,000 * 19)                | —            |               | 1,90,000     |               |
| Total Sales (A)              | 12,50,000    | 25            | 4,40,000     | 24            |
| <b>Variable Costs:</b>       |              |               |              |               |
| Direct Materials             | 5,00,000     | 10            | 6,00,000     | 10            |
| Direct Wages                 | 2,50,000     | 5             | 3,00,000     | 5             |
| Cost of Export               | —            | —             | 5000         | 0.08          |
| Factory Overhead             | 1,00,000     | 2             | 1,20,000     | 2             |
| Selling and Distribution     | 50,000       | 1             | 60,000       | 1             |
| Total Variable Cost (B)      | 9,00,000     | 18            | 10,85,000    | 18.08         |
| Contribution (C) = (A) – (B) | 3,50,000     | 7             | 3,55,000     | 5.92          |
| <b>Fixed Assets:</b>         |              |               |              |               |
| Factory Overhead             | 50,000       | 1             | 50,000       | 0.83          |
| Administration Overhead      | 75,000       | 1.5           | 75,000       | 1.25          |
| Selling and Distribution     | 25,000       | 0.5           | 25,000       | 0.42          |
| Total Fixed Costs (D)        | 1,50,000     | 3             | 1,50,000     | 2.5           |
| Profit = (C) – (D)           | 2,00,000     | 4             | 2,05,000     | 3.42          |

**Conclusion:** If the foreign order is accepted, profits of the manufacturer increases from ₹ 2,00,000 to ₹ 2,05,000 Profits increases by ₹ 5,000 and therefore, foreign order should be accepted by the manufacturer.

**Illustration 16:** A manufacturer of packing cases makes three main types of — Deluxe, Luxury and Economy, overheads are incurred on the basis of labour hours. Wages are paid at ₹ 1.00 per hour. Estimates for the cases show the following:

| Particulars           | Deluxe (₹) | Luxury (₹) | Economy (₹) |
|-----------------------|------------|------------|-------------|
| Materials             | 10         | 8          | 3           |
| Wages                 | 6          | 3          | 2           |
| Overheads             | 12         | 6          | 4           |
|                       | 28         | 17         | 9           |
| Net Profit/Loss       | 2          | 3          | 3           |
| Average Selling Price | 26         | 20         | 12          |
| Average Sales (Units) | 10,000     | 20,000     | 5,000       |

The manufacturer felt that he would be well advised to discontinue producing the deluxe and economy cases even though it would mean that some of production facilities would remain unused. He cannot increase the sales of luxury cases. It has been ascertained that 60% of the overheads is fixed. You are required to advise the manufacturer.

**Solution:****Statement of Cost and Contribution of Various Products**

| Particulars                   | Deluxe (₹)                 | Luxury (₹)                 | Economy (₹)                |
|-------------------------------|----------------------------|----------------------------|----------------------------|
| Material                      | 10                         | 8                          | 3                          |
| Wages                         | 6                          | 3                          | 2                          |
| Variable Overheads 40%        | 4.8                        | 2.4                        | 1.6                        |
| Total Variable Cost           | 20.8                       | 13.4                       | 6.6                        |
| Selling Price                 | 26                         | 20                         | 12                         |
| Contribution                  | 5.2                        | 6.6                        | 5.4                        |
| Less: Fixed Cost (60%)        | 2.2                        | 3.6                        | 2.4                        |
| Net Profit/Loss               | (-) 2.8                    | 3                          | 3                          |
| P/V Ratio = $C \times 100/SP$ | $5.2 \times 100/26 = 20\%$ | $6.6 \times 100/20 = 33\%$ | $5.4 \times 100/12 = 45\%$ |

**Conclusion:** The above statement clearly explains that product Deluxe is incurring loss and also its P/V ratio is less as compared to other two products. Hence, it is recommended that the manufacturer should discontinue the product 'Deluxe' and increase the production of products 'Luxury' and 'Economy'.

**(Dropping of a Product)**

**Illustration 17:** A manufacturing company makes two products – Luxury and Deluxe. The results for 2009 were as under.

| Particulars   | Luxury (₹) | Deluxe (₹) |
|---------------|------------|------------|
| Sales         | 2,00,000   | 1,60,000   |
| Variable cost | 1,20,000   | 1,32,000   |
| Fixed Cost    | 40,000     | 32,000     |
| Profit/Loss   | 40,000     | (-) 4,000  |

The managing director has suggested that Deluxe should be dropped as it is making loss. It is estimated that ₹ 8,000 will be saved in fixed overheads as his suggestion is implemented. Should Deluxe be dropped, if:

1. His decision has no effect on sales of luxury;
2. By using the vacant factory space, sales of luxury could be increased by ₹ 1,00,000, the extra production would lead to increase in the total fixed cost to ₹ 76,000.

**Solution:**

| Particulars         | Luxury<br>₹ | Deluxe<br>₹ |
|---------------------|-------------|-------------|
| Sales               | 2,00,000    | 1,60,000    |
| Less: Variable Cost | 1,20,000    | 1,32,000    |
| Contribution        | 80,000      | 28,000      |
| Less: Fixed Cost    | 40,000      | 32,000      |

|                               |                                       |  |
|-------------------------------|---------------------------------------|--|
| Net Profit/Loss               | 40,000                                | (-) 4,000                                |
| P/V Ratio = $C \times 100/SP$ | $= 80,000 \times 100/20,000$<br>= 40% | $= 28,000 \times 100/16,000$<br>= 17.50% |

**Advice:** Since the P/v ratio of ‘Deluxe’ is less, it should be dropped and increase the production of Luxury.

**Revived P/V Ratio:**

| Particulars         | Luxury (₹) |
|---------------------|------------|
| Sales               | 3,00,000   |
| Less: Variable Cost | 1,20,000   |
| Contribution        | 1,80,000   |
| Less: Fixed Cost    | 76,000     |
| Net Profit          | 1,04,000   |

$P / V \text{ Ratio} = 1,80,000 \times 100/3,00,000 = 60\%$

Since the P/V ratio of Luxury is more in both cases, it would be preferable to increase production of Luxury as the contribution is more.

**(Determination of Sales Mix)**

**Illustration 18:** From the following data, you are required to present:

- (i) The marginal cost of product of X and Y and the contribution per unit.
- (ii) The total contribution and profit resulting from each of the suggested sales mixtures.

| Particulars      | Product | Per Unit<br>₹ |
|------------------|---------|---------------|
| Direct Materials | x       | 10.5          |
| Direct Materials | y       | 8.5           |
| Direct Wages     | x       | 3             |
| Direct Wages     | y       | 2             |

Variable expenses 100% of direct wages per product.

Fixed Expenses (total) ₹ 800

Sales Price X ₹ 20.50

Y ₹ 14.50

Suggested Sales Mixes

| Alternatives | No. of<br>X | Results<br>Y |
|--------------|-------------|--------------|
| A            | 100         | 200          |
| B            | 150         | 150          |
| C            | 200         | 100          |

**Solution:****Evaluation of Sales Mix**

| <b>Particulars</b>                       | <b>Product X<br/>₹</b> | <b>Product Y<br/>₹</b> |
|--|------------------------|------------------------|
| Direct Materials                         | 10.5                   | 8.5                    |
| Direct Wages                             | 3                      | 2                      |
| Variable Expenses (100% of Direct wages) | 3                      | 2                      |
| Marginal Cost per unit                   | 16.5                   | 12.5                   |
| Selling Price per unit                   | 20.5                   | 14.5                   |
| <i>Less: Marginal Cost</i>               | 16.5                   | 12.5                   |
| Contribution per unit                    | 4                      | 2                      |

**Sales Mix A**

| <b>Particulars</b>                              | <b>₹</b> |
|---|----------|
| Contribution from 100 units of Product X at ₹ 4 | 400      |
| Contribution from 200 units of Product Y at ₹ 2 | 400      |
| Total Contribution                              | 800      |
| <i>Less: Fixed Expenses</i>                     | 800      |
| Profit (₹)                                      | Nil      |

**Sales Mix B**

| <b>Particulars</b>                      | <b>₹</b> |
|---|----------|
| Contribution from 150 products X at ₹ 4 | 600      |
| Contribution from 150 Products Y at ₹ 2 | 300      |
| Total Contribution                      | 900      |
| <i>Less: Fixed Expenses</i>             | 800      |
| Profit                                  | 100      |

**Sales Mix C**

| <b>Particulars</b>                      | <b>₹</b> |
|---|----------|
| Contribution from 200 products X at ₹ 4 | 800      |
| Contribution from 100 products Y at ₹ 2 | 200      |
| Total Contribution                      | 1,000    |
| <i>Less: Fixed Expenses</i>             | 800      |
| Profit                                  | 200      |

**Advice:** Mix C should be adopted because it gives maximum contribution and profit.

**(Determination of Profitable Sales Mix)**

**Illustration 19:** The following information in respect of product X and Y of ABC Co. Ltd is obtained.

| Particulars                          | Products             |                      |
|--------------------------------------|----------------------|----------------------|
|                                      | X                    | Y                    |
| Sale Price                           | 1000                 | 640                  |
| Direct Material                      | 400                  | 400                  |
| Direct Labour Hours (@ ₹ 5 per hour) | 20 hours             | 40 hours             |
| Variable Overheads                   | 100% of Direct Wages | 100% of Direct Wages |

Fixed Overheads are ₹ 30,000.

You are required to:

- (a) Calculate and present the marginal product costs and contribution per unit
- (b) State which of the following alternative mixes you would recommend? Why?
- (c) 100 units of Product X and 50 units of Product Y
- (d) 50 units of Product X and 100 units of Product Y
- (e) 150 units of Product A only
- (f) 150 units of Product B only

**Solution:**

**Marginal Cost Statement**

| Particulars   | Products |     |
|---|----------|-----|
|   | X        | Y   |
| Sales Price (A)   | 1000     | 640 |
| Variable Cost:  |          |     |
| Direct Material   | 400      | 400 |
| Direct Labour at ₹ % per hour                             | 100      | 200 |
| Variable Overhead (100% of Wages)                         | 100      | 200 |
| Marginal Cost (B)   | 600      | 800 |
| Marginal Contribution per Unit = (A) – (B)                | 400      | 160 |
| <b>Case 1: 100 Units of Product X and 50 of Product Y</b> | 40,000   |     |
| <b>Contribution from 100 Units of x = 100_400</b>         |          |     |
| Cont. from 50 Units of Y = 50 × (160)                     | 8,000    |     |
| Total Contribution  | 32,000   |     |
| Less: Fixed Cost  | 30,000   |     |
| Profit  | 2,000    |     |
| <b>Case 2: 50 Units of Product X and 100 of Product Y</b> |          |     |

|   |        |
|---|--------|
| 50 Units of X = $50 \times 400$                 | 20,000 |
| 100 Units of Y = $100 (160)$                    | 16,000 |
| Total Contribution                              | 4,000  |
| Less: Fixed Cost                                | 30,000 |
| Loss  | 26,000 |
| <b>Case 3: 150 Units of Product X only</b>      |        |
| 150 Units $\times$ 400                          | 60,000 |
| Less: Fixed Cost                                | 30,000 |
| Profit  | 30,000 |
| <b>Case 4: 150 Units of Product Y only</b>      |        |
| Contribution = $150 \text{ Units} \times (160)$ | 24,000 |
| Less: Fixed Cost                                | 30,000 |
| Loss  | 60,000 |

Hence, Case 3 is the most profitable case, i.e., 150 units of Product X only is suitable.

### (Acceptance or Rejection of Export Offer)

**Illustration 20:** The Jaya Snow Company manufactures and sells direct to consumers 5000 jars of snow per month at ₹ 25 per jar. The company's normal production capacity is 10000 jars per month. An analysis of cost for 5000 jars is given below:

| Particulars     | ₹        |
|-----------------|----------|
| Direct Material | 20,000   |
| Direct Labour   | 49,500   |
| Power           | 2,800    |
| Other Expenses  | 8,600    |
| Cost of Jars    | 12,000   |
| Fixed Expenses  | 1,59,100 |
|                 | 2,52,000 |

The company has received an offer for the export under a differential brand name of 60,000 jars of snow at 5,000 jars per month at ₹ 15 a year. Write a short report on the advisability or otherwise of accepting the offer.

**Solution:**

#### Marginal Contribution Analysis of the Present and Proposed Position

| Particulars   | Per Unit | Present Position Capacity<br>50% | Proposed Offer Capacity<br>50% | Total Capacity<br>100% |
|---------------|----------|----------------------------------|--------------------------------|------------------------|
| Sales (Units) | 5,000    | 5,000                            | 10,000                         |                        |
|               | ₹        | ₹                                | ₹                              | ₹ (@ ₹ 15 per jar)     |

|                        |       |          |                       |          |
|------------------------|-------|----------|-----------------------|----------|
| Sales (Value)          | 25    | 1,25,000 | 75,000                | 2,00,000 |
| Less: Direct Materials | 4     | 20,000   | 20,000                |          |
| Direct Labour          | 9.9   | 49,500   | 49,500                |          |
| Power                  | 0.56  | 2,800    | 2,800                 |          |
| Other Expenses         | 1.72  | 8,600    | 8,600                 |          |
| Cost of Sales          | 2.4   | 12,000   | 12,000                |          |
| Variable Cost          | 18.58 | 92,900   | 92,900                | 1,85,800 |
| Marginal Contribution  | 6.42  | 32,100   | (-) <sup>17,900</sup> | 14,200   |
| Fixed Cost             |       |          |                       | 1,59,100 |
| Loss                   |       |          |                       | 1,44,900 |

The proposed offer at lower price will decrease the contribution to the extent of ₹ 17,900. The proposal should not be accepted since there is decrease in the total contribution. The following further points should be kept in view:

- (i) The extent of additional export costs to be incurred.
- (ii) Consideration of opportunity cost whether the additional capacity could be utilised for production of other more profitable products
- (iii) Whether there is any risk of dumping, i.e., re-export by the foreign customer so that the company will be faced with competition with itself.
- (iv) Long-term effect of the reduced export price on the home market.

**(Determination of Profitable Sale Mix)**

**Illustration 21:** From the following information, you are required to:

- (a) Calculate and present the marginal product costs and contribution per unit
- (b) State which of the alternative sales mixes you would recommend to management? Why?

| Particulars              | Per Unit (₹) |
|--------------------------|--------------|
| <b>Selling Price:</b>    |              |
| For X                    | 250          |
| For Y                    | 200          |
| <b>Direct Materials:</b> |              |
| For X                    | 80           |
| For Y                    | 60           |
| <b>Direct Wages:</b>     |              |
| For X                    | 60           |
| For Y                    | 40           |

Fixed overheads are 75,000 and variable overheads are 150% of direct wages. Alternative Sales Mix:

- 1. 2500 units of Product X and 2500 units of Product Y.
- 2. Nil units of Product X and 400 units of Product Y.

3. 4000 units of Product X and 1000 units of Product Y.

**Solution:**

**Statement Showing Marginal Cost and Contribution per unit**

| Particulars         | Product X |     | Product Y |     |
|---------------------|-----------|-----|-----------|-----|
|                     | ₹         | ₹   | ₹         | ₹   |
| Selling Price       |           | 250 |           | 200 |
| Less: Marginal Cost |           |     |           |     |
| Direct Materials    | 80        |     | 60        |     |
| Direct Wages        | 60        |     | 40        |     |
| Variable Overheads  | 90        | 230 | 60        | 160 |
| Contribution        |           | 20  |           | 40  |

**Statement Showing Profitability of Alternative Sales Mix**

| Particulars           | X      | Y        | Total    | X   | Y        | Total    | X      | Y      | Total    |
|-----------------------|--------|----------|----------|-----|----------|----------|--------|--------|----------|
| Sales Mix (units)     | 2,500  | 2,500    | 5,000    | Nil | 4,000    | 4,000    | 4,000  | 1,000  | 5,000    |
| Contribution          | 50,000 | 1,00,000 | 1,50,000 |     | 1,60,000 | 1,60,000 | 80,000 | 40,000 | 1,20,000 |
| Less: Fixed Overheads |        |          | 75,000   |     |          | 75,000   |        |        | 75,000   |
| Profit                |        |          | 75,000   |     |          | 85,000   |        |        | 45,000   |

**Exercise**

1. A company manufactures and sells two products and presents the following cost structure and selling:

| Particulars                 | Product M            | Product N            |
|-----------------------------|----------------------|----------------------|
| Direct Materials Per Unit   | ₹ 25                 | ₹ 30                 |
| Direct Labour Hour Per Unit | 10 hours             | 12 hours             |
| Direct Labour Hour Rate     | ₹ 2 per hour         | ₹ 2 per hour         |
| Variable Factory Overhead   | 100 of Direct Labour | 100 of Direct Labour |
| Selling Price Per Unit      | ₹ 75                 | ₹ 90                 |

Fixed Cost ₹ 10,000.

The marketing manager has suggested the following sales options:

| Option | Unit of M | Unit of N |
|--------|-----------|-----------|
| I      | 800       | 600       |
| II     | 1,600     | -         |
| III    | -         | 1,300     |
| IV     | 1,100     | 500       |

Prepare marginal cost statement of two products. Evaluate sales options and suggest best profitable sales mix.

2. Financial Accountant of PSC Ltd. has presented the following product for Performance Report for the year ended March, 2010:

| Particulars           | ₹         |
|-----------------------|-----------|
| Sales @ ₹ 10 per unit | 10,00,000 |
| Total Variable Cost   | 7,00,000  |
| Fixed Cost            | 2,00,000  |
| Profit                | 1,00,000  |

The Marketing Manager of the company has come up with a proposal that if the selling price of the product is reduced by 10% the quantity sold will go up by 25%. On the other hand, the Costing Department is of the opinion that as most of the competitors have higher prices, the selling price should increase by 10%. The Marketing Manager has apprehension that if the selling price is increased by 10%, the quantity sold will fall by 20%. You are invited by the company to analyse the situation and advise the company to take a decision with:

- The Selling Price should be increased or
  - The Selling Price should be reduced or
  - The Selling Price should be left unchanged.
3. The following relevant data of a firm is given:

| Particulars                         | Activity Levels (Tonnes) |               |               |               |
|-------------------------------------|--------------------------|---------------|---------------|---------------|
|                                     | 50,000 tonnes            | 60,000 tonnes | 70,000 tonnes | 80,000 tonnes |
| Variable cost (₹ in thousands)      | 5,000                    | 6,000         | 7,000         | 8,000         |
| Semi-variable cost (₹ in thousands) | 1,500                    | 1,600         | 1,650         | 1,700         |
| Fixed cost (₹ in thousands)         | 2,500                    | 2,500         | 3,000         | 3,000         |
| Total cost (₹ in thousands)         | 9,000                    | 10,100        | 11,650        | 12,700        |

The fixed costs follow step-graph pattern as is clear from the above and the semi-variable costs change at uniform rate between the above given activity level. Given that the firm operates at 55,000 tonnes level at present,

- Calculate the additional/incremental costs if it manufactures: (a) 10,000 tonnes and (b) 15,000 tonnes.
  - Advice whether the firm should accept 'any one' of the following additional (special) export market offers and if yes 'which one' should it accept:
    - For 10,000 tonnes at a selling price of ₹ 125/- per tonne
    - For 15,000 tonnes at a selling price of ₹ 150/- per tonne
4. Diversity & Co. manufactures five different products Alpha, Beeta, Gama, Theeta and Delta from the same raw material which is in short supply, viz., available only to the extent 5,000 kgs. The following relevant data is available to you:

| Particulars                 | Alpha | Beeta | Gama  | Theeta | Delta |
|-----------------------------|-------|-------|-------|--------|-------|
| Maximum Sales (units)       | 1,500 | 2,500 | 1,600 | 2,000  | 2,200 |
| Production per unit         | 2,000 | 3,000 | 1,500 | 2,000  | 2,000 |
| Selling Price per unit (₹)  | 4     | 3.5   | 1.5   | 1      | 3     |
| Marginal Cost per unit (₹)  | 3     | 2     | 1.25  | 0.75   | 2.5   |
| Raw Material (kgs) per unit | 2     | 8     | 3     | 5      | 2     |

You are required to:

- (a) Determine the most profitable production mix:
  - (b) Given the mix derived in (a) above is being produced, determine which of the following two alternative proposals should the enterprise accept in order to increase its profit:
    - (i) Improve quality and sell at the same price to sell an additional quantity of 500 units, the quality improvement costs increasing the marginal costs by ₹ 0.15 per unit;
    - (ii) Reduce the selling price by ₹ 0.05 per unit to sell an additional quantity of 400 units.
5. Following data relates to a company which manufactures a single product:

|                      |                |
|----------------------|----------------|
| <b>Product Cost:</b> |                |
| Variable             | ₹ 2/- per unit |
| Fixed cost           | ₹ 80,000       |
| <b>Assets:</b>       |                |
| Working Capital      | ₹ 1,00,000/-   |
| Fixed Cost           | ₹ 2,00,000/-   |
|                      | ₹ 3,00,000/-   |

The desired rate on the return of the capital employed by the company is 30% and the Divisional Manager has fixed the selling price of the product at ₹ 2.50 per unit.

- (i) Calculate the number of the units which the division should produce and sell to achieve the target return.
  - (ii) The product is also unable as a raw material in another division of the same enterprise. It is supposed that out of the total units manufactured as per item (i) above 60,000 units be transferred to the other division. The transfer price under discussion. The transfer is insisting that the price be fixed at ₹ 2.30 per unit which is the price which it can be procured from the market. The transferee divisional manager states that if no transfer is made and production is curtailed accordingly, there will be reduction in the working capital, Fixed assets and fixed costs to the extent of ₹ 10,000/- each. You are required to give your comments regarding the proposed transfer price of ₹ 2.30 per unit.
  - (iii) Suppose that it is agreed that the transfer to the other division be made at price of ₹ 2.30 per units, at what price should it transfer or sell the remaining units so as to maintain the desired return of 30%? Alternatively, how many more units it should produce assuming that this will not make any change in the fixed cost, the asset cost or the selling price.
6. Modern Chair Manufacturing Company received an offer to sell 25000 outdoor patro chairs to Easy Lift Corporation. Modern Chair Manufacturing Company produces 400000 chairs annually by operating at 80% full capacity. Regular selling price for this type of chairs is ₹ 33. The chairs required are similar to those currently being produced by Modern Chairs Manufacturing company. Budgeted annual production costs and other expenses are as follows:

| Particulars   | Per Unit<br>₹ | Total<br>₹ |
|---------------|---------------|------------|
| Raw Material  | 4.25          | 1700000    |
| Direct Labour | 5.75          | 2300000    |

|   |      |                   |
|---|------|-------------------|
| Variable Factory Overhead                 | 7.75 | 3100000           |
| Fixed Factory Overhead                    | –    | 2500000           |
| Variable Selling Costs                    | –    | 5% of Sales Price |
| Fixed Selling and Administrative Overhead | –    | 1450000           |

The company wants to earn a minimum profit of rupee one per chair and no selling expenses will be incurred for special order transaction. Assume that normal operations will not be affected by the special order and that the regular sales volume for the year is 400000 chairs as initially planned you are required to:

- (a) Find out what should be the minimum price to be quoted by Modern Chair Manufacturing Company?
  - (b) Prepare an income statement showing the position of the company without special order, for special order and with special order.
7. From the following data, which product would you recommend to be manufactured in a factory, time being the key factor?

| Per Unit of Product             | A (₹)   | B (₹)   |
|---------------------------------|---------|---------|
| Direct Material                 | 24      | 14      |
| Direct Labour (₹ 1 per hr.)     | 2       | 13      |
| Variable Overhead (₹ 2 per hr.) |         | 16      |
| Selling Price                   | 100     | 110     |
| Standard Time to Produce        | 2 hours | 3 hours |

8. Suyush Ltd is considering launching a new monthly magazine at a selling price of ₹ 10 per copy. Sales of the magazine are expected to be 5,00,000 copies per month but it is possible that the actual sales could differ quite significantly from the estimate.

Two different methods of producing the magazines are being considered and neither would involve any additional capital expenditure. The estimated production cost for each of the two methods of manufacture, together with the additional marketing and distribution costs of selling the new magazine, are given below:

| Particulars           | Method A        | Method B         |
|-----------------------|-----------------|------------------|
| Variable Costs        | ₹ 5.50 per Copy | ₹ 5.00 per Copy  |
| Specific Fixed Costs  | ₹ 8,00,000 p.m. | ₹ 12,00,000 p.m. |
| Semi-variable Copies: |                 |                  |
| For 3,50,000 Copies   | ₹ 5,50,000 p.m. | ₹ 4,75,000 p.m.  |
| For 4,50,000 Copies   | ₹ 6,50,000 p.m. | ₹ 5,25,000 p.m.  |

|                      |                      |
|----------------------|----------------------|
| Sales                | 2,20,000 Copies p.m. |
| Selling Price        | ₹ 8.50 per Copy      |
| Variable Costs       | ₹ 3.50 per Copy      |
| Specific Fixed Costs | ₹ 8,00,000 p.m.      |

You are required to calculate for each production method:

- (i) The net increase in company profit which will result from the introduction of the new magazine, at each of the following levels of activity  
5,00,000      4,00,000      6,00,000      copies per month
- (ii) The amount by which sales volume of the now magazine could decline from the anticipated 5,00,000 copies p.m., before the company makes no additional profit from the introduction of the new publication.

And also briefly identify any conclusion which may be drawn from your calculations.

9. A pen manufacturer makes an average profit of ₹ 25,000 per pen on a selling price of ₹ 143 by producing and selling 60,000 pens or 60% of the potential capacity. His cost of sales is:

|                                |         |
|--------------------------------|---------|
| Direct Materials               | ₹ 35.00 |
| Direct Wages                   | ₹ 12.50 |
| Works Overheads (50% Fixed)    | ₹ 62.50 |
| Sales Overheads (25% Variable) | ₹ 08.00 |

During the current year, he intends to produce the same number of pens but anticipates that his fixed charges will go up by 10% while rates of direct labour and direct material will increase by 8% and 6% respectively. But he has no option of increasing the selling price under the situation. He obtain offer for a further 205 of his capacity. What minimum price will you recommend for acceptance to ensure the manufacturer and overall profit of ₹ 16,73,000?

10. Jay-Vijay Company is at present operating at 60% capacity producing at the rate of 10,000 units a months – a single product sells for ₹ 9.00 a unit for the year 2009, the results have been as follows:

| Particulars                              | ₹        | ₹         |
|--|----------|-----------|
| Sales: 1,20,000 Units at ₹ 9.00 per unit |          | 10,80,000 |
| <b>Cost of Sales:</b>                    |          |           |
| Direct Materials                         | 1,80,000 |           |
| Direct Labour                            | 3,60,000 |           |
| Variable Overheads                       | 90,000   |           |
| Fixed Manufacturing Overheads            | 1,35,000 |           |
|  |          | 7,65,000  |
| Gross Profit                             |          | 3,15,000  |
| <b>Selling Expenses:</b>                 | 50,000   |           |
| Fixed                                    | 36,000   |           |
| Variable                                 |          |           |
| <b>Administrative Expenses:</b>          |          |           |
| Fixed                                    | 22,000   |           |
|  |          | 1,08,000  |
| Profits                                  |          | 2,07,000  |

Although the company is operating relatively at the high net profit at a plant capacity of 60%, it is a fact that the price per unit could be reduced by 20%, the value of sales would increase to 1,80,000 units per year with an increase in the fixed manufacturing overheads of ₹ 9,000 per year. If sales price could be reduced by 33%, the volume of sales could increase to full capacity (20,00,000) units with increase in expenses at 60% levels as follows:

- (a) Fixed manufacturing overheads – ₹ 11,000
- (b) Fixed selling expenses – ₹ 2000
- (c) Fixed administration expenses – ₹ 6,000

You are required to:

- (i) Prepare a comparative statement showing net income under the three alternative profit volume relationships and
- (ii) Compute the break-even sales point in each.

## Objective Questions

### I. Fill in the Blanks

1. Relevant Costs are costs which would \_\_\_\_\_ as a result of the decision.
2. \_\_\_\_\_ are historical cost that cannot be recovered in a given situation.
3. Opportunity costs are \_\_\_\_\_ for not pursuing the alternative course.
4. \_\_\_\_\_ is also known as discretionary cost.
5. Budgets are not actual but \_\_\_\_\_.
6. After setting up objectives in terms of plans, it becomes imperative to organise the factors of production to convert into a \_\_\_\_\_ and \_\_\_\_\_.
7. \_\_\_\_\_ signifies such systematic efforts which help the management to know whether actual performance is in line with predetermined goal, policy and plans.
8. Internal refinement, broad indexation of activities and concentrated details is the essential features in \_\_\_\_\_.

[Ans.: 1. Change, 2. Sunk cost, 3. Monetary benefits foregone, 4. Avoidable cost, 5. Estimates, 6. Reality and workable preposition, 7. Control 8. Planning.]



## STANDARD COSTING

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### Introduction

You know that management accounting is managing a business through accounting information. In this process, management accounting is facilitating managerial control. It can also be applied to your own daily/monthly expenses, if necessary. These measures should be applied correctly so that performance takes place according to plans. Planning is the first tool for making the control effective. The vital aspect of managerial control is cost control. Hence, it is very important to plan and control costs. Standard costing is a technique which helps you to control costs and business operations. It aims at eliminating wastes and increasing efficiency in performance through setting up standards or formulating cost plans.

### Meaning of Standard

When you want to measure something, you must take some parameter or yardstick for measuring. We can call this as standard. What are your daily expenses? An average of ₹50! If you have been spending this much for so many days, then this is your daily standard expense.

The word standard means a benchmark or yardstick. The standard cost is a predetermined cost which determines in advance what each product or service should cost under given circumstances.

In the words of Backer and Jacobsen, “Standard cost is the amount the firm thinks a product or the operation of the process for a period of time should cost, based upon certain assumed conditions of efficiency, economic conditions and other factors.”

### Definition

The CIMA, London has defined standard cost as “a predetermined cost which is calculated from management standards of efficient operations and the relevant necessary expenditure.” They are the predetermined costs on technical estimate of material labour and overheads for a selected period of time and for a prescribed set of working conditions. In other words, a standard cost is a planned cost for a unit of product or service rendered.

The technique of using standard costs for the purpose of cost control is known as standard costing. It is a system of cost accounting which is designed to find out how much should be the cost of a product under the existing conditions. The actual cost can be ascertained only when production is undertaken. The predetermined cost is compared to the actual cost and a variance between the two enables the management to take necessary corrective measures.

## Advantages

Standard costing is a management control technique for every activity. It is not only useful for cost control purposes but is also helpful in production planning and policy formulation. It allows management by exception. In the light of various objectives of this system, some of the advantages of this tool are given below:

1. **Efficiency measurement:** The comparison of actual costs with standard costs enables the management to evaluate performance of various cost centres. In the absence of standard costing system, actual costs of different period may be compared to measure efficiency. It is not proper to compare costs of different period because circumstance of both the periods may be different. Still, a decision about base period can be made with which actual performance can be compared.
2. **Finding of variance:** The performance variances are determined by comparing actual costs with standard costs. Management is able to spot out the place of inefficiencies. It can fix responsibility for deviation in performance. It is possible to take corrective measures at the earliest. A regular check on various expenditures is also ensured by standard cost system.
3. **Management by exception:** The targets of different individuals are fixed if the performance is according to predetermined standards. In this case, there is nothing to worry. The attention of the management is drawn only when actual performance is less than the budgeted performance. Management by exception means that everybody is given a target to be achieved and management need not supervise each and everything. The responsibilities are fixed and everybody tries to achieve his/her targets.
4. **Cost control:** Every costing system aims at cost control and cost reduction. The standards are being constantly analysed and an effort is made to improve efficiency. Whenever a variance occurs, the reasons are studied and immediate corrective measures are undertaken. The action taken in spotting weak points enables cost control system.
5. **Right decisions:** It enables and provides useful information to the management in taking important decisions. For example, the problem created by inflating, rising prices. It can also be used to provide incentive plans for employees, etc.
6. **Eliminating inefficiencies:** The setting of standards for different elements of cost requires a detailed study of different aspects. The standards are set differently for manufacturing, administrative and selling expenses. Improved methods are used for setting these standards. The determination of manufacturing expenses will require time and motion study for labour and effective material control devices for materials. Similar studies will be needed for finding other expenses. All these studies will make it possible to eliminate inefficiencies at different steps.

## Limitations of Standard Costing

1. It cannot be used in those organisations where non-standard products are produced. If the production is undertaken according to the customer specifications, then each job will involve different amount of expenditures.
2. The process of setting standard is a difficult task, as it requires technical skills. The time and motion study is required to be undertaken for this purpose. These studies require a lot of time and money.

3. There are no inset circumstances to be considered for fixing standards. The conditions under which standards are fixed do not remain static. With the change in circumstances, if the standards are not revised the same becomes impracticable.
4. The fixing of responsibility is not an easy task. The variances are to be classified into controllable and uncontrollable variances. Standard costing is applicable only for controllable variances.

For instance, if the industry changed the technology then the system will not be suitable. In that case, we will have to change or revise the standards. A frequent revision of standards will become costly.

## Setting Standards

Normally, setting up standards is based on the past experience. The total standard cost includes direct materials, direct labour and overheads. Normally, all these are fixed to some extent. The standards should be set up in a systematic way so that they are used as a tool for cost control.

Various elements which Influence the Setting of Standards

### Setting Standards for Direct Materials

There are several basic principles which ought to be appreciated in setting standards for direct materials. Generally, when you want to purchase some material what are the factors you consider. If material is used for a product, it is known as direct material. On the other hand, if the material cost cannot be assigned to the manufacturing of the product, it will be called indirect material. Therefore, it involves two things:

- Quality of material
- Price of the material

When you want to purchase material, the quality and size should be determined. The standard quality to be maintained should be decided. The quantity is determined by the production department. This department makes use of historical records, and an allowance for changing conditions will also be given for setting standards. A number of test runs may be undertaken on different days and under different situations, and an average of these results should be used for setting material quantity standards.

The second step in determining direct material cost will be a decision about the standard price. Material's cost will be decided in consultation with the purchase department. The cost of purchasing and store keeping of materials should also be taken into consideration. The procedure for purchase of materials, minimum and maximum levels for various materials, discount policy and means of transport are the other factors which have bearing on the materials cost price. It includes the following:

- Cost of materials
- Ordering cost
- Carrying cost

The purpose should be to increase efficiency in procuring and storekeeping of materials. The type of standard used – ideal standard or expected standard – also affects the choice of standard price.

## Setting Direct Labour Cost

If you want to engage a labour force for manufacturing a product or a service for which you need to pay some amount, this is called wages. If the labour is engaged directly to produce the product, this is known as direct labour. The second largest amount of cost is of labour. The benefit derived from the workers can be assigned to a particular product or a process. If the wages paid to workers cannot be directly assigned to a particular product, these will be known as indirect wages. The time required for producing a product would be ascertained and labour should be properly graded. Different grades of workers will be paid different rates of wages. The times spent by different grades of workers for manufacturing a product should also be studied for deciding upon direct labour cost. The setting of standard for direct labour will be done basically on the following:

- Standard labour time for producing
- Labour rate per hour

Standard labour time indicates the time taken by different categories of labour force which are as under:

- Skilled labour
- Semi-skilled labour
- Unskilled labour

For setting a standard time for labour force, we normally take in to account previous experience, past performance records, test run result, work-study etc. The labour rate standard refers to the expected wage rates to be paid for different categories of workers. Past wage rates and demand and supply principle may not be a safe guide for determining standard labour rates. The anticipation of expected changes in labour rates will be an essential factor. In case there is an agreement with workers for payment of wages in the coming period, these rates should be used. If a premium or bonus scheme is in operation, then anticipated extra payments should also be included. Where a piece rate system is used, standard cost will be fixed per piece. The object of fixed standard labour time and labour rate is to device maximum efficiency in the use of labour.

## Setting Standards of Overheads

The next important element comes under overheads. The very purpose of setting standard for overheads is to minimise the total cost. Standard overhead rates are computed by dividing overhead expenses by direct labour hours or units produced. The standard overhead cost is obtained by multiplying standard overhead rate by the labour hours spent or number of units produced. The determination of overhead rate involves three things:

- Determination of overheads
- Determination of labour hours or units manufactured
- Calculating overheads rate by dividing A by B

The overheads are classified into fixed overheads, variable overheads and semi-variable overheads. The fixed overheads remain the same irrespective of level of production, while variable overheads change in the proportion of production. The expenses increase or decrease with the increase or decrease in output. Semi-variable overheads are neither fixed nor variable. These overheads increase with the increase in production but the rate of increase will be less than the rate of increase in

production. The division of overheads into fixed, variable and semi-variable categories will help in determining overheads.

## Determination of Standard Costs

How should the ideal standards for better controlling be determined?

### 1. Determination of Cost Centre

According to J. Betty, “A cost centre is a department or part of a department or an item of equipment or machinery or a person or a group of persons in respect of which costs are accumulated, and one where control can be exercised.” Cost centres are necessary for determining the costs. If the whole factory is engaged in manufacturing a product, the factory will be a cost centre. In fact, a cost centre describes the product while cost is accumulated. Cost centres enable the determination of costs and fixation of responsibility. A cost centre relating to a person is called personnel cost centre, and a cost centre relating to products and equipment is called impersonal cost centre.

### 2. Current Standards

A current standard is a standard which is established for use over a short period of time and is related to current condition. It reflects the performance that should be attained during the current period. The period for current standard is normally one year. It is presumed that conditions of production will remain unchanged. In case there is any change in price or manufacturing condition, the standards are also revised. Current standard may be ideal standard and expected standard.

### 3. Ideal Standard

This is the standard which represents a high level of efficiency. Ideal standard is fixed on the assumption that favourable conditions will prevail and management will be at its best. The price paid for materials will be lowest and wastes etc., will be minimum possible. The labour time for making the production will be minimum and rates of wages will also be low. The overhead expenses are also set with maximum efficiency in mind. All the conditions, both internal and external, should be favorable and only then ideal standard will be achieved.

Ideal standard is fixed on the assumption of those conditions which may rarely exist. This standard is not practicable and may not be achieved. Though this standard may not be achieved, even then an effort is made. The deviation between targets and actual performance is ignorable. In practice, ideal standard has an adverse effect on the employees. They do not try to reach the standard because the standards are not considered realistic.

### 4. Basic Standards

A basic standard may be defined as a standard which is established for use for an indefinite period which may be a long period. Basic standard is established for a long period and is not adjusted to the Present conditions. The same standard remains in force for a long period. These standards are revised only on the changes in specification of material and technology productions. It is indeed just like a number against which subsequent process changes can be measured. Basic standard enables the measurement of changes in costs. For example, if the basic cost for material is ₹ 20 per unit and the current price is ₹ 25 per unit, it will show an increase of 25% in the cost of materials. The changes in manufacturing costs can be measured by taking basic standard, as a base standard cannot serve as a

tool for cost control purpose because the standard is not revised for a long time. The deviation between standard cost and actual cost cannot be used as a yardstick for measuring efficiency.

### **5. Normal Standards**

As per terminology, normal standard has been defined as a standard which, it is anticipated, can be attained over a future period of time, preferably long enough to cover one trade cycle. This standard is based on the conditions which will cover a future period of five years, concerning one trade cycle. If a normal cycle of ups and downs in sales and production is 10 years, then standard will be set on average sales and production which will cover all the years. The standard attempts to cover variance in the production from one time to another time. An average is taken from the periods of recession and depression. The normal standard concept is theoretical and cannot be used for cost control purpose. Normal standard can be properly applied for absorption of overhead cost over a long period of time.

### **6. Organisation for Standard Costing**

The success of standard costing system will depend upon the setting up of proper standards. For the purpose of setting standards, a person or a committee should be given this job. In a big concern, a standard costing committee is formed for this purpose. The committee includes production manager, purchase manager, sales manager, personnel manager, chief engineer and cost accountant. The cost accountant acts as a co-coordinator of this committee.

### **7. Accounting System**

Classification of accounts is necessary to meet the required purpose, i.e. function, asset or revenue item. Codes can be used to have a speedy collection of accounts. A standard is a pre-determined measure of material, labour and overheads. It may be expressed in quality and its monetary measurements in standard costs.

## **Revision of Standards**

For effective use of this technique, sometimes we need to revise the standards which follow for better control. Even standards are also subjected to change like the production method, environment, raw material, and technology.

Standards may need to be changed to accommodate changes in the organisation or its environment. When there is a sudden change in economic circumstances, technology or production methods, the standard cost will no longer be accurate. Standards that are out of date will not act as effective feed forward or feedback control tools. They will not help us to predict the inputs required nor help us to evaluate the efficiency of a particular department. If standards are continually not being achieved and large deviations or variances from the standard are reported, they should be carefully reviewed. Also, changes in the physical productive capacity of the organisation or in material prices and wage rates may indicate that standards need to be revised. In practice, changing standards frequently is an expensive operation and can cause confusion. For this reason, standard cost revisions are usually made only once a year. At times of rapid price inflation, many managers have felt that the high level of inflation forced them to change price and wage rate standards continually. This, however, leads to reduction in value of the standard as a yardstick. At the other extreme is the adoption of basic standard which will remain unchanged for many years. They provide a constant base for comparison, but this is hardly satisfactory when there is technological change in working procedures and conditions.

## Summary

Basically, standard costing is a management tool for control. In the process, we have taken standards as parameters for measuring the performance. Cost analysis and cost control is essential for any activity. Cost includes material labour and overheads. Sometimes, we need to revise the standards due to change in uses, raw material, technology, method of production etc. For a proper organisation, it is required to implement this under a committee for the activity. It is a continued activity for the optimum utilization of resources.

## Variance Analysis

A variance is the difference between an actual result and an expected result. The process by which the total difference between standard and actual results is analysed is known as variance analysis. When actual results are better than the expected results, we have a favourable variance (F). If, on the other hand, actual results are worse than expected results, we have an adverse (A).

**I will use this example throughout this Exercise:**

| <b>Standard cost of Product A</b>  | <b>₹</b>   |
|------------------------------------|------------|
| Materials (5 kgs × ₹10 per kg)     | 50         |
| Labour (4 hrs × ₹5 per hr)         | 20         |
| Variable o/hds (4 hrs × ₹2 per hr) | 8          |
| Fixed o/hds (4 hrs × ₹6 per hr)    | 24         |
|                                    | <b>102</b> |

### **Budgeted results**

|                |                |
|----------------|----------------|
| Production:    | 1,200 units    |
| Sales:         | 1,000 units    |
| Selling price: | ₹ 150 per unit |

### **ACTUAL Results**

|                 |                     |
|-----------------|---------------------|
| Production:     | 1,000 units         |
| Sales:          | 900 units           |
| Materials:      | 4,850 kgs, ₹ 46,075 |
| Labour:         | 4,200 hrs, ₹ 21,210 |
| Variable o/hds: | ₹ 9,450             |
| Fixed o/hds:    | ₹ 25,000            |
| Selling price:  | ₹ 140 per unit      |

## 1. Variable Cost Variances

### **Direct Material Variances**

The direct material total variance is the difference between what the output actually cost and what it should have cost, in terms of material.

From the example above the material total variance is given by:

|  |                  |
|--|------------------|
| 1,000 units should have cost ( $\times ₹ 50$ ) | 50,000           |
| But did cost                                   | 46,075           |
| <b>Direct material total variance</b>          | <b>3,925 (F)</b> |

It can be divided into two sub-variances

#### The Direct Material Price Variance

This is the difference between what the actual quantity of material used did cost and what it should have cost.

|   |                  |
|---|------------------|
|   | ₹                |
| 4,850 kgs should have cost ( $\times ₹10$ ) | 48,500           |
| But did cost                                | 46,075           |
| <b>Direct material price variance</b>       | <b>2,425 (F)</b> |

#### The Direct Material Usage Variance

This is the difference between how much material should have been used for the number of units actually produced and how much material was used, valued at standard cost

|  |                    |
|--|--------------------|
| 1,000 units should have used ( $\times 5$ kgs) | 5,000 kgs          |
| But did use                                    | 4,850 kgs          |
| Variance in kgs                                | 150 kgs (F)        |
| Valued at standard cost per kg                 | $\times ₹10$       |
| <b>Direct material usage variance in ₹</b>     | <b>₹ 1,500 (F)</b> |

*The direct material price variance is calculated on material purchases in the period if closing stocks of raw materials are valued at standard cost or material used if closing stocks of raw materials are valued at actual cost (FIFO).*

#### Direct Labour Total Variance

The direct labour total variance is the difference between what the output should have cost and what it did cost, in terms of labour.

|  |                  |
|--|------------------|
|  | ₹                |
| 1,000 units should have cost ( $\times ₹ 20$ ) | 20,000           |
| But did cost                                   | 21,210           |
| <b>Direct material price variance</b>          | <b>1,210 (A)</b> |

#### Direct Labour Rate Variance

This is the difference between what the actual number of hours worked should have cost and what it did cost.

|  |                |
|--|----------------|
|  | ₹              |
| 4,200 hrs should have cost (4,200 hrs $\times ₹ 5$ ) | 21,000         |
| But did cost   | 21,210         |
| <b>Direct labour rate variance</b>                   | <b>210 (A)</b> |

### The Direct Labour Efficiency Variance

This is the difference between how many hours should have been worked for the number of units actually produced and how many hours were worked, valued at the standard rate per hour.

| ₹  |                    |
|--|--------------------|
| 1,000 units should have taken (x 4 hrs)  | 4,000 hrs          |
| But did take                             | 4,200 hrs          |
| Variance in hrs                          | 200 hrs            |
| Valued at standard rate per hour         | × ₹ 5              |
| <b>Direct labour efficiency variance</b> | <b>₹ 1,000 (A)</b> |

*When idle time occurs the efficiency variance is based on hours actually worked (not hours paid for) and an idle time variance (hours of idle time x standard rate per hour) is calculated.*

### 2. Variable Production Overhead Total Variances

The variable production overhead total variance is the difference between what the output should have cost and what it did cost, in terms of variable production overhead.

| ₹  |                  |
|--|------------------|
| 1,000 units should have cost (× ₹8)                  | 8,000            |
| But did cost   | 9,450            |
| <b>Variable production o/hd expenditure variance</b> | <b>1,450 (A)</b> |

### The Variable Production Overhead Expenditure Variance

This is the difference between what the variable production overhead did cost and what it should have cost

| ₹  |                  |
|--|------------------|
| 4,200 hrs should have cost (× ₹ 2)                   | 8,400            |
| But did cost   | 9,450            |
| <b>Variable production o/hd expenditure variance</b> | <b>1,050 (A)</b> |

### The Variable Production Overhead Efficiency Variance

This is the same as the direct labour efficiency variance in hours, valued at the variable production overhead rate per hour.

|   |                  |
|---|------------------|
| Labour efficiency variance in hours                 | 200 hrs (A)      |
| Valued @ standard rate per hour                     | × ₹ 2            |
| <b>Variable production o/hd efficiency variance</b> | <b>₹ 400 (A)</b> |

### 3. Fixed Production Overhead Variances

The total fixed production variance is an attempt to explain the under or overabsorbed fixed production overhead.

$$\text{Remember that overhead absorption rate} = \frac{\text{Budgeted fixed production overhead}}{\text{Budgeted level of activity}}$$

If either the numerator or the denominator or both are incorrect then we will have under or over-absorbed production overhead.

- If actual expenditure  $\pm$  budgeted expenditure (numerator incorrect) » expenditure variance
- If actual production/hours of activity » budgeted production/hours of activity (denominator incorrect) » volume variance.
- The workforce may have been working at a more or less efficient rate than standard to produce a given output » volume efficiency variance (similar to the variable production overhead efficiency variance).
- Regardless of the level of efficiency, the total number of hours worked could have been more or less than was originally budgeted (employees may have worked a lot of overtime or there may have been a strike and so actual hours worked were less than budgeted) » volume capacity variance.

#### 4. The Fixed Production Overhead Variances are Calculated as Follows:

##### Fixed production overhead variance

This is the difference between fixed production overhead incurred and fixed production overhead absorbed (= the under or overabsorbed fixed production overhead):

|  | ₹                |
|--|------------------|
| Overhead incurred                            | 25,000           |
| Overhead absorbed (1,000 units $\times$ ₹24) | 24,000           |
| <b>Overhead variance</b>                     | <b>1,000 (A)</b> |

##### Fixed Production Overhead Expenditure Variance

This is the difference between the budgeted fixed production overhead expenditure and actual fixed production overhead expenditure

|  | ₹                |
|--|------------------|
| Budgeted overhead (1,200 $\times$ ₹24) | 28,800           |
| Actual overhead                        | 25,000           |
| <b>Expenditure variance</b>            | <b>3,800 (F)</b> |

##### Fixed Production Overhead Volume Variance

This is the difference between actual and budgeted production volume multiplied by the standard absorption rate per unit.

|  | ₹                |
|--|------------------|
| Actual production at std. rate (1,000 $\times$ ₹ 24)   | 24,000           |
| Budgeted production at std. rate (1,200 $\times$ ₹ 24) | 28,800           |
|  | <b>4,800 (A)</b> |

**Fixed Production Overhead Volume Efficiency Variance**

This is the difference between the number of hours that actual production should have taken, and the number of hours actually worked (usually the labour efficiency variance), multiplied by the standard absorption rate per hour.

|                                     |                    |
|-------------------------------------|--------------------|
| Labour efficiency variance in hours | 200 hrs (A)        |
| Valued @ standard rate per hour     | × ₹ 6              |
| <b>Volume efficiency variance</b>   | <b>₹ 1,200 (A)</b> |

**Fixed Production Overhead Volume Capacity Variance**

This is the difference between budgeted hours of work and the actual hours worked, multiplied by the standard absorption rate per hour

|                            |                    |
|----------------------------|--------------------|
| Budgeted hours (1,200 x 4) | 4,800 hrs          |
| Actual hours               | 4,200 hrs          |
| Variance in hrs            | 600 hrs (A)        |
| x standard rate per hour   | × ₹ 6              |
|                            | <b>₹ 3,600 (A)</b> |

**KEY**

The fixed overhead volume capacity variance is unlike the other variances in that an excess of actual hours over budgeted hours results in a favourable variance and not an adverse variance as it does when considering labour efficiency, variable overhead efficiency and fixed overhead volume efficiency. Working more hours than budgeted produces an overabsorption of fixed overheads, which is a favourable variance.

**Sales Variances****5. Selling Price Variance**

The selling price variance is a measure of the effect on expected profit of a different selling price to standard selling price. It is calculated as the difference between what the sales revenue should have been for the actual quantity sold, and what it was.

|  |                  |
|--|------------------|
|  | ₹                |
| Revenue from 900 units should have been (× ₹150) | 135,000          |
| But was (x ₹140)                                 | 126,000          |
| <b>Selling price variance</b>                    | <b>9,000 (A)</b> |

**Sales Volume Variance**

The sales volume variance is the difference between the actual units sold and the budgeted quantity, valued at the standard profit per unit. In other words it measures the increase or decrease in standard profit as a result of the sales volume being higher or lower than budgeted.

|                       |             |
|-----------------------|-------------|
| Budgeted sales volume | 1,000 units |
| Actual sales volume   | 900 units   |

|  |                    |
|--|--------------------|
| Variance in units                            | 100 units (A)      |
| x standard margin per unit (x ₹ (150 – 102)) | × ₹ 48             |
| <b>Sales volume variance</b>                 | <b>₹ 4,800 (A)</b> |

**KEY**

Don't forget to value the sales volume variance at standard contribution marginal costing is in use.

**Operating Statement**

The most common presentation of the reconciliation between budgeted and actual profit is as follows.

|  | ₹   | ₹   |
|--|-----|-----|
| Budgeted profit before sales and admin costs | X   |     |
| Sales variances – price                      |     | X   |
| – volume                                     | X   | X   |
| Actual sales minus standard cost of sales    |     | X   |
| Cost variances                               | ₹   | ₹   |
|  | (F) | (A) |
| Material price                               | X   |     |
| Material usage etc.                          | X   | X   |
|  | X   | X   |
| Sales and administration costs               | X   |     |
| Actual profit                                | X   |     |

## Variances in a Standard Marginal Costing System

- No fixed overhead volume variance
- Sales volume variances are valued at standard contribution margin (not standard profit margin)

**Reasons, Interdependence and Significance****6. Reasons for Variances****Material Price**

- (F) unforeseen discounts received, greater care taken in purchasing, change in material standard.  
 (A) price increase, careless purchasing, change in material standard.

**Material Usage**

- (F) material used of higher quality than standard, more effective use made of material.  
 (A) defective material, excessive waste, theft, stricter quality control.

**Labour Rate**

- (F) use of workers at rate of pay lower than standard.
- (A) wage rate increase.

**Idle Time**

Machine breakdown, non-availability of material, illness.

**Labour Efficiency**

- (F) output produced more quickly than expected because of work motivation, better quality of equipment or materials.
- (A) lost time in excess of standard allowed, output lower than standard set because of deliberate restriction, lack of training, substandard material used.

**Overhead Expenditure**

- (F) savings in cost incurred, more economical use of services.
- (A) increase in cost of services used, excessive use of services, change in type of services used

**Overhead Volume**

- (F) production greater than budgeted
- (A) production less than budgeted

**7. Interdependence between Variances**

The cause of one (adverse) variance may be wholly or partly explained by the cause of another (favourable) variance.

- Material price or material usage and labour efficiency
- Labour rate and material usage
- Sales price and sales volume

**8. The Significance of Variances**

The decision as to whether or not a variance is so significant that it should be investigated should take a number of factors into account.

- The type of standard being used
- Interdependence between variances
- Controllability
- Materiality

**9. Materials Mix and Yield Variances**

The materials usage variance can be subdivided into a materials mix variance and a materials yield variance if the proportion of materials in a mix is changeable and controllable.

The mix variance indicates the effect on costs of changing the mix of material inputs.

The yield variance indicates the effect on costs of material inputs yielding more or less than expected.

Standard input to produce 1 unit of product X:

|            |               | ₹          |
|------------|---------------|------------|
| Material A | 20 kgs × ₹ 10 | 200        |
| Material B | 30 kgs × ₹ 5  | 150        |
|            |               | <u>350</u> |

In period 3, 13 units of product X were produced from 250 kgs of material A and 350 kgs of material B.

**Solution 1:** individual prices per kg as variance valuation cases

Mix Variance

|                             |                           | Kgs            |
|-----------------------------|---------------------------|----------------|
| Standard mix of actual use: | A: $2/5 \times (250+350)$ | 240            |
|                             | B: $3/5 \times (250+350)$ | 360            |
|                             |                           | <u>600</u>     |
|                             | A                         | B              |
| Mix should have been        | 240 kgs                   | 360 kgs        |
| But was                     | 250 kgs                   | 350 kgs        |
| Mix variance in kgs         | 10 kgs (A)                | 10 kgs (F)     |
| x standard cost per kg      | x ₹10                     | x ₹5           |
| Mix variance in ₹           | <u>₹100 (A)</u>           | <u>₹50 (F)</u> |
|                             | 50 (A)                    |                |

Total mix variance in quantity is always zero.

Yield variance

|  | A                | B                |
|--|------------------|------------------|
| 13 units of product X should have used | 260 kgs          | 390 kgs          |
| but actual input in standard mix was   | 240 kgs          | 360 kgs          |
| Yield variance in kgs                  | 20 kgs (F)       | 30 kgs (F)       |
| x standard cost per kg                 | × ₹ 10           | × ₹ 5            |
|  | <u>₹ 200 (F)</u> | <u>₹ 150 (F)</u> |
|  | <u>₹ 350 (F)</u> |                  |

**Solution 2:** Budgeted weighted average price per unit of input as variance valuation base.

Therefore, Budgeted weighted average price = ₹ 350/50 = ₹ 7 per kg

**Mix variance**

|  | A          | B          |
|--|------------|------------|
| 13 units of product X should have used | 260 kgs    | 390 kgs    |
| but did use                            | 250 kgs    | 350 kgs    |
| Usage variance in kgs                  | 10 kgs (F) | 40 kgs (F) |

|                                      |                  |                  |
|--------------------------------------|------------------|------------------|
| x individual price per kg – budgeted |                  |                  |
| weighted average price per kg        |                  |                  |
| ₹ (10 – 7)                           | × ₹ 3            |                  |
| ₹ (5 – 7)                            |                  | × (₹ 2)          |
|                                      | <u>₹ 30 (F)</u>  | <u>₹ 80 (A)</u>  |
|                                      | <u>₹ 50 (A)</u>  |                  |
| Yield variance                       |                  |                  |
|                                      | A                | B                |
| Usage variance in kgs                | 10 kg (F)        | 40 kg (F)        |
| x budgeted weighted average          |                  |                  |
| Price per kg                         | 0215 ₹ 7         | × ₹ 7            |
|                                      | <u>₹ 70 (F)</u>  | <u>₹ 280 (F)</u> |
|                                      | <u>₹ 350 (F)</u> |                  |

## 10. Sales Mix and Quantity Variances

The sales volume variance can be subdivided into a mix variance if the proportions of products sold are controllable.

### Sales Mix Variance

This variance indicates the effect on profit of changing the mix of actual sales from the standard mix.

**It can be calculated in one of two ways.**

The difference between the actual total quantity sold in the standard mix and the actual quantities sold, valued at the standard margin per unit.

The difference between actual sales and budgeted sales, valued at (standard profit per unit – budgeted weighted average profit per unit).

### Sales Quantity Variance

This variance indicates the effect on profit of selling a different total quantity from the budgeted total quantity.

**It can be calculated in one of two ways.**

- The difference between actual sales volume in the standard mix and budgeted sales valued at the standard margin per unit.
- The difference between actual sales volume and budgeted sales valued at the budgeted weighted average profit per unit.

### KEY

With all variance calculations, from the most basic (such as variable cost variances) to the more complex (such as mix and yield/mix and quantity variances), it is vital that you do not simply learn formulae. You must understand what your calculations are supposed to show.

## Illustrations

**Illustration 1:** 'X' Ltd. has budgeted the following sales for the month of August, 2012.

| Product | No. of units | Selling Price per Unit (₹) |
|---------|--------------|----------------------------|
| A       | 15,000       | 15.00                      |
| B       | 9,000        | 20.00                      |
| C       | 12,000       | 12.00                      |

The Actual sales for the month of August 2012 were as follows:

| Product | No. of units | Selling Price per Unit (₹) |
|---------|--------------|----------------------------|
| A       | 16,500       | 14.00                      |
| B       | 10,000       | 19.50                      |
| C       | 12,300       | 11.90                      |

You are required to calculate:

- Sales value variance
- Sales price variance
- Sales volume variance
- Sales mix variance
- Sales quantity variance

**Solution:**

### Budgeted Sales

| Product | No. of units  | S.P. per Unit (₹) | ₹               |
|---------|---------------|-------------------|-----------------|
| A       | 15,000        | 15.00             | 2,25,000        |
| B       | 9,000         | 20.00             | 1,80,000        |
| C       | 12,000        | 12.00             | 1,44,000        |
|         | <b>36,000</b> |                   | <b>5,49,000</b> |

### Actual Sales

| Product | No. of units  | S.P. per Unit (₹) | ₹               |
|---------|---------------|-------------------|-----------------|
| A       | 16,500        | 14.00             | 2,31,000        |
| B       | 10,000        | 19.50             | 1,95,000        |
| C       | 12,300        | 11.90             | 1,46,370        |
|         | <b>38,800</b> |                   | <b>5,72,370</b> |

$$\text{Revised Std. Qty.} = \frac{\text{Total Actual Qty.}}{\text{Total Budget Qty.}} \times \text{Budget Qty.}$$

$$A = \frac{36,000}{38,800} \times 15,000 = 13,917$$

$$B = \frac{36,000}{38,800} \times 9,000 = 8,350$$

$$C = \frac{36,000}{38,800} \times 12,000 = 11,134$$

Revised sales as are follows:

| Product | Revised Qty.  | Budget Price | Revised Sales   |
|---------|---------------|--------------|-----------------|
| A       | 13,917        | 15.00        | 2,08,755        |
| B       | 8,350         | 20.00        | 1,67,000        |
| C       | 11,134        | 12.00        | 1,33,608        |
|         | <b>33,401</b> |              | <b>5,09,363</b> |

Applied sales as are follows:

| Product | Actual Qty.   | Budget Price | Applied Sales   |
|---------|---------------|--------------|-----------------|
| A       | 16,500        | 15.00        | 2,47,500        |
| B       | 10,000        | 20.00        | 2,00,000        |
| C       | 12,300        | 12.00        | 1,47,600        |
|         | <b>38,800</b> |              | <b>5,95,100</b> |

(a) **Sales Value variance**

$$= \text{Budget Sales} - \text{Actual Sales} \\ = 5,49,000 - 5,72,370 = \text{₹ } 23,370 \text{ (A)}$$

(b) **Sales Price variance**

$$= \text{Applied Sales} - \text{Actual Sales} \\ = 5,95,100 - 5,72,370 = \text{₹ } 22,730 \text{ (F)}$$

(c) **Sales Volume variance**

$$= \text{Budget Sales} - \text{Applied Sales} \\ = 5,49,000 - 5,95,100 = \text{₹ } 46,100 \text{ (A)}$$

(d) **Sales Mix variance**

$$= \text{Revised Sales} - \text{Applied Sales} \\ = 5,09,363 - 5,95,100 = \text{₹ } 85,737 \text{ (A)}$$

(e) **Sales Quantity variance**

$$= \text{Budgeted Sales} - \text{Revised Sales} \\ = 5,49,000 - 5,09,363 = \text{₹ } 39,637 \text{ (F)}$$

**Illustration 2:** Vinay Ltd. produces an article by blending three basic raw materials. It operates a standard costing system and the following standards have been set for materials.

| Materials | Standard Mix (%) | Standard Price per kg ₹ |
|-----------|------------------|-------------------------|
| A         | 25               | 8.80                    |
| B         | 35               | 10.60                   |
| C         | 40               | 12.90                   |

The standard loss in processing is 20%

During the month of August, 2012, Company produced 12,000 kgs. of finished output.

The actual consumption of materials is as under:

| Materials | Quantity (kgs.) | Actual Price per kg ₹ |
|-----------|-----------------|-----------------------|
| A         | 3600            | 8.70                  |
| B         | 5200            | 10.80                 |
| C         | 5900            | 13.10                 |

You are required to calculate:

- Material Cost variance
- Material Price variance
- Material Usage variance
- Material Mix variance
- Material Yield variance

**Solution:**

**(a) Material price variance**

= Actual Qty used (Std price – Actual price)

|            |                        |              |
|------------|------------------------|--------------|
| Material A | = 3600 (8.80 – 8.70)   |              |
|            | = 3600 (0.10)          | = ₹ 360 (F)  |
| Material B | = 5200 (10.60 – 10.80) |              |
|            | = 5200 (0.20)          | = ₹ 1040 (A) |
| Material C | = 5900 (12.90 – 13.10) |              |
|            | = 5900 (0.20)          | = ₹ 1180 (A) |

**(b) Material cost variance**

= (Std. Price × Std. Qty) – (Actual Price × Actual Qty)

|            |                                   |                |
|------------|-----------------------------------|----------------|
| Material A | = (8.80 × 3000) – (8.70 × 3600)   |                |
|            | = 26,400 – 31,320                 | = ₹ 4920 (A)   |
| Material B | = (10.60 × 4200) – (10.80 × 5200) |                |
|            | = 44,520 – 56,160                 | = ₹ 11,640 (A) |
| Material C | = (12.90 × 4800) – (13.10 × 5900) |                |
|            | = 61,920 – 77,290                 | = ₹ 15,370 (A) |

**Revised Std. Qty.**

|            |                                 |        |
|------------|---------------------------------|--------|
| Material A | = $\frac{25}{100} \times 14700$ | = 3675 |
| Material B | = $\frac{35}{100} \times 14700$ | = 5145 |
| Material C | = $\frac{40}{100} \times 14700$ | = 5880 |

**(c) Material Mix variance**

= Std price (Revised Std. Qty. – Actual Qty.)

|            |                       |             |
|------------|-----------------------|-------------|
| Material A | = 8.80 (3675 – 3600)  |             |
|            | = 8.80 (75)           | = ₹ 660 (F) |
| Material B | = 10.60 (5145 – 5200) |             |
|            | = 10.60 (55)          | = ₹ 583 (A) |
| Material C | = 12.90 (5880 – 5900) |             |
|            | = 12.90 (20)          | = ₹ 258 (A) |

**(d) Material Usage variance**

= Std. Price (S.Q. for actual output – Actual qty. used)

|            |                                 |                |
|------------|---------------------------------|----------------|
| A          | = $\frac{25}{100} \times 12000$ | = 3000         |
| B          | = $\frac{35}{100} \times 12000$ | = 4200         |
| C          | = $\frac{40}{100} \times 12000$ | = 4800         |
| Material A | = 8.80 (3000 – 3600)            |                |
|            | = 8.80 (600)                    | = ₹ 5280 (A)   |
| Material B | = 10.60 (4200 – 5200)           |                |
|            | = 10.60 (1000)                  | = ₹ 10,600 (A) |
| Material C | = 12.90 (4800 – 5900)           |                |
|            | = 12.90 (1100)                  | = ₹ 14,190 (A) |

**(e) Material Yield variance**

= Std. cost per unit of output (Std. yield for actual material – Actual yield)

= 13.837 (11,760 – 12,000)

= 13.837 (– 240) = ₹ 3320.88 (A)

Std. cost per unit of output

Material A = 3000

|                 |   |               |
|-----------------|---|---------------|
| Material B      | = | 4200          |
| Material C      | = | 4800          |
|                 |   | <u>12,000</u> |
| Less: Std. loss |   | <u>2,400</u>  |
|                 |   | <b>9,600</b>  |

$$\begin{aligned} \text{Std. cost per unit of output} &= \frac{(26400 + 44520 + 61920)}{9,600} \\ &= \frac{1,32,840}{9,600} &&= \text{₹ } 13.837 \end{aligned}$$

Std. Yield for Actual Material

|                 |   |               |
|-----------------|---|---------------|
| Material A      | = | 3600          |
| Material B      | = | 5200          |
| Material C      | = | 5900          |
|                 |   | <u>14,700</u> |
| Less: Std. loss |   | <u>2,940</u>  |
|                 |   | <b>11,760</b> |

**Illustration 3:** A gang of workers normally consists of 30 men, 15 women and 10 boys. They are paid at Standard rates per hour as, Men ₹ 80.00 women ₹ 60.00 and Boy ₹ 40.00. In a normal working of a week of 40 hours, the Gang is expected to produce 2000 units of output.

During the week ended 31<sup>st</sup> December, 2011, the gang consisted of 40 men, 10 women and 05 boys. The actual wages paid per hour were Men ₹ 70.00, Women ₹ 65.00 and Boy ₹ 30.00. Actual units produced by the gang 1600 units.

**Calculate:**

- (i) Labour Cost Variance
- (ii) Labour Rate Variance
- (iii) Labour Efficiency Variance
- (iv) Labour Mix Variance
- (v) Labour Yield Variance

**Solution:**

**(i) Labour Cost Variance**

$$(\text{Std. Rate} \times \text{Std. time for actual output}) - (\text{Actual Rate} \times \text{Actual Time})$$

|       |   |                                      |                |
|-------|---|--------------------------------------|----------------|
| Men   | = | $(80 \times 960) - (70 \times 1600)$ |                |
|       | = | $(76,800 - 1,12,000)$                | = ₹ 35,200 (A) |
| Women | = | $(60 \times 480) - (65 \times 400)$  |                |
|       | = | $(28,800 - 26,000)$                  | = ₹ 2,800 (F)  |
| Boys  | = | $(40 \times 320) - (30 \times 200)$  |                |

$$= (12,800 - 6,000) = ₹ 6,800 \text{ (F)}$$

$$\text{Labour Cost Variance} \quad ₹ 25,600 \text{ (A)}$$

**(ii) Labour Rate Variance**

Actual time (SR – AR)

$$\text{Men} = 1600 (80 - 70) = ₹ 16,000 \text{ (F)}$$

$$\text{Women} = 400 (60 - 65) = ₹ 2,000 \text{ (A)}$$

$$\text{Boys} = 200 (40 - 30) = ₹ 2,000 \text{ (F)}$$

$$\text{Labour Rate Variance} \quad ₹ 16,000 \text{ (F)}$$

**(iii) Labour Efficiency Variance**

= Std. price (Std. time for actual output – actual time)

$$\text{Men} = 80 (960 - 1600)$$

$$= 80 (640) = ₹ 51,200 \text{ (A)}$$

$$\text{Women} = 60 (480 - 400)$$

$$= 60 (80) = ₹ 4,800 \text{ (F)}$$

$$\text{Boys} = 40 (320 - 200)$$

$$= 40 (120) = ₹ 4,800 \text{ (F)}$$

$$\text{Labour Efficiency Variance} \quad ₹ 41,600 \text{ (A)}$$

**(iv) Labour Mix Variance**

= Std. Rate (Std. Time – Actual Time Worked)

$$\text{Men} = 80 (1200 - 1600)$$

$$= 80 (400) = ₹ 32,000 \text{ (A)}$$

$$\text{Women} = 60 (600 - 400)$$

$$= 60 (200) = ₹ 12,000 \text{ (F)}$$

$$\text{Boys} = 40 (400 - 200)$$

$$= 40 (200) = ₹ 8,000 \text{ (F)}$$

$$\text{Labour Mix Variance} \quad ₹ 12,000 \text{ (A)}$$

**(v) Labour Yield Variance**

= Std. labour cost per unit of output × (Std. Output for Actual Time – Actual output)

$$= 47 (2000 - 1600)$$

$$= 74 (400) = ₹ 29,600 \text{ (F)}$$

**Working Notes:****1. Actual time**

$$\text{Men} = 40 \times 40 = 1600$$

$$\text{Women} = 10 \times 40 = 400$$

$$\begin{aligned} \text{Boys} &= 05 \times 40 &= 200 \\ &&2200 \text{ hrs.} \end{aligned}$$

**2. Std. time for actual output**

$$\text{Men} = \frac{1600}{2000} \times (30 \times 40) = 690 \text{ hrs.}$$

$$\text{Women} = \frac{1600}{2000} \times (15 \times 40) = 480 \text{ hrs.}$$

$$\text{Boys} = \frac{1600}{2000} \times (10 \times 40) = 320 \text{ hrs.}$$

**3. Std. time**

$$\text{Men} = (30 \times 40) = 1200 \text{ hrs.}$$

$$\text{Women} = (15 \times 40) = 600 \text{ hrs.}$$

$$\text{Boys} = (10 \times 40) = 400 \text{ hrs.}$$

**4. Std. labour cost permit of output:**

Std. output given = 2000 units

Std. Cost given

$$\text{Men} = 30 \times 40 \times 80 = 96000$$

$$\text{Women} = 15 \times 40 \times 60 = 36000$$

$$\text{Boys} = 10 \times 40 \times 40 = 16000$$

**1,48,000**

So, labour cost permit of output

$$= \frac{1,48,000}{2000} = ₹ 74/-$$

Std. output for actual time worked for 2200 hours of total.

Std. output = 2000 units

for 1760 hrs. of actual time worked

$$= 2000 \times \frac{1760}{2200} = 1600 \text{ units}$$

**Illustration 4:** The Standard material cost for a normal mix of one tonne of Chemical X is based on:

| <b>Chemical:</b>                                      | <b>X</b> | <b>Y</b> | <b>Z</b> |
|---|----------|----------|----------|
| Usage (Kg.):  | 240      | 400      | 640      |
| Price per (Kg.) (₹):                                  | 6        | 12       | 10       |
| During a month, 6.25 tonnes of X were purchased from. |          |          |          |
| <b>Chemical:</b>                                      | <b>X</b> | <b>Y</b> | <b>Z</b> |
| Consumption (Tonnes):                                 | 1.6      | 3.4      | 4.5      |
| Cost (₹):   | 11,200   | 30,000   | 47,250   |

Calculate the material variances

**Solution:**

| Chemical     | SQ           | SP | AQ           | *AP                    |      | RSQ   |
|--------------|--------------|----|--------------|------------------------|------|---|
| X            | 1,500        | 6  | 1,600        | $\frac{11,200}{1,600}$ | 7    | $\frac{1,500}{8,000} \times 8,500 = 1,593.75$ |
| Y            | 2,500        | 12 | 2,400        | $\frac{30,000}{2,400}$ | 12.5 | $\frac{2,500}{8,000} \times 8,500 = 2,656.25$ |
| Z            | 4,000        | 10 | 4,500        | $\frac{47,250}{4,500}$ | 10.5 | $\frac{4,000}{8,000} \times 8,500 = 4,250.00$ |
| <b>Total</b> | <b>8,000</b> | -  | <b>8,500</b> | -                      | -    | <b>8,500</b>                                  |

**Actual Output**

**Note:** 1,000 kgs = 1 tonne

\*Actual Price (AP) = Actual Cost/Actual Quantity {(/) Divide}

- (a) Material Cost Variance =  $(SQ \times SP) - (AQ \times AP)$   
 X:  $(1,500 \times 6) - 11,200$   
 $9,000 - 11,200 = 2,200 \text{ A}$   
 Y:  $(2,500 \times 12) - 30,000$   
 $30,000 - 30,000 = \text{Zero}$   
 Z:  $(4,000 \times 10) - 47,250$   
 $40,000 - 47,250 = 7,250 \text{ A}$   
**Total = 9,450 A(b)**
- (b) Material Price Variation =  $AQ (SP - AP)$   
 X:  $1,600 (6 - 7) = 1,600 \text{ A}$   
 Y:  $2,400 (12 - 12.5) = 1,200 \text{ A}$   
 Z:  $4,500 (10 - 10.5) = 2,250 \text{ A}$   
**Total = 5,050 A**
- (c) Material Usage Variance =  $SP (SQ - AQ)$   
 X:  $6 (1,500 - 1,600) = 600 \text{ A}$   
 Y:  $12 (2,500 - 2,400) = 1,200 \text{ F}$   
 Z:  $10 (4,000 - 4,500) = 5,000 \text{ A}$   
**Total = 4,400 A**
- (d) Material Mix Variance =  $SP (RSQ - AQ)$   
 X:  $6 (1,500 - 1,593.75) = 562.50 \text{ A}$   
 Y:  $12 (2,500 - 2,656.25) = 3,075.00 \text{ A}$   
 Z:  $10 (4,250 - 4,500) = 2,500.00 \text{ A}$   
**Total = 537.50 F**

|                             |   |                          |
|-----------------------------|---|--------------------------|
| (e) Material yield Variance | = | SP (SQ – RSQ)            |
| X: 6 (1,500 – 1,593.75)     | = | 562.50 A                 |
| Y: 12 (2,500 – 2,656.25)    | = | 1,875.00 A               |
| Z: 10 (4,000 – 4,250)       | = | <u>2,500.00 A</u>        |
| <b>Total</b>                | = | <b><u>4,937.50 A</u></b> |

**Illustration 5:** The Devansh Ltd. manufactures a particular product, the standard direct labour cost of which is ₹ 120 and which is arrived as follows:

| Grade of Workers | Hours per unit of Output | Rate per hour (₹) | Amount (₹) |
|------------------|--------------------------|-------------------|------------|
| X                | 30                       | 2                 | 60         |
| Y                | 20                       | 3                 | 60         |
| Total            | 50                       |                   | 120        |

In a particular period, 100 units of the product were produced, the actual cost of which was as follows:

| Grade of Workers | Hours | Rate (₹) | Amount (₹) |
|------------------|-------|----------|------------|
| X                | 3,200 | 1.50     | 4,800      |
| Y                | 1,900 | 4.00     | 7,600      |
| Total            | 5,100 |          | 12,400     |

You are required to calculate the:

- (1) Total Labour cost variance
- (2) Labour rate variance
- (3) Labour mix variance and
- (4) Labour efficiency variance

**Solution:** Standard Input for Actual Output

| Grade of Workers | SH           | SR       | AH           | AR       | RSH  |
|------------------|--------------|----------|--------------|----------|--|
| X                | 3,000        | 2        | 3,200        | 1.5      | $\frac{3,000}{5,000} \times 5,100 = 3,060$ |
| Y                | 2,000        | 3        | 1,900        | 4        | $\frac{2,000}{5,000} \times 5,100 = 2,040$ |
| <b>Total</b>     | <b>5,000</b> | <b>-</b> | <b>5,100</b> | <b>-</b> | <b>5,100</b>                               |

| Grade of Workers | Per Unit  | For 100 Units |
|------------------|-----------|---------------|
| A                | 30        | 3,000         |
| B                | 20        | 2,000         |
| <b>Total</b>     | <b>50</b> | <b>5,000</b>  |

$$\text{Labour Cost variance} = (\text{SH} \times \text{SR}) - (\text{AH} \times \text{AR})$$

$$\text{A: } (3,000 \times 2) - 4,800$$

$$6,000 - 4,800 = 1,200 \text{ F}$$

$$\text{B: } (2,000 \times 3) - 7,600$$

$$6,000 - 7,600 = 1,600 \text{ A}$$

$$\text{Total} = 400 \text{ A}$$

$$\text{Labour Rate Variance} = \text{AH} (\text{SR} - \text{AR})$$

$$\text{A: } 3,200 (2 - 1.5) = 1,600 \text{ F}$$

$$\text{B: } 1,900 (3 - 4) = 1,900 \text{ A}$$

$$\text{Total} = 300 \text{ A}$$

$$\text{Labour Efficiency variance} = \text{SR} (\text{SH} - \text{AH})$$

$$\text{A: } 2 (3,000 - 3,200) = 1,600 \text{ F}$$

$$\text{B: } 3 (2,000 - 1,900) = 1,900 \text{ A}$$

$$\text{Total} = 100 \text{ A}$$

$$\text{Labour Mix variance} = \text{SR} (\text{RSH} - \text{AH})$$

$$\text{A: } 2 (3,060 - 3,200) = 280 \text{ A}$$

$$\text{B: } 3 (2,040 - 1,900) = 420$$

$$\text{Total} = 140 \text{ F}$$

**Illustration 6:** Calculate the overhead variance from the following data:

|                               | Budget   | Actual   |
|-------------------------------|----------|----------|
| Number of Working days        | 20       | 22       |
| Man hours per Day             | 8,000    | 8,400    |
| Output per man hours in units | 1.0      | 0.9      |
| Fixed overhead cost (₹)       | 1,60,000 | 1,68,000 |

(1) Fixed overhead cost Variance

$$= (\text{SR per hour} \times \text{Actual Output}) - \text{Actual Fixed overhead}$$

$$= \left( \left[ \frac{1,60,000}{20 \times 8,000 \times 1} \right] \times [22 \times 8,400 \times 0.9] \right) - 1,68,000$$

$$= (1 \times 1,66,320) - 1,68,000$$

$$= 1,66,000 - 1,68,000$$

$$= 1,680 \text{ A}$$

(2) Fixed overhead expenditure Variance

$$= \text{standard Recovery rate}$$

$$= (\text{Standard Recovery rate} \times \text{Budgeted output}) - \text{Actual Fixed Overhead}$$

$$= \left( 1 \times \left[ 20 \times \frac{8,000}{1} \right] \right) - 1,68,000$$

$$= 1,60,000 - 1,68,000$$

$$= 8,000 \text{ A}$$

(3) Fixed overhead Volume Variance

$$= \left( \frac{\text{Fixed overhead Expenses recovered}}{\text{On actual output at Standard rate}} \right) - \left( \frac{\text{Budgeted fixed}}{\text{overhead expenses}} \right)$$

$$= \left[ \frac{1,60,000}{20} \times 8,000 \right] \times 1,66,320 - 1,60,000$$

$$= (1 \times 1,66,320) - 1,60,000$$

$$= 6,320 \text{ F}$$

(4) Fixed overhead Efficiency variance

$$= \left( \frac{\text{Standard Fixed overhead}}{\text{Recovery rate per hour}} \right) - \left( \frac{\text{Standard Hours for}}{\text{Actual Report}} - \frac{\text{Actual Report}}{\text{Actual Report}} \right)$$

$$= \left[ \frac{1,60,000}{1,60,000} \times (1,66,320 - 1,84,800) \right]$$

$$= 1 \times -18,480$$

$$= 18,480 \text{ A}$$

(5) Fixed Overhead Capacity Variance

(a) With Calendar Variance

$$= \left( \frac{\text{Standard Recovery}}{\text{Rate per hour}} \right) - \left( \frac{\text{Standard output}}{\text{Actual Hours}} - \frac{\text{Standard output for}}{\text{Actual working days}} \right)$$

$$= 1 \times [1 \times (22 \times 8,400) - (1 \times 8,000 \times 22)]$$

$$= 1 \times [1,84,800 - 1,76,000]$$

$$= 8,800 \text{ F}$$

(b) Fixed overhead calendar Variance

$$= \left( \frac{\text{Standard Fixed Overhead}}{\text{Recovery rate per day}} \right) - \left( \frac{\text{Number of excess}}{\text{days of work}} \right)$$

$$= \frac{-1,60,000}{20} \times (22-20)$$

$$= 8,000 \times 2$$

$$= 16,000 \text{ F}$$

**Illustration 7:** Vivek Ltd. has furnished you the following for the month of August 2006:

|                    | Budget | Actual |
|--------------------|--------|--------|
| Output (Units)     | 30,000 | 32,500 |
| Hours              | 30,000 | 33,000 |
| Fixed Overhead (₹) | 45,000 | 50,000 |

|                       |        |        |
|-----------------------|--------|--------|
| Variable Overhead (₹) | 60,000 | 68,000 |
| Working Days          | 25     | 26     |

Calculate the Variance

**Solution:**

(1) Variable Overhead Variance

$$\begin{aligned}
 &= \left( \frac{\text{Standard Variable Cost per unit}}{\text{Standard Variable Cost per unit}} \times \frac{\text{Actual outputs units}}{\text{Actual outputs units}} \right) - \left( \frac{\text{Actual Variable Overhead Expenses}}{\text{Actual Variable Overhead Expenses}} \right) \\
 &= \left( \frac{60,000}{30,000} \times 32,500 \right) - 68,000 \\
 &= 65,000 - 68,000 \\
 &= 3,000 \text{ A}
 \end{aligned}$$

(2) Variable Overhead Expenditure variance

$$\begin{aligned}
 &= \left( \frac{\text{Standard Variable Overhead Expenses Per hour}}{\text{Standard Variable Overhead Expenses Per hour}} \times \frac{\text{Actual Hours worked}}{\text{Actual Hours worked}} \right) - \left( \frac{\text{Actual Variable Overhead expenses Incurred}}{\text{Actual Variable Overhead expenses Incurred}} \right) \\
 &= \left( \frac{60,000}{30,000} \times 33,000 \right) - 68,000 \\
 &= 66,000 - 68,000 \\
 &= 2,000 \text{ A}
 \end{aligned}$$

(3) Variable Overhead Efficiency Variance

$$\begin{aligned}
 &= \left( \frac{\text{Actual Output}}{\text{Actual Output}} \times \frac{\text{Standard hour's per unit time}}{\text{Standard hour's per unit time}} - \frac{\text{Actual Hours}}{\text{Actual Hours}} \right) \times \text{Standard variable Overhead Expenses per hour} \\
 &= [(32,500 \times 1) - 33,000] \times 2 \\
 &= [32,500 - 33,000] \times 2 \\
 &= -500 \times 2 \\
 &= 1,000 \text{ A}
 \end{aligned}$$

(4) Fixed Overhead Cost Variance

$$\begin{aligned}
 &= \left( \frac{\text{Standard fixed Overhead For Actual output}}{\text{Standard fixed Overhead For Actual output}} \right) - \left( \frac{\text{Actual Fixed Overhead Incurred}}{\text{Actual Fixed Overhead Incurred}} \right) \\
 &= \left( \frac{45,000}{30,000} \times 32,500 \right) - 50,000 \\
 &= 48,750 - 50,000 \\
 &= 1,250 \text{ A}
 \end{aligned}$$

(5) Fixed overhead Expenditure Variance

$$\begin{aligned}
 &= \text{Budgeted fixed overhead} - \text{Actual Fixed overhead} \\
 &= 45,000 - 50,000 \\
 &= 5,000 \text{ A}
 \end{aligned}$$

- (6) Fixed Overhead Expenditure Variance
- $$= \left( \frac{\text{Fixed Overhead Expenses Recovered}}{\text{On Actual Output at Standard rate}} \right) - \left( \frac{\text{Budgeted Fixed Overhead Expenses}}{\text{Standard Output}} \right)$$
- $$= \left( \frac{45,000}{30,000} \times 32,500 \right) - 45,000$$
- $$= 48,750 - 45,000$$
- $$= 3,750 \text{ F}$$
- (7) Fixed Overhead Efficiency Variance
- $$= \text{Standard Rate SH for Actual Output} - \text{AH}$$
- $$= \frac{-45,000}{30,000} \left( \frac{30,000}{30,000} \times 32,500 \right) - 33,000$$
- $$= 1.5 [32,500 - 33,000]$$
- $$= 750 \text{ A}$$
- (8) Fixed Overhead with Calendar Variance
- $$= \left( \frac{\text{Standard Fixed Overhead Recovery rate per unit}}{\text{Standard Output for actual hours}} \times \text{Standard output for Actual Working Days} \right)$$
- $$= \frac{45,000}{30,000} \left( \frac{30,000}{30,000} \times 33,000 \right) - \left( \frac{30,000}{25} \times 26 \right)$$
- $$= 1.5 (33,000 - 31,200)$$
- $$= 2,700 \text{ F}$$
- (9) Fixed Overhead Calendar variance
- $$= (\text{Standard Fixed Overhead recovery rate per day}) \times (\text{No. of Excess Days worked})$$
- $$= \frac{45,000}{25} \times 26 - 25$$
- $$= ₹ 1,800 \text{ F}$$

**Illustration 8:** The Following particulars are available in respect of the working of a company for a particular period:

| Product      | Budgeted Sales   |           |               | Actual Sales     |           |               |
|--------------|------------------|-----------|---------------|------------------|-----------|---------------|
|              | Quantity (Units) | Price (₹) | Amt (₹)       | Quantity (Units) | Price (₹) | Amt (₹)       |
| A            | 1,000            | 2         | 2,000         | 1,800            | 2.50      | 4,500         |
| B            | 3,000            | 3         | 9,000         | 4,200            | 2.75      | 11,550        |
| <b>Total</b> | <b>4,000</b>     |           | <b>11,000</b> | <b>6,000</b>     |           | <b>16,050</b> |

You are required to calculate:

- (1) Total Sales volume Variance
- (2) Sales Price variance
- (3) Sales Mix Variance and

## (4) Sales Quantity Variance

**Solution:**

$$(1) \text{ Sales price Variance} = \text{ASQ (ASP - BSP)}$$

$$\text{A: } 1,800 (2.5 - 2) = 900 \text{ F}$$

$$\text{B: } 4,200 (2.75 - 3) = 1,050 \text{ A}$$

$$\text{Total} = 150 \text{ A}$$

$$(2) \text{ Sales Volume Variance} = \text{BSP (ASQ - BSQ)}$$

$$\text{A: } 2 (1,800 - 1,000) = 1,600 \text{ F}$$

$$\text{B: } 3 (4,200 - 3,000) = 3,600 \text{ F}$$

$$\text{Total} = 5,200 \text{ F}$$

$$(3) \text{ Sales Quantity Variance} = \text{BSP (RSSQ - BSQ)}$$

$$\text{A: } \left( \left[ \frac{1,000}{4,000} \times 6,000 \right] - 1,000 \right) = 1,000 \text{ F}$$

$$\text{B: } \left( \left[ \frac{3,000}{4,000} \times 6,000 \right] - 3,000 \right) = 4,500 \text{ F}$$

$$\text{Total} = 5,500 \text{ F}$$

$$(4) \text{ Sales Mix Variance} = \text{BSP (ASQ - RSSQ)}$$

$$\text{A: } \left( 21,800 - \left[ \frac{1,000}{4,000} \times 6,000 \right] \right) = 600 \text{ F}$$

$$\text{B: } \left( 34,200 - \left[ \frac{3,000}{4,000} \times 6,000 \right] \right) = 900 \text{ A}$$

$$\text{Total} = 300 \text{ A}$$

**Illustration 9:** Compute the Missing Data indicated by question marks from the following:

| Particulars           | Product R | Product S |
|-----------------------|-----------|-----------|
| Sales Quantity (Std.) | ?         | 400       |
| Actual (Units)        | 500       | ?         |
| Price/Unit Std.       | 12        | 15        |
| Price/Unit - Actual   | 15        | 20        |
| Sales price Variance  | ?         | ?         |
| Sales Volume Variance | 1200 F    | ?         |
| Sales Value Variance  | ?         | ?         |

Sales Mix Variance for both the products together is ₹ 450 (F)

**Solution:**

| Product | Standard Quality | Standard price | Actual Quantity | Actual Price | RSQ                                 |
|---------|------------------|----------------|-----------------|--------------|-------------------------------------|
| R       | 400              | 12             | 500             | 15           | $\frac{400}{800} \times 1300 = 650$ |
| S       | 400              | 15             | 800             | 20           |                                     |
|         | 800              |                | 1300            |              | $\frac{400}{800} \times 1300 = 650$ |
|         |                  |                |                 |              | 1300                                |

(1) Sales Revenue variance ASR – BSR

$$\begin{aligned} \text{R: } & (500 \times 15) - (400 \times 12) \\ & 7500 - 4800 = 2,700 \text{ F} \end{aligned}$$

$$\begin{aligned} \text{S: } & (800 \times 20) - (400 \times 15) \\ & 16,000 - 6,000 = 10,000 \text{ F} \\ & = 12,700 \text{ F} \end{aligned}$$

(2) Sales Price Variance = ASQ (ASP – SSP)

$$\begin{aligned} \text{R: } & 500 (15 - 12) = 1,500 \text{ F} \\ \text{S: } & 800 (20 - 15) = 4,000 \text{ F} \\ & = 5,500 \text{ F} \end{aligned}$$

(3) Sales Volume Variance = SSP (ASQ – SSQ)

$$\begin{aligned} \text{R: } & 12 (500 - 400) = 1,200 \text{ F} \\ \text{S: } & 15 (800 - 400) = 6,000 \text{ F} \\ & = 7,200 \text{ F} \end{aligned}$$

(4) Sales Mix Variance = SSP (ASQ – RSQ)

$$\begin{aligned} \text{R: } & 12 (500 - 650) = 1,800 \text{ A} \\ \text{S: } & 15 (800 - 650) = 2,250 \text{ F} \\ & 450 \text{ F} \end{aligned}$$

(5) Sales Quantity Variance = (RSSQ – SSQ) SSP

$$\begin{aligned} \text{R: } & (650 - 400) 12 = 3,000 \text{ F} \\ \text{S: } & (650 - 400) 15 = \underline{3,750 \text{ F}} \\ & = \underline{6,750 \text{ F}} \end{aligned}$$

(6) R:  $12 [500 - (250 + 0.5x)] =$

$$\begin{aligned} \text{S: } & 15 [x - (250 + 0.5x)] = \\ & [12 (500 - 250 - 0.5x)] + [15 (x - 250 - 0.5x)] = 450 \end{aligned}$$

$$[12 (250 - 0.5x)] + [15(0.5x - 250)] = 450$$

$$[3,000 - 6x] + [7.5x - 3,750] = 450$$

$$3,000 - 3,750 - 6x + 7.5x = 450$$

$$-750 + 1.5x = 450$$

$$1.5x = 450 + 750$$

$$X = 800$$

**Illustration 10:** Following Data is available from the records of a manufacturing company:

**Standard (Per Unit)**

|                                     |                        |
|-------------------------------------|------------------------|
| Materials:                          | 6 kg @ ₹ 4 per Kg      |
| Labour:                             | 4 Hours @ ₹ 4 per hour |
| Standard Production For the Month:  | 12,000 units           |
| Actual Production For the Month:    | 12,500 units           |
| Actual Material price per kg.       | ₹ 4.50                 |
| Material Consumed during the month: | 7,800 Kg               |
| Direct labour hours worked:         | 48,000 hours           |
| Actual Wage rate per hour:          | ₹ 3.50                 |

**Calculate:**

- (1) Material Cost Variance
- (2) Material price Variance
- (3) Material Usage Variance
- (4) Labour Cost Variance
- (5) Labour Rate Variance
- (6) Labour Efficiency variance

**Solution:**

- (1) Material Cost variance =  $(SR \times SQ) - (AR \times AQ)$   
 Standard Cost – Actual Cost  
 $(24 \times 12,000) - (7,800 \times 4.50)$   
 $2,88,000 - 35,100$   
 $= 2,52,900 \text{ F}$   
 $SR = 6 \times 4 = ₹ 24$
- (2) Material Price Variance =  $AQ (SP - AP)$   
 $7,800 (4 - 4.50)$   
 $= 3,900 \text{ A}$
- (3) Material Usage Variance  $SP (SQ - AQ)$   
 $4 (72,000 - 7,800)$   
 $= 2,56,800 \text{ F}$
- (4) Labour Cost Variance =  $(SR \times SH) - (AR \times AH)$   
 Standard Labour Cost = Actual Labour Cost  
 $(4 \times 4 \times 12,000) = (48,000 \times 3.50)$   
 $= 1,92,000 - 1,68,000$   
 $= 24,000 \text{ F}$
- (5) Labour Rate Variance  $AH (SR - AR)$   
 $48,000 (4 - 3.50)$   
 $= 24,000 \text{ F}$

- (6) Labour Efficiency Variance = SR (SH – AH)  
 $4 ([4 \times 12,000] - 48,000)$   
 $4 (48,000 - 48,000)$   
 = Zero

**Illustration 11:** ABC Ltd. has furnished the following information:

| Particulars            | Budget | Actual |
|------------------------|--------|--------|
| Output (units)         | 15,000 | 16,000 |
| No. of Working Days    | 25     | 28     |
| Fixed Overheads (₹)    | 30,000 | 30,500 |
| Variable Overheads (₹) | 45,000 | 47,000 |

**Calculate:**

- (1) Fixed Overheads cost variance
- (2) Fixed Overhead expenditure Variance
- (3) Fixed Overhead Cost Variance
- (4) Variable Overhead expenditure Variance

**Solution:**

- (1) Total Overhead Cost Variance = (Actual units x SR) – Actual Overhead Cost

$$\left( 16,000 \times \frac{30,000 + 45,000}{15,000} \right) - 30,500 + 47,000$$

$$(16,000 \times 5) - 77,500$$

$$= 80,000 - 77,500$$

$$= 2,500 \text{ F}$$

- (2) Variable Overhead Expenditure Variance = [(AQ × SR) – Actual Fixed Overheads]

$$\left( \left[ 16,000 \times \frac{45,000}{15,000} \right] - 47,000 \right)$$

$$[(16,000 \times 3) - 47,000]$$

$$48,000 - 47,000$$

$$= 1,000 \text{ F}$$

- (3) Fixed Overhead Cost Variance = [(AQ × SR) – Actual Fixed overheads]

$$\left( \left[ 16,000 \times \frac{30,000}{15,000} \right] - 30,500 \right)$$

$$[(16,000 \times 2) - 30,500]$$

$$= 32,000 - 30,500$$

$$= 1,500 \text{ F}$$

- (4) Fixed overhead Volume Variance = (AQ X SR) – Budgeted Fixed Overheads

$$(16,000 \times 2) - 30,000$$

$$= 32,000 - 30,500$$

$$= 1,500 \text{ F}$$

(5) Fixed overhead Expenditure Variance = Budgeted Fixed Overheads – Actual Fixed O/h  
 $30,000 - 30,500$   
 $= 500 \text{ A}$

(6) Variable Overhead Cost Variance = (Actual Output X Variable Overhead rate p.u.)  
 -Actual Variable Overhead Cost  
 $(16,000 \times 3) - 47,000$   
 $48,000 - 47,000$   
 $1,000 \text{ F}$

**Illustration 12:** The Following details relating to a product are made available to you:

**Standard Cost per unit:**

Materials: 50 Kg @ ₹ 40 per kg.

Labour: 400 hours @ Re. 1 per hour.

**Actual Cost:** (For an output of 10 units)

Material: 590 Kg @ ₹ 42 per kg

Labour: 3,960 hours @ ₹ 1.10 per units

**Calculate the Following Variances:**

- (1) Material Cost Variance
- (2) Material Usage Variance
- (3) Material Price Variance
- (4) Labour Cost Variance
- (5) Labour Efficiency Variance
- (6) Labour rate Variance

**Solution:**

(1) Material Cost Variance =  $(SR \times SQ) - (AR \times AQ)$

Standard Cost – Actual Cost

$$(40 \times 50 \times 10) - (42 \times 590)$$

$$20,000 - 24,780$$

$$= 4,780 \text{ A}$$

(2) Material Usage Variance =  $SR (SQ - AQ)$

$$40 (50 \times 10 - 590)$$

$$40 (500 - 590)$$

$$= 3,600 \text{ A}$$

(3) Material Price Variance =  $AQ (SR - AR)$

$$590 (40 - 42)$$

$$= 1,180 \text{ A}$$

- (4) Labour Cost Variance = (SR X SH) – (AR X AH)  
 $(1 \times 400 \times 10) - (1.10 \times 3,960)$   
 $4,000 - 4,356$   
 $= 356 \text{ A}$
- (5) Labour Efficiency Variance = SR (SH – AH)  
 $1 (400 \times 10 - 3,960)$   
 $= 40 \text{ F}$
- (6) Labour rate Variance = AH (SR – AR)  
 $3,960 (1 - 1.1)$   
 $= 396 \text{ A}$

**Illustration 13:** The Following information is available from the record of the factory:

| Particulars                    | Budget | Actual |
|--------------------------------|--------|--------|
| Fixed Overheads For June (₹)   | 10,000 | 12,000 |
| Production in June (Units)     | 2,000  | 2,100  |
| Standard Time per unit (Hours) | 10     | -      |
| Actual hours Worked in June    | -      | 22,000 |

**Calculate:**

- (1) Fixed Overheads Cost Variance
- (2) Fixed Overheads expenditure Variance
- (3) Fixed Overheads Volume Variance

**Solution:**

- (1) Fixed Overhead Cost Variance = [(AQ × SR) – Actual Fixed Overheads]  
 $\left[ \left( 2,100 \times \frac{10,000}{20,000} \right) - 12,000 \right]$   
 $[(2,100 \times 5) - 12,000]$   
 $10,500 - 12,000$   
 $= 1,500 \text{ A}$
- (2) Fixed Overhead Expenditure Variance = Budgeted Fixed Overheads – Actual Fixed O/h  
 $10,000 - 12,000$   
 $= 2,000 \text{ A}$
- (3) Fixed Overhead Volume Variance = (AQ × SR) – Budgeted Fixed Overheads  
 $= \left( 2,100 \times \frac{10,000}{2,000} \right) - 10,000$   
 $= (2,100 \times 5) - 10,000$   
 $= 10,500 - 10,000$   
 $= 500 \text{ F}$

**Illustration 14:** Calculate Variable Overheads

- (1) Cost Variance
- (2) Expenditure Variance
- (3) Efficiency Variance

From the following information:

| Particulars            | Budget ₹ | Actual ₹ |
|------------------------|----------|----------|
| Variable Overheads (₹) | 10,000   | 8,910    |
| Hours                  | 10,000   | 9,900    |
| Output                 | 5,000    | 4,500    |

**Solution:**

- (1) Variable Overhead Cost Variance = (Actual Output × Variable Overhead rate p.u.)  
– Actual Variable Overhead Cost
 
$$\left(4,500 \times \frac{10,000}{5,000}\right) - 8,910$$

$$(4,500 \times 2) - 8,910$$

$$9,000 - 8,910$$

$$= 90 \text{ F}$$
- (2) Variable Overhead Expenditure Variance = [(AQ X SR ) – Actual Variable Cost]
 
$$[(4,500 \times 2) - 8,910]$$

$$9000 - 8,910$$

$$= 90 \text{ F}$$
- (3) Variable Overheads Efficiency Variance = SR (Actual Production – Standard Production)
 
$$2(4,500 - 5,000)$$

$$2 \times 500$$

$$= 1,000 \text{ A}$$

**Illustration 15:** The Following Standards have been set to manufacture a product.

| Particulars                 | ₹  | ₹  |
|-----------------------------|----|----|
| Direct materials:           |    |    |
| 4 units of X @ ₹ 4 per unit | 16 |    |
| 6 units of Y @ ₹ 3 per unit | 18 |    |
| Standard Material Cost      |    | 34 |
| Direct Labour:              |    |    |
| 3 Hours @ ₹ 2 per unit      |    | 6  |
| Standard Cost per Unit      |    | 40 |

The Company manufactured and sold 6,000 units of the product during the year, details of direct material and labour cost being:

|                                     | ₹        | ₹        |
|-------------------------------------|----------|----------|
| Direct materials                    |          |          |
| 25,000 units of X @ ₹ 4.20 per unit | 1,05,000 |          |
| 6 units of Y @ ₹ 3 per unit         | 97,200   | 2,02,000 |
| Direct labour:                      |          |          |
| 17,000 hours per @ 2.20 per hour    |          | 37,400   |
| Total ₹                             |          | 2,39,000 |

**Calculate the Following Variances:**

- (1) Material Cost Variance
- (2) Material usage Variance
- (3) Material Price Variance
- (4) Labour Cost Variance
- (5) Labour Efficiency Variance
- (6) Labour Rate Variance

**Solution:****Basic calculations:****(1) Material:**

| Material | S      | Q      | SP | SC       | AQ     | AP  | AC       | RSQ  |
|----------|--------|--------|----|----------|--------|-----|----------|--|
| X        | 24,000 |        | 4  | 96,000   | 25,000 | 4.2 | 1,05,000 | $\frac{24,000}{60,000} \times 61,000 = 24,000$ |
| Y        |        | 36,000 | 3  | 1,08,000 | 36,000 | 2.7 | 97,200   | $\frac{36,000}{60,000} \times 61,200 = 36,600$ |
| Total    | 60,000 |        | -  | 2,04,000 | 61,200 | -   | 2,02,000 | 61,000   |

**Actual Output 6,000 units**

$$X \quad 4 \times 6,000 = 24,000 \text{ units}$$

$$Y \quad 6 \times 6,000 = \underline{36,000 \text{ units}}$$

60,000 units

**(2) Labour:**

| SH     | SR | SC     | AH     | AR  | AC     |
|--------|----|--------|--------|-----|--------|
| 18,000 | 2  | 36,000 | 17,000 | 2.2 | 37,400 |

- (1) Material Cost Variance = Standard Cost – Actual Cost  
= SC – AC  
X = 96,000 – 1,05,000 = 9,000 A  
Y = 1,08,000 – 97,200 = 10,800 F  
= 1,800 F
- (2) Material Usage Variance = SR (SO – AQ)

$$\begin{aligned}
 X &= 4 (24,000 - 25,000) &= 4,000 \text{ A} \\
 Y &= 3 (36,000 - 36,000) &= 0 \\
 & &= 4,000 \text{ A} \\
 (3) \text{ Material Price Variance} &= AQ(SR - AR) \\
 X &= 25,000(4 - 4.2) &= 5,000 \text{ A} \\
 Y &= 36,000(3 - 2.7) &= 10,800 \text{ F} \\
 & &= 5,800 \text{ F} \\
 (4) \text{ Labour Cost Variance} &= (SR \times SH) - (AR \times SH) \\
 &= SC - SC \\
 &= 36,000 - 37,400 \\
 &= 1,400 \text{ A} \\
 (5) \text{ Labour Efficiency Variance} &= SR (SH - AR) \\
 &= 2(18,000 - 17,000) \\
 &= 2,000 \text{ F} \\
 (6) \text{ Labour Rate Variance} &= AH (SH - AR) \\
 &= 17,000(2 - 2.2) \\
 &= 3,400 \text{ A}
 \end{aligned}$$

**Illustration 16:** Shruti Ltd. has furnished the following information for the month of May, 2002

|                   | Budget   | Actual   |
|-------------------|----------|----------|
| Output (Units)    | 400      | 425      |
| Hours             | 8,000    | 8,600    |
| Fixed Overheads   | ₹ 40,000 | ₹ 47,300 |
| Variable Overhead | ₹ 64,000 | ₹ 73,100 |

**Calculate the following Variances:**

- Fixed Overhead Variance
- Fixed Overhead Volume Variance
- Fixed Overhead Expenditure Variance
- Variable Overhead Variance
- Variable Overhead Expenditure Variance

**Solution:**

- Fixed Overhead Variance = [Standard FO for Actual Output] – [Actual FO incurred]
 
$$\begin{aligned}
 &= \left( \frac{40,000}{400} \times 425 \right) - 47,300 \\
 &= 42,500 - 47,300 \\
 &= 4,800 \text{ A}
 \end{aligned}$$
- Fixed Overhead Volume Variance = [Fixed Overhead recovery on Actual Output at standard rate] – [Budgeted Fixed Overhead Expenses]

$$= \left( \frac{40,000}{400} \times 425 \right) - 40,000$$

$$= 42,500 - 40,000$$

$$= 2,500 \text{ F}$$

(c) Fixed Overhead Expenditure Variance = Budgeted FO – Actual FO

$$= 40,000 - 47,300$$

$$= 7,300 \text{ A}$$

(d) Variable Overhead Variance = (Standard Variable CPU x Actual Output units) – Actual Variable Overhead Expenses

$$= \left( \frac{64,000}{400} \times 425 \right) - 73,100$$

$$= 68,000 - 73,100$$

$$= 5,100 \text{ A}$$

(e) Variable Overhead Expenditure Variance = [Standard Variable overhead expense per hour x Actual Hours worked] – Actual Variable OH expenses incurred.

$$= \left( \frac{64,000}{8,000} \times 8,600 \right) - 73,100$$

$$= 68,800 - 73,100$$

$$= 4,300 \text{ A}$$

**Illustration 17:** The Fixed Production overhead of producing one unit of an item was ₹ 35. Fixed production overheads were absorbed on the expected annual output of 13,200 units.

The actual production of one month was 1,000 units

The Actual fixed overhead for that month were ₹ 39,000

**Calculate:**

- (1) Fixed Overhead Cost Variance
- (2) Fixed Overhead Volume Variance
- (3) Fixed Overhead Expenditure Variance

**Solution:**

$$\begin{aligned} (1) \text{ Fixed Overhead Cost Variance} &= (\text{SH} \times \text{SR}) - \text{Actual Overheads} \\ &= (12,000 \times 35) - 4,68,000 \\ &= 4,20,000 - 4,68,000 \\ &= 48,000 \text{ A} \end{aligned}$$

$$\begin{aligned} (2) \text{ Fixed Overhead Volume Variance} &= \text{Standard FO} - \text{Budgeted FO} \\ &= 4,20,000 - (35 \times 13,200) \\ &= 4,20,000 - 4,62,000 \\ &= 42,000 \text{ A} \end{aligned}$$

$$(3) \text{ Fixed Overhead Expenditure Variance} = (\text{BQ} \times \text{SR}) - \text{Actual FO}$$

$$\begin{aligned}
 &= (13,200 \times 35) - (39,000 \times 12) \\
 &= 4,62,000 - 4,68,000 \\
 &= 6,000 \text{ A}
 \end{aligned}$$

**Illustration 18:** The Following data is given

| Particulars                | Budgeted | Actual |
|----------------------------|----------|--------|
| Production in units        | 400      | 360    |
| Man-hours to produce above | 8,000    | 7,000  |
| Variable Overheads (₹)     | 10,000   | 9,150  |

The Standard time to produce one unit of the product is 20 hours.

**Calculate:**

- (1) Variable Overhead efficiency variance
- (2) Variable overhead expenditure variance
- (3) Variable overhead cost variance

**Solution:**

**Workings:**

$$\begin{aligned}
 \text{(a) Standard Hours (SH) for Actual Output} &= 20 \times 360 \\
 &= 7,200 \text{ hours} \\
 \text{(b) Standard Rate (SR)} &= \frac{\text{Budgeted Overheads}}{\text{Budgeted Hours}} \\
 &= \frac{\text{Rs. } 10,000}{8,000 \text{ hours}} \\
 &= ₹ 1.25 \text{ per hour} \\
 \text{(c) Actual Rate (AR)} &= \frac{\text{Actual Overheads}}{\text{Actual hours}} \\
 &= \frac{\text{Rs. } 9,150}{7,000 \text{ hours}} \\
 &= ₹ 1.307 \text{ per hour} \\
 \text{(1) Variable Overheads Variance (VOV)} &= (\text{SH} \times \text{SR}) - (\text{AH} \times \text{AR}) \\
 &= (7,200 \times 1.25) - 9,150 \\
 &= 9,000 - 9,150 \\
 &= 150 \text{ A} \\
 \text{(2) Variable Overheads Efficiency Variance (VEFV)} &= (\text{SH} - \text{AH}) \times \text{SR} \\
 &= (7,200 - 7,000) \times 1.25 \\
 &= 250 \text{ F} \\
 \text{(3) Variable Overheads Expenditure Variance (VEXV)} &= (\text{SR} - \text{AR}) \times \text{AH} \\
 &= (1.25 - 1.307) \times 7,000 \\
 &= 400 \text{ A}
 \end{aligned}$$

**Illustration 19:** The Standard Cost of the product 'SLR' reveals:

**Standard materials:**

|  | ₹     |
|--|-------|
| 2 kg of A @ ₹ 2 per kg                 | 400   |
| 1 kg of B @ ₹ 6 per kg                 | 600   |
| Direct Labour (3 hours @ ₹ 6 per hour) | 18.00 |

**Actual Data:**

|                                  | ₹        |
|----------------------------------|----------|
| <b>Direct Materials</b>          |          |
| 19,000 kg of A @ 2.20 per kg     | 41,800   |
| 10,000 kg of B @ 5.60 per kg     | 56,000   |
| <b>Direct labour:</b>            |          |
| (28,500 hours @ ₹ 6.40 per hour) | 1,82,400 |

Actual Production was 9,000 units.

**Calculate:**

- (1) Material Price Variance
- (2) Material usage Variance
- (3) Material Cost Variance
- (4) Labour rate Variance
- (5) Labour Efficiency Variance.

**Solution:**

**(a) Material**

Standard Quantity for Actual output

Kgs.

$$A \ 2\text{kg} \times 9,000 = 18,000$$

$$B \ 1\text{kg} \times 9,000 = 9,000$$

$$= 27,000$$

| Material | SR | SQ     | SP     | AR  | AQ     | AP     | RSQ    |
|----------|----|--------|--------|-----|--------|--------|--------|
| A        | 2  | 18,000 | 36,000 | 2.2 | 19,000 | 41,800 | 19,333 |
| B        | 6  | 9,000  | 54,000 | 5.6 | 10,000 | 56,000 | 9,667  |
| Total    | -  | 27,000 | 90,000 | -   | 29,000 | 97,800 | 29,000 |

- (1) Material Cost variance = (SR X SQ) – (AR X AQ)  
 $A = 36,000 - 41,000 = 5,800 \text{ A}$   
 $B = 54,000 - 56,000 = 2,000 \text{ A}$   
 $= 7,800 \text{ A}$
- (2) Material Price Variance = AQ (SR – AR)

$$\begin{aligned}
 A &= 19,000 (2-2.2) &= 3,800 \text{ A} \\
 B &= 10,000 (6-5.6) &= 4,000 \text{ F} \\
 & &= 200 \text{ F} \\
 (3) \text{ Material Usage Variance} &= \text{SR} (\text{SR} - \text{AR}) \\
 A &= 2(18,000 - 19,000) &= 2,000 \text{ A} \\
 B &= 6(9,000 - 10,000) &= 6,000 \text{ A} \\
 & &= 8,000 \text{ A} \\
 (4) \text{ Labour Rate Variance} &= \text{AH} (\text{SR} - \text{AR}) \\
 &= 28,500 (6-6.4) \\
 &= 11,400 \text{ A} \\
 (5) \text{ Labour Efficiency Variance} &= \text{SR} (\text{SH} - \text{AH}) \\
 &= 6(27,000 - 28,500) \\
 &= 9,000 \text{ A}
 \end{aligned}$$

**(b) Labour:**

| SH     | SR | SC       | AH     | AR  | AC       |
|--------|----|----------|--------|-----|----------|
| 27,000 | 6  | 1,62,000 | 28,500 | 6.4 | 1,82,400 |

**Illustration 20:** In Order to produce 20 kgs. Of finished goods, raw materials of 50 kgs are required at ₹ 2.10 per unit. During an accounting period 20 units are manufactured by employing 57 kgs of raw materials at the rate of ₹ 1.80.

Calculate material variances

**Solution:**

$$\begin{aligned}
 (1) \text{ Material Cost Variance} &= (\text{SR} \times \text{SQ}) - (\text{AR} \times \text{AQ}) \\
 &= (2.10 \times 50) - (1.80 \times 57) \\
 &= 105 - 102.6 \\
 &= 2.4 \text{ F} \\
 (2) \text{ Material Price Variance} &= \text{AQ} (\text{SR} - \text{AR}) \\
 &= 57(2.10 - 1.80) \\
 &= 17.1 \text{ F} \\
 (3) \text{ Material Usage Variance} &= \text{SR}(\text{SQ} - \text{AQ}) \\
 &= 2.10(50 - 57) \\
 &= 14.7 \text{ A}
 \end{aligned}$$

**Illustration 21:** Following data pertains to Mahi Ltd.

| Materials | Standard Quantity | Standard Rate (₹) | Actual Quantity | Actual Rate (₹) |
|-----------|-------------------|-------------------|-----------------|-----------------|
| X         | 40                | 50                | 50              | 45              |
| Y         | 60                | 40                | 60              | 55              |

Calculate Material Variances

**Solution:**

| Materials | SQ  | SR | AQ  | AR | RSQ                              |
|-----------|-----|----|-----|----|----------------------------------|
| X         | 40  | 50 | 50  | 45 | $\frac{40}{110} \times 110 = 44$ |
| Q         | 60  | 40 | 60  | 55 | $\frac{60}{110} \times 110 = 66$ |
| Total     | 100 | -  | 110 | -  | 110                              |

$$\begin{aligned}
 (1) \text{ Material Cost Variance} &= (\text{SR} \times \text{SQ}) - (\text{AR} \times \text{AQ}) \\
 \text{P} &= (50 \times 40) - (45 \times 50) \\
 &= 2,000 - 2,250 = 250 \text{ A} \\
 \text{Q} &= (40 \times 60) - (55 \times 60) \\
 &= 2,400 - 3,300 = 900 \text{ A} \\
 &= 1,150 \text{ A} \\
 (2) \text{ Material Price Variance} &= \text{AQ} (\text{SR} - \text{AR}) \\
 \text{P} &= 50(50 - 45) = 250 \text{ F} \\
 \text{Q} &= 60(40 - 55) = 900 \text{ F} \\
 &= 650 \text{ F} \\
 (3) \text{ Material Usage Variance} &= \text{SR}(\text{SQ} - \text{AQ}) \\
 \text{P} &= 50(40 - 50) = 500 \text{ A} \\
 \text{Q} &= 40(60 - 60) = 0 \\
 &= 500 \text{ A} \\
 (4) \text{ Material Mix Variance} &= \text{SR} (\text{RSQ} - \text{AQ}) \\
 \text{P} &= 50(44 - 50) = 300 \text{ A} \\
 \text{Q} &= 40(66 - 60) = 240 \text{ F} = 60 \text{ F} \\
 (5) \text{ Material Yield Variance} &= \text{SR} (\text{SQ} - \text{RSQ}) \\
 \text{P} &= 50(40 - 44) = 200 \text{ A} \\
 \text{Q} &= 40 (60 - 66) = 240 \text{ A} \\
 &= 440 \text{ A}
 \end{aligned}$$

**Illustration 22:** Following data is given for 10 units of finished goods “A” 50 units at ₹ 2 per unit, “B” 80 units at ₹ 4 per unit and “Z” 70 units at ₹ 3 per units. During the particular accounting period 65 units of finished Goods are manufactured and actual data is:

A 350 units at ₹ 1.95;

B 500 units at ₹ 3.95;

C 450 units at ₹ 3.35;

Calculate Material Variances.

**Solution:**

| Material     | Standard (65 units) |    | Actual ( 65 units) |      | RSQ   |
|--------------|---------------------|----|--------------------|------|---|
|              | SQ                  | SR | AQ                 | AR   |   |
| A            | 325                 | 2  | 350                | 1.95 | $\frac{325}{1300} \times 1300 = 325$                |
| B            | 520                 | 4  | 500                | 3.95 |   |
| C            | 455                 | 3  | 450                | 3.35 | $\frac{520}{1300} \times 1300 = 520$                |
| <b>Total</b> | <b>1300</b>         | -  | <b>1300</b>        |      | $\frac{455}{1300} \times 1300 = 455$<br><b>1300</b> |

- (1) Material Cost Variance =  $(SR \times SQ) - (AR \times AQ)$   
A =  $(2 \times 325) - (1.95 \times 350)$   
=  $650 - 682.5 = 32.5$  A  
B =  $(4 \times 520) - (3.95 \times 500)$   
=  $2080 - 1975 = 105$  F  
C =  $(3 \times 455) - (3.35 \times 450)$   
=  $1365 - 1507.5 = 142.5$  A  
= 70 A
- (2) Material Price Variance =  $AQ(SR - AR)$   
A =  $350(2 - 1.95) = 17.5$  F  
B =  $500(4 - 3.95) = 25$  F  
C =  $450(3 - 3.35) = 157.5$  A  
= 115 A
- (3) Material usage Variance =  $SR(SQ - AQ)$   
A =  $2(325 - 350) = 50$  A  
B =  $4(520 - 500) = 80$  F  
C =  $3(455 - 450) = 15$  F  
= 45F
- (4) Material Mix variance =  $SR(RSQ - AQ)$   
A =  $2(325 - 350) = 50$  A  
B =  $4(520 - 500) = 80$  F  
C =  $3(455 - 450) = 15$  F  
= 45F
- (5) Material Yield Variance =  $SR(SQ - RSQ)$   
A =  $2(325 - 325) = 0$   
B =  $4(520 - 520) = 0$   
C =  $3(455 - 433) = 0$   
= Zero

**Illustration 23:** Following information pertains to Salman Ltd.

| Standard: 182 units |            |      |                | Actual: 182 units |            |      |              |
|---------------------|------------|------|----------------|-------------------|------------|------|--------------|
| Materials           | Units      | Rate | Amt            | Materials         | Units      | Rate | Amt          |
|                     | SQ         | SR   | SC             |                   | AQ         | AR   | AC           |
| A                   | 121        | 10   | 1,210.0        | A                 | 140        | 9.5  | 1,330        |
| B                   | 81         | 8.5  | 688.5          | B                 | 60         | 9    | 540          |
|                     | <b>202</b> |      | <b>1,898.5</b> |                   | <b>200</b> |      | <b>1,870</b> |
| <b>Less: Loss</b>   | 20         |      |                | Less: Loss        | 18         |      |              |
|                     | 182        |      |                |                   | 182        |      |              |

Calculate all Material Variances.

**Solution:**

- (1) Material Cost Variance = (SR X SQ) – (AR x AQ)  
 = 1,898.5 – 1870  
 = 28.5 F
- (2) Material Price Variance = AQ(SR – AR)  
 A = 140(10 – 9.5) = 70 F  
 B = 60(8.5 – 9) = 30 A  
 = 40A
- (3) Material Usage Variance = SR(SQ – AQ)  
 A = 10(121 – 140) = 190.0 A  
 B = 8.5(81 – 60) = 178.5A  
 = 11.5 A
- (4) Material Mix Variance = SR(RSQ – AQ)  
 A = 10(121 – 120) = 200 A  
 B = 8.5(80 – 60) = 170 F  
 = 30 A
- (5) Material Yield Variance = SR (SQ - RSQ)  
 A = 10(121 – 120) = 10.0 F  
 B = 8.5(81 – 80) = 8.5F  
 = 18.5 F

**RSQ:**

$$A = \frac{121}{200} \times 200 = 120$$

$$B = \frac{81}{202} \times 200 = \underline{80}$$

200

**Illustration 24:** Following data is available of Devansh:

Budgeted Sales:

X 500 units @ ₹ 5 per unit

Y 700 units @ ₹ 8 per unit

Actual Sales:

X 635 @ ₹ 5.4 per unit

Y 865 @ ₹ 8.2 per unit

Calculate all Sales Variances:

**Solution:**

| Products | SQ    | SR | SC    | AQ    | AR  | AC     | RSQ                                  |
|----------|-------|----|-------|-------|-----|--------|--------------------------------------|
| X        | 500   | 5  | 2,500 | 635   | 5.4 | 3,429  | $\frac{500}{1200} \times 1500 = 625$ |
| Y        | 700   | 8  | 5,600 | 865   | 8.2 | 7,093  | $\frac{700}{1200} \times 1500 = 875$ |
| Total    | 1,200 | -  | 8,100 | 1,500 | -   | 10,522 | 1,500                                |

- (1) Sales Value Variances =  $(AR \times AQ) - (SR \times SQ)$   
=  $10,522 - 8,100 = 2,422$  F
- (2) Sales Price Variance =  $AQ(ASP - BSP)$   
X =  $635(5.4 - 5) = 254$  F  
Y =  $865(8.2 - 8) = 173$  F  
= 427 F
- (3) Sales Volume Variance =  $BSP(AQ - BQ)$   
X =  $5(635 - 500) = 675$  F  
Y =  $8(865 - 700) = 1320$  F  
= 1995F
- (4) Sales Mix Variance =  $BSP(AQ - RSQ)$   
X =  $5(635 - 625) = 50$  F  
Y =  $8(865 - 875) = 80$  A  
= 30 A
- (5) Sales Quantity Variance =  $BSP(RSQ - BQ)$   
X =  $5(625 - 500) = 625$  F  
Y =  $8(875 - 700) = 1400$  F  
= 2025 F

**Exercise**

1. S.V Ltd. manufactures a single product, the standard mix which is:

Material X 60 % at ₹ 20 per kg

Material Y 40% at ₹ 10 per kg

Normal Loss in production is 30% of input. Due to shortage of Material X the standard mix was changed.

Actual results for March 2006 were;

Material X 105 kg. At ₹ 20 per kg

Material Y 95 kg. At 9 per kg

Input 200 kg

Loss 35 kg

Output 165 kg

Calculate:

- (a) Material Price Variance
- (b) Material Usage Variance
- (c) Material Mix Variance
- (d) Material Yield Variance

[Ans.: (a) Material Price Variance: A Nil; B 95 F; Total 95 F  
(b) Material Usage Variance: A 375 F; B125A; Total 250 F  
(c) Material Mix Variance: A 300 F; B 150 A; Total 150 F  
(d) Material Yield Variance: Total 100 F]

2. The Standard Cost of certain chemical mixture is:

35%Material X at ₹ 25 per kg

65% Material Y at ₹ 36 per kg

A Standard loss at 5% is expected in production.

During a period there is used:

125 Kg of material X at ₹ 27 per kg

275 Kg of material Y at ₹ 34 per kg

The actual output was 365 kg.

**Calculate:**

- (a) Material Cost Variance
- (b) Material Price Variance
- (c) Material Mix Variance
- (d) Material Yield Variance

[Ans.: (a) Material Cost Variance: 373 A  
(b) Material Price Variance: X 250 A; Y 350 F; Total 300 F  
(c) Material Mix Variance: X 375 F; Y 540 A; Total 165 A  
(d) Material Yield Variance: 508 A]

3. From the following data prepare a unit cost statement showing the prime cost of products A and B together with analysis of variances:

|                    | Product A        | Product B        |
|--------------------|------------------|------------------|
| Material: Standard | 600 kg @ ₹ 5.00  | 90 Kg ₹ 3.00     |
| Actual             | 580 Kg @ ₹ 5.50  | 100 Kg @ ₹ 2.80  |
| Labour: Standard   | 80 Hrs. @ ₹ 2.00 | 16 Hrs. @ ₹ 2.80 |
| Actual             | 92 Hrs. @ ₹ 1.75 | 14 Hrs. @ ₹ 2.00 |

- [Ans.: 1. Standard Prime Cost: A 3,160; B 314.80  
 2. Actual Prime Cost: A 3,351; B 316.40  
 3. Prime Cost Variance: A 191 A; b 20 F  
 4. Material Price Variance: A 290 F; B 20 A  
 5. Material Usage Variance: A 100 F; B 30 A  
 6. Material Cost Variance: A 190 A; B 10 A  
 7. Labour rate Variance: A 23 F; B 2.8 F  
 8. Labour Efficiency Variance: A 24 A; B 5.6 F  
 9. Labour Cost Variance: A 24 A; B 8.4 F]
4. The following information is gathered from the labour records of SRK Co.
1. Payroll allocations for direct labour ₹ 20,000
  2. Time card analysis shows that 8,000 hours were worked on production lines.
  3. Production reports for the period shows that 4,000 units have been completed each having standard labour time of 1 1/2 hours and standard labour rate ₹ 2 per hour.

Calculate:

- (a) Labour Rate Variance
  - (b) Labour Efficiency Variance
  - (c) Labour Cost Variance
5. The Standard material cost for 200 units of output is:

| Materials | Kg  | Rate per Kg |
|-----------|-----|-------------|
| A         | 50  | 12          |
| B         | 100 | 9           |
| C         | 100 | 10          |

The Actual cost for 8,000 units is as follows:

| Materials | Kg   | Total Cost |
|-----------|------|------------|
| A         | 2100 | 28,350     |
| B         | 3750 | 30,750     |
| C         | 4150 | 46,480     |

Calculate Material Cost Variance, Material Price Variance and Material Usage Variance.

6. The standard output of production 'EXE' is 25 units per hour in manufacturing department of a company employing 100 workers. The hourly wage rate per labour hour is ₹ 6.

In a 42- hour week, the department produced 1,040 units 'EXE' despite 5% of the time paid were lost due to an abnormal reason. The hourly wage rate actually paid were ₹ 6.60, ₹ 6 and 5.70 respectively to 10, 30 and 60 of the workers.

Compute Relevant Variances.

- [Ans.: 1. Labour Cost Variance                      432 F  
 2. Labour Rate Variance  
       84 A; Nil; 756 F; Total 672 F  
 3. Labour Efficiency Variance                  1,020 F  
 4. Labour Idle Time Variance                  1,260 A]

7. The following information was obtained from the records of a manufacturing unit using standard costing system:

|                       | Standard   | Actual      |
|-----------------------|------------|-------------|
| Production            | 4,00 units | 3,800 units |
| Working Days          | 20         | 21          |
| Fixed Overhead (₹)    | 40,000     | 39,000      |
| Variable Overhead (₹) | 12,000     | 12,000      |

You are required to calculate the following overhead variances:

- (a) Variable Overhead Variance.  
 (b) Fixed Overhead Variance.  
     1. Expenditure Variance  
     2. Volume Variance  
     3. Efficiency Variance  
     4. Calendar Variance  
 (c) Also prepare a reconciliation statement for the standard fixed expenses worked out at standard fixed overhead rate and the actual fixed overhead.

- [Ans.: 1. Variable Overhead Cost Variance                  600 A  
 2. Fixed Overhead Variance                                  1,000 A  
 3. Fixed Overhead Expenditure Variance                  1,000 A  
 4. Fixed Overhead Volume Variance                          2,000 A  
 5. Fixed Overhead Efficiency Variance                          4,000 A  
 6. Fixed Overhead Calendar Variance                          2,000 F]

8. From the following information about sales, calculate:

- (a) Total Sales Variance  
 (b) Sales Price Variance  
 (c) Sales Volume Variance  
 (d) Sales Mix Variance  
 (e) Sales Quantity Variance.

| Product | Product No.   | Standard rate in ₹ per unit | ₹             | Product nos.  | Actual rate in ₹ per unit | ₹             |
|---------|---------------|-----------------------------|---------------|---------------|---------------------------|---------------|
| A       | 5,000         | 5                           | 25,000        | 6,000         | 6                         | 36,000        |
| B       | 4,000         | 6                           | 24,000        | 5,000         | 5                         | 25,000        |
| C       | 3,000         | 7                           | 21,000        | 4,000         | 8                         | 32,000        |
|         | <b>12,000</b> |                             | <b>70,000</b> | <b>15,000</b> |                           | <b>93,000</b> |

- [Ans.: 1. Total Sales Variance 23,000 F  
 2. Sales Price Variance: A 6,000 F; B 5,000 A; C 4,000 F; Total 5,000F  
 3. Sales Volume Variance: A 5,000 F; B 6,000 F; C 7,000 F; Total 18,000 F  
 4. Sales Mix Variance 500 F  
 5. Sales Quantity Variance 17,500 F]
9. From the following information of Kautsa Corporation, compute:
- Price Variance
  - Usage Variance and
  - Mix Variances

|            | Quantity Kgs. | Unit Price | Total | Quantity Kgs. | Unit Price | Total |
|------------|---------------|------------|-------|---------------|------------|-------|
| Material A | 20            | 4          | 80    | 10            | 6          | 60    |
| Material B | 40            | 6          | 240   | 20            | 12         | 240   |
| Material C | 40            | 12         | 480   | 30            | 10         | 300   |
|            | 100           |            | 800   | 60            |            | 600   |

10. From the following particulars in respect of a product 'P' in which raw materials 'A' and 'B' are used, you are required to calculate:
- Material Cost Variance
  - Material Price Variance
  - Material Mix Variance
  - Material Yield Variance
11. The Standard material cost for a normal mix of one ton of a chemical X is based on the following:

| Chemical | Usage in Kg. | Price Per kg. (₹) |
|----------|--------------|-------------------|
| A        | 240          | 6                 |
| B        | 400          | 12                |
| C        | 640          | 10                |

During a month 6.25 tons of Chemical X were produced from the following:

| Chemicals | Usage in tons | Cost (₹) |
|-----------|---------------|----------|
| A         | 1.6           | 11,200   |
| B         | 2.4           | 30,000   |
| C         | 4.5           | 47,250   |

Analyse all Variances.

12. The Standard cost of a certain chemical mixture is:  
 40% material X at ₹ 200 per ton  
 60% material Y at ₹ 300 per ton  
 A Standard loss of 103 is expected in production.  
 During a period there is used  
 90% tons of Material X at the cost of ₹ 180 per ton  
 110 tons Material Y at the cost of ₹ 340 per ton.  
 The weight produced is 182 tons of good production.  
 Calculate and present:
- (a) Material Price Variance  
 (b) Material Usage Variance  
 (c) Material Mix Variance  
 (d) Material Yield Variance.
14. The Devansh Badani Co. Ltd. manufactures a single product, the standard mix Material A 60% @ ₹ 20 per kg., material B 40% @ ₹ 10 per kg. Normal loss in production is 20% of input. Due to shortage of material A the standard mix was changed.

Actuals are:

|                          |       |
|--------------------------|-------|
| Material A 210 Kg @ ₹ 20 | 4,200 |
| Material B 190 kg @ ₹ 9  | 1,710 |
| Input 400 Kg             | 5,910 |
| Loss 60 Kg               | -     |
| Output 340 Kg            | 5,910 |

Calculate material price, mixture yields and usage variances.

15. From the following data, calculate:
1. Material Cost Variance
  2. Material Price Variance
  3. Material Usage Variance

| Name of Material | Standard |          | Actual |          |
|------------------|----------|----------|--------|----------|
|                  | Kg.      | Rate (₹) | Kg.    | Rate (₹) |
| X                | 8,000    | 1.05     | 7500   | 1.25     |
| Y                | 3,000    | 2.15     | 3300   | 2.30     |
| Z                | 2,000    | 3.30     | 2400   | 3.50     |

16. Using the following information for Department X,

Calculate all possible labour variances.

|                                |       |
|--------------------------------|-------|
| Actual Wages rate per hour (₹) | 3.5   |
| Standard hours for production  | 8,640 |
| Standard rate per Hour (₹)     | 3     |
| Actual hours worked            | 8,200 |

17. From the following particulars in respect of a product 'X' in which raw materials 'A' and 'B' are used. Calculate:
1. Material Cost Variance
  2. Material Price Variance
  3. Material Mix Variance
  4. Material Yield Variance

| Materials (Input) | Standard |          | Actual |          |
|-------------------|----------|----------|--------|----------|
|                   | Tons     | Rate (₹) | Tons   | Rate (₹) |
| A                 | 120      | 10.00    | 140    | 9.50     |
| B                 | 80       | 7.50     | 60     | 9.00     |
|                   | 200      |          | 200    |          |
| Loss              | 20       |          | 18     |          |

## Objective Questions

### I. Fill in the Blanks

1. The difference between total actual cost incurred and total standard cost applied is referred to as \_\_\_\_\_.
2. The difference between what was paid for inputs and what should have been paid for inputs is referred to as a \_\_\_\_\_.
3. The difference between standard quantity allowed and quantity used for a unit of output is known as an \_\_\_\_\_.
4. The difference between actual variable overhead and budgeted variable overhead based upon actual hours is referred to as the \_\_\_\_\_.
5. The difference between actual and budgeted fixed factory overhead is referred to as a \_\_\_\_\_.
6. When multiple materials are used, the effect of substituting a non-standard mix of materials during the production process is referred to as a \_\_\_\_\_ variance.
7. When multiple labour categories are used, the financial effect of using a different mix of workers in a production process is referred to as a \_\_\_\_\_ variance.

[Ans.: 1. Total Variance, 2. Price Variance, 3. Efficiency Variance, 4. Variable Overhead Spending Variance, 5. Fixed Overhead Spending Variance, 6. Material Mix, 7. Labor Mix

### II. True or False

1. Specifications for materials are compiled on a bill of materials.
2. An operations flow document shows all processes necessary to manufacture one unit of a product.
3. A standard cost card is prepared before developing manufacturing standards for direct materials, direct labour, and factory overhead.
4. The total variance can provide useful information about the source of cost differences.
5. The formula for price/rate variance is  $(AP - SP) \times SQ$

6. The price variance reflects the difference between the quantity of inputs used and the standard quantity allowed for the output of a period.
7. The usage variance reflects the difference between the price paid for inputs and the standard price for those inputs.
8. The formula for usage variance is  $(AQ - SQ) * SP$
9. The point of purchase model calculates the materials price variance using the quantity of materials purchased.
10. The difference between the actual wages paid to employees and the standard wages for all hours worked is the labor rate variance.
11. The difference between the standard hours worked for a specific level of production and the actual hours worked is the labor rate variance.
12. A flexible budget is an effective tool for budgeting factory overhead.

[Ans.: 1. True, 2. True, 3. False, 4. False, 5. False, 6. False, 7. False, 8. True, 9. True, 10. True, 11. False, 12. True]

### III. Multiple Choice. Write the Letter Only for your Best Answer.

1. A primary purpose of using a standard cost system is
  - (a) to make things easier for managers in the production facility.
  - (b) to provide a distinct measure of cost control.
  - (c) to minimize the cost per unit of production.
  - (d) b and c are correct.
2. The standard cost card contains quantities and costs for
  - (a) direct material only
  - (b) direct labor only.
  - (c) direct material and direct labor only
  - (d) direct material, direct labor, and overhead.
3. Which of the following statements regarding standard cost systems is **true**?
  - (a) Favorable variances are not necessarily good variances.
  - (b) Managers will investigate all variances from standard
  - (c) The production supervisor is generally responsible for material price variances.
  - (d) Standard costs cannot be used for planning purposes since costs normally change in the future.
4. In a standard cost system, Work in Process Inventory is ordinarily debited with
  - (a) actual costs of material and labor and a predetermined overhead cost for overhead
  - (b) standard costs based on the level of input activity (such as direct labor hours worked).
  - (c) standard costs based on production output.
  - (d) actual costs of material, labor, and overhead.
5. A standard cost system may be used in
  - (a) job order costing, but not process costing
  - (b) process costing, but not job order costing.

- (c) either job order costing or process costing.
  - (d) neither job order costing nor process costing.
6. Standard costs may be used for
- (a) product costing.
  - (b) planning.
  - (c) Controlling.
  - (d) all of the above.
7. A purpose of standard costing is to
- (a) replace budgets and budgeting
  - (b) simplify costing procedures.
  - (c) eliminate the need for actual costing for external reporting purposes.
  - (d) eliminate the need to account for year-end under-applied or over-applied manufacturing overhead.
8. Standard costs
- (a) are estimates of costs attainable only under the most ideal conditions.
  - (b) are difficult to use with a process costing system
  - (c) can, if properly used, help motivate employees.
  - (d) require that significant unfavourable variances be investigated, but do not require that significant favorable variances be investigated.
9. A bill of material does **not** include
- (a) quantity of component inputs.
  - (b) price of component inputs
  - (c) quality of component inputs.
  - (d) type of product output.
10. An operations flow document
- (a) tracks the cost and quantity of material through an operation.
  - (b) tracks the network of control points from receipt of a customer's order through the delivery of the finished product.
  - (c) specifies tasks to make a unit and the times allowed for each task.
  - (d) charts the shortest path by which to arrange machines for completing products.
11. A total variance is best defined as the difference between total
- (a) actual cost and total cost applied for the standard output of the period.
  - (b) standard cost and total cost applied to production.
  - (c) actual cost and total standard cost of the actual input of the period.
  - (d) actual cost and total cost applied for the actual output of the period.

[Ans.: 1. (b), 2. (d), 3. (a), 4. (c), 5. (c), 6. (d), 7. (b), 8. (c), 9. (b), 10. (c), 11. (d)]



## BUDGETARY CONTROL

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### Introduction

Basically, management is the co-ordination of human effort, i.e., the accomplishment of goals by utilising the efforts of other people. Management is termed efficient if it accomplishes the objectives with minimum effort and costs. Management planning and control has been recognised as one of the most important approaches for facilitating effective performance of the management process.

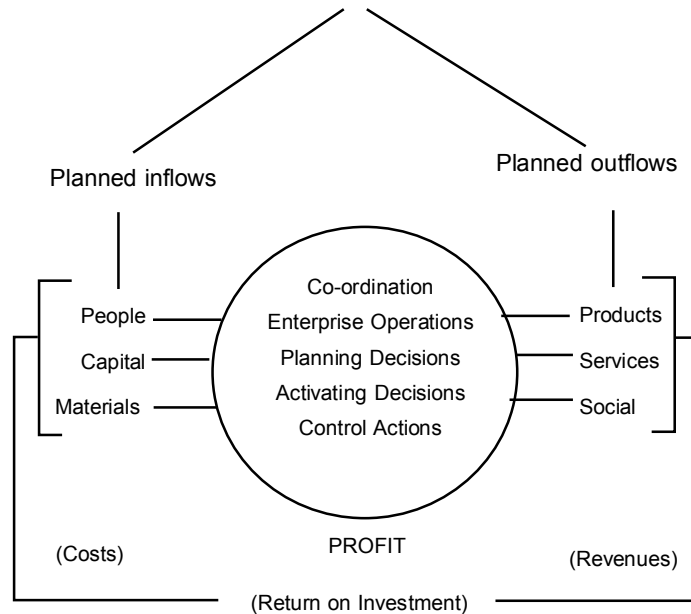
While all business endeavours have multiple objectives of profit and contribution to the economic and social improvement, non-business endeavours have relatively precise objectives generally to be accomplished within specified cost constraints. Whether it is a business or non-business endeavour it is essential that the management and other interested parties are very well acquainted with the objectives and goals so that proper managerial guidance could be given and the effectiveness with which the desired activities are performed could be measured.

So, whatever be the endeavour, the management process essentially conforms to the general pattern – planning, co-ordination and control. With the increasing competition among profit making enterprises, the concept of profit planning and control system has gained wide acceptance which requires management to design its course in advance and use appropriate techniques to assure co-ordination and control of operations.

### Elements of Management Planning and Control System

Management planning and control means the development and acceptance of objectives and goals and moving an organisation efficiently to achieve the desired objectives and goals. It is not a separate technique but entails an integration of all the functional and operational aspects of an enterprise.

Although management planning and control is related to accounting, it is a management system which comprises of activities of planning, co-ordination and control. For long-range success the stream of managerial decisions must generate plans and actions to provide the essential inflows that are necessary to support the planned outflows of the enterprise so that realistic profit and return on investment are earned. The relationship between these activities of the management can be seen in the Figure 4.1.



**Figure 4.1: Planning and Controlling Inflows and Outflows for Profit**

It may be noted that planned inflows are people, capital and materials, generally cost-incurring factors while outflows are products, services and social contributions that the enterprise generates which are generally revenue-generating factors. The responsibility of management is to manipulate, through the management process, i.e., planning, activating (or co-ordinating) and control the combinations of inflows and outflows so that the long-range objectives of the enterprise generally in terms of profit and return on investment are attained.

### Planning

Planning has been defined as the design of a desired future state for an entity and rests on the belief that the future state can be attained by continuous management action. Thus, it projects the effective ways of attaining this desired future state, and presupposes that an entity can be more successful, in terms of its broad objectives, because of planned management decisions than it can if there were no planned intervention by the management.

The purpose of planning is to provide the managers with the guidelines for making decisions on a day-to-day basis. Planning referred here, is a decision-making process of highest order and thus requires management time and dedication. It starts with an attempt to project the future state without any intervention by the management and the desired state of the entity. Then, it concludes with a planning projection and thus, projects the ways to attain the desired future state realistically.

Planning is a continuous process since it requires constant revisions with changing conditions.

### Control

Control may be defined simply as the action necessary to assure that objectives, plan, policies and strategies are being attained. It rests upon a firm foundation of management planning and thus, believes that the objectives, plans, policies and strategies are properly planned and communicated to those managers who are responsible for their accomplishment.

Generally, a control process encompasses the following:

1. Measuring performance against predetermined objectives and standards.
2. Communicating to the appropriate managers of the results.
3. Calculating deviations from the set objectives and standards.
4. Framing all possible alternative ways to correct the indicated variances.
5. Choosing and implementating the most promising alternative.
6. Appraising the corrective action and improve future planning and control cycles.

Control is effective if it is exercised at the point of action or at the time of commitment rather than after the completion of the action. This implies that the objectives, plans, policies and standards are communicated to and understood by the managers who are responsible for certain actions, so that they would be in a position to exercise control at the point of action.

In control process, evaluation of an actual result must be based upon some standard of performance. Current actual results can be compared to the actual results of the prior period. In this way, trends are revealed. However, comparison with prior period actual results may not provide effective measurement of performance due to the following reasons – (1) conditions may have changed (2) accounting classifications adopted may be different, and (3) performance in the prior period itself would have been unsatisfactory. Thus, the management has to evaluate the performance of various managers after taking into consideration the above points.

### Co-ordination

Though Co-ordination is listed as a separate function of management, it should be viewed as an effect that ensues when the managerial functions of planning and controlling are accomplished.

Co-ordination is the synchronisation of individual actions with the result that each subdivision of an entity effectively works toward the common objectives. Co-ordination is regarded as one of the central tasks of management as it involves a reconciliation of differences in effort, timing, policies and aggregation of resources. Lack of co-ordination in an enterprise is observed when a department head is permitted to expand the department on the specific needs of that department only, although such expansion may negatively affect other departments and alter their performances. Thus, co-ordination is required at all vertical levels and on a horizontal basis.

The process of management planning and control system is summarised in the Figure 4.2.

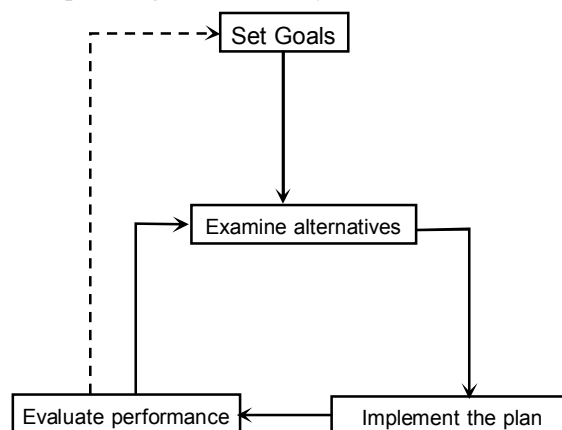


Figure 4.2

## Role of Accounting Information

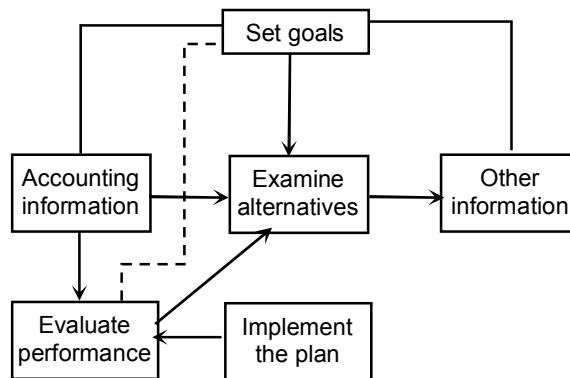
As already said, management planning and control system is related to accounting system. Let us see how this information enters into planning and control process.

Suitable goals are set based on the information provided by the accountants. Projections of future sales, expenses, incomes [and estimation of profits are made] depending on the accounting information.

After setting goals while examining alternatives, information about these alternatives comes from accounting system and the accountant is made to combine the data and produce meaningful reports.

Though, implementation of chosen alternative is done by the managers alone without the intervention of accounting system, the accountant is required to collect and summarise data about the success of the chosen plan. The evaluation of performance depends heavily on the facts that the accountant accumulates and reports.

The flowchart in Figure 4.3 summarises the planning-control cycle and the part played by the accountants and other information providers.



**Figure 4.3**

Though, accounting system is helpful in the process of planning and control it should be emphasised that the accountant does not necessarily participate in the management, and that his information may not necessarily prove that the success or failure has been achieved or suffered.

## Budgeting as a Tool of Management Planning and Control

Budget is a numeric representation of the manager's plans for a specified period of time. It is commonly used by business firms, governmental agencies, non-profit organisations and even households. While there is considerable variation in the scope, degree of formality and level of sophistication applied to budgeting, most of the well managed business firms use budget which is a comprehensive and co-ordinated plan for the operations and resources of the firm.

A Budget can serve as an extremely useful tool for all managers.

- (i) **Communication:** A budget can serve as a means of communicating information within a firm. It is especially useful to lower level managers. For example, the district sales managers can know from the budget the level of sales that are expected of them or the production manager can know through the budget how much he can spend towards labour

expenses, etc. The budget serves as a communicator over time. As everyone tends to forget what they have planned without a written record, budget will remind them of their goals and progress towards the goals.

- (ii) **Co-ordination:** Whenever a manager is faced with managing two or more interrelated processes, he encounters the need to co-ordinate operations to maximise the utilisation of the available resources and to minimise idleness. A manager of a small manufacturing concern needs to co-ordinate such things as raw material purchases, working capital matter, labour union negotiations, etc. As the size of the operations increases, the number of factors to be co-ordinated increase and the manager is likely to find himself in a precarious situation without a concretely stated central plan. Co-ordination is essential when responsibility for different segments is delegated to separate individuals. The budget can serve for the above purpose of co-ordination.
- (iii) **Measurement of Success:** Success is determined by comparing past performance against a previous period's performance. However, this comparison using historical records does not take into consideration the changes that take place for example, the market for the product may have increased, etc. Whereas, budgets provides us to compare the actual performance with the budgeted performance which is an estimate of 'what might have been' taking all the possible changes into account. Though budget is only a prior estimate of future conditions and thus subject to manipulation, it can be used as a success criterion, if done carefully and with additional data.
- (iv) **Motivation:** Budgets prepared for the coming year motivates the managers to do their best. And, if a reward system is attached to the budget it further motivates the managers to achieve the levels of output.

## Application of the Budget

In the following areas, budgeting can be applied.

### Outputs

Careful analysis of future sales will be made. Then the manager will begin to plan production or purchase requirements to meet the expected sales figure. With the budgets prepared he would be in a position to utilise the available resources efficiently to meet the anticipated demand.

### Inputs

Once the Budget establishes a manufacturing firm's output requirements, the manager can go about planning for labour and materials acquisition to support the desired output levels. Budgets help the managers to plan in advance for future and negotiate labour and material contracts at favourable rates. Without budget he may be forced into emergency purchases at higher costs, less skilled or overtime skilled labour and sometimes he may have to face with no production situation because of shortage of input. Budget helps managers to avoid off season layoffs and peak period bulges by spreading production more evenly through the year.

### Facilities

Good budgeting also informs the manager about the adequacy of existing facilities for his future needs. However, this approach will require additional storage of materials and finished products and hence more space. Increased inventory costs leads to increased non-cash working capital and hence

cash may be borrowed until sales can be made. Thus, budgeting facilitates the above anticipations and assists in establishing co-ordination. Production of some materials needs special equipment, the need of which can be anticipated by budgeting and can be procured at favourable terms instead of a rush rental.

### Administration

Budgeting applies equally well to administrative activities. Needs for clerks, storekeepers, book-keepers, secretaries, office supplies, etc., can be handled in the similar fashion through foresight and planning. Anticipation can lead to efficiency and higher profits in the office as well as in the production.

### Cash Needs

Budgeting provides estimation of future receipts and disbursements. Careful planning facilitates the treasurer to minimise the chances of running out of cash and go bankrupt and also avoids situations of excess cash which is not capable of earning income.

### Control

A well-structured budget can lead to efficient control of the firm as the manager has an indication of what should be done and can more easily spot what is being ineffectively done.

### Organisation of the Budget

The following guidelines may be followed in preparing a budget.

Assigning personnel: The manager of an entity should assign his most qualified personnel to the preparation of the budget. The organisation chart that is generally found in medium sized firms is shown in Figure 4.4.

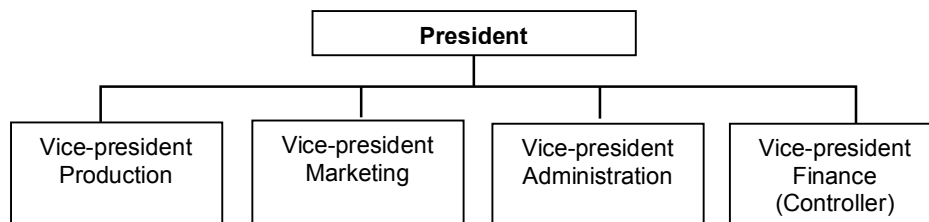


Figure 4.4

The four vice-presidents have responsibility for their respective functional areas. Each will delegate authority to his subordinates in order to get work done. Though, the Vice-president for finance provides information required by other departments, he makes decisions concerning the operation of his own department only.

A better course of action is to establish a budget committee with representation from each of the financial areas. A Budget Committee usually reports directly to top management. In large companies the budget committee is composed of executives in-charge of major functions of the business and includes the sales manager, personnel manager, finance manager, the production manager, the chief engineer, the treasurer and the chief accounts officer. One member of the budget committee is the budget director who is in-charge of preparing a budget manual of instructions and accumulating the

proposed budget data. In large companies, the position may be full-time job; in smaller companies, the post may be assigned to the finance manager or chief accounts officer or some other officer who acts as budget director on a part-time basis.

The principal functions of the budget committee are to:

- Decide the company's general policies and objectives;
- Receive and review individual budget estimates concerning different departments/units/division;
- Suggest changes, modifications in accordance with organisational objectives;
- Approve budgets which act as an authority/target for departmental action;
- Receive and analyse performance reports regarding the implementation of budgets;
- Suggest corrective action to improve efficiency and achieve budgetary goals.

### Deriving Budget Figures

There are three ways that the budget committee can derive the estimates that appear in the final budget.

In one approach, known as imposed budget or top-down approach, the budgeted quantities are obtained from the top level managers and then communicated downward to the lower level managers. Low level managers do not participate in this type of budget, i.e., they have nothing to say about what is expected of them.

One important advantage of this type of budgeting is that the top level managers are involved in planning decisions and as such they have wider perspective of the firm's operation and would be in a position to allocate various resources among the various areas of responsibility.

Additionally, this is very cheaper because of the relatively fewer persons involved. However, this approach has two disadvantages. Firstly, top level managers, due to their positions, are separated from actual production and marketing processes and their allocation of resources to various areas would be without specific knowledge and as such may not be proper. Secondly, as the low level managers do not participate in preparing the budget, they are not motivated to work as per the estimates.

Another approach, known as participative approach is designed to eliminate the above disadvantages of imposed budgeting. In participating approach, estimations of lower level managers are coordinated and communicated upward to the top level managers. As lower level managers are given special importance in the preparation of budget figures, they will make special efforts to meet those goals. Participating approach rests on the belief that the low level managers who involve in day-to-day activities know very well his requirements and abilities and as such can give proper budgeted figures.

However, this approach too has disadvantages. Firstly, the manager may inflate the importance of his own area of responsibility and produce unrealistic demands. Secondly, to be in a comfortable position, each manager may provide for more inputs than required. And, from practical point of view, this approach is costlier to imposed approach.

Keeping in view the disadvantages of both the approaches, very few firms follow either a pure imposed or a pure participating approach. Thus, generally what is followed is the mixed approach, known as negotiated approach in which the possible goals set by higher level managers are

communicated downward to lower level managers for their acceptance. If the lower levels are not satisfied with the set goals they are allowed to suggest alternatives, either in terms of expectations or resources. Then, the upper management makes the necessary alternation. It is believed that this approach brings out the advantage of the other two, i.e., it combines a broad perspective of top management with precise knowledge of line managers. It also achieves a personal commitment from the lower levels to reasonable goals. Of course, all these advantages are obtained at a cost of high managerial expenses.

### **Selecting the Time Frame**

The time/budget period is an important factor in developing a comprehensive budgeting programme. This is the period for which forecasts can reasonably be made and budgets can be formulated. A business enterprise generally prepares a Short-range budget and a Long-range budget.

### **Short-range Budget**

Short-range budgets may cover periods of three, six or twelve months depending upon the nature of the business. Most manufacturing firms use one year as the planning period. Wholesale and retail firms usually employ a six-month budget which is related to their selling seasons. In determining the period of the Short-range budget, the following factors should be considered.

The budget period should be long enough to cover complete production of various products.

For business of a seasonal nature, the budget period should cover at least one entire seasonal cycle.

The budget period should be long enough to allow for the financing of production well in advance of actual needs. It should provide adequate time to arrange the funds for production and other purposes.

The budget period should coincide with the financial accounting period to compare actual results with the budget estimates and thus to facilitate better interpretation of the performance.

### **Long-range Budget**

A Long-range budget or planning is defined as “a systematic and formalised process for purposefully directing and controlling future operations toward a desired objective for periods extending beyond one year.” Long-range budgets cover specific areas, such as future sales, future production, long-term capital expenditures, extensive research and development programmes, financial requirements, profit/forecast. They evaluate the future implications associated with present decisions and help management in making present decisions and select the most profitable alternative. Long-range budgeting does not eliminate risk altogether, it only reduces the risk to a level which does not hamper the production and achievement of company objectives.

There are many factors which are duly considered while preparing long-term budgets, such as market trends, economic factors, growth of population, consumption pattern, industrial production, national income, government economic and industrial policy. Quantitative sales can be budgeted for a three to five year period. After forecasting sales, a budgeted profit and loss account can be prepared relating anticipated sales to corresponding cost and thus net operating profit can be forecasted. Likewise, a balance sheet for many years can be prepared to forecast cash, inventory levels, accounts receivable, accounts payable, liabilities, etc. The forecasted profit and loss account and balance sheet for a Long-range is a very useful tool in accomplishing the objectives of the organisation as a whole.

## Limiting or Principal Budget Factor

When budgets are made, there is invariably some factor which governs or sets a limit to the quantity which can be made or sold. This is known as the limiting or principal budget factor. A principal budget factor is “the factor the extent of whose influence must first be assessed in order to ensure that the functional budgets are reasonably capable of fulfilment.” In the field of sales the limiting factor is customer demand which is influenced by many factors, such as price and quality of the product, competition, the general purchasing power of the public, advertising, etc. In the field of production, the principal budget factor may be plant capacity, the supply of labour of the right quality or the availability of scarce materials. Sometimes, management itself may impose limiting factors, e.g., management may control production to maintain a definite price level or management may not decide to purchase plant and machinery and thus to maintain the same plant capacity.

The limiting or principal budget factors must be carefully considered while preparing the budget. If not properly taken into account, budgets may not be realistic and become difficult to achieve. Co-ordination among different departments will be lacking. The principal budget factors can be eliminated by taking suitable measures, for example, the plant capacity can be increased by purchase of additional plant.

## The Budgeting Process

### Budgeting Sales

Every activity of a profit oriented firm must be directed to one overall goal – sales because if the products cannot be sold at a profit, there would not be any economic reason for the firm to produce them. And also, sales is regarded as the primary source of cash. The capital-additions needed, the production level, manpower requirements and other important operational aspects depend on the volume of sales.

Thus, the sales plan is the foundation for periodic planning in the firm, because practically all other enterprise planning is built on it. The usefulness of the entire budget depends on the reliability of the sales estimates. If sales estimate is too low, profits will be lost because the firm will not be able to provide all the units, the customers demand. And, if the sales estimate is too high, the firm has to incur more costs than it can recover by sales. Hence, a great deal of effort should be expended on the preparation of the forecast of sales.

Much of the expertise for the preparation of sales forecast is generally found within the marketing staff of the firm. This group will gather information from many sources and marketing studies are done to determine whether the market for the product still exists or not and if it does how large it will be. Various possibilities such as price changes, etc., are evaluated and various strategies are framed. The Budget Committee will accept the best one among the various alternatives and the planning phase begins. An important factor considered in the planning of the sales volume is price at which the product can be sold.

### Pricing Decision

Three important factors that affect pricing decision are demand for the product, cost recovery and profit margins.

## Demand

Before deciding the price of the product a firm has to check whether market already exists for that product or whether it is a new product in the market. If it is already an existing product in the market, it can charge a higher price for the product only when it can create products with superior quality. Or else, it should check whether it is profitable for it to sell at the existing price or at a lower one. If, on the other hand, the product is a new one, though it has freedom in selecting the price level in the beginning it should build flexibility into the pricing system so that it can respond quickly to any strategy that may be employed by others later.

Another approach is first to determine the price in order to attract the customers and then to design the product in such a way that it can be manufactured at a cost sufficiently low to assure a profit.

## Cost Recovery

Law of economics holds that if a firm has to survive, its total sales revenue should exceed its total costs. The firm should determine the price level, at which sales revenue exceeds the total costs, which includes not only the production costs but also selling and administration costs. Thus, the firm can adopt cost-plus strategy, i.e., to determine the selling price by adding profit margin to the average unit cost. This approach should be made by careful market research as it completely neglects the competition. It assumes that the competitors will essentially have the same cost and same profit margin as the firm has.

## Profit Margins

The third major point to be considered in establishing prices concerns the amount of profit that management would like to achieve in the upcoming time period. Generally, the goal of the management is to obtain satisfactory profits. Usually, businessmen employ two measures in gauging the size of the profits. They are return on sales and return on investment. Return on sales represents the portion of each sales dollar that eventually ends up as a profit and return on investment is the ratio between net profits and the assets used to produce those profits. Whatever is the measure employed, the firms should determine the rate of return required and establish the desired amount of profit and then select the pricing policy.

## Sales Budget

After determining the price at which the product is to be sold, it should decide the volume of units that it can sell. It cannot establish a high sales volume as the firm may not be able to capture the market to sell that many units. Then, the sales budget is prepared which is the numeric representation of the marketing department plans for the coming year.

Table 4.1 presents a specimen of a sales budget.

**Table 4.1: ABC Company Ltd.  
Sales Budget for the year ending December 31, 2001**

| Products | Budgeted Sales Units | Budgeted Sales Price | Total            |
|----------|----------------------|----------------------|------------------|
| A        | 70,000               | 55                   | 38,50,000        |
| B        | 80,000               | 40                   | 32,00,000        |
|          | <b>1,50,000</b>      |                      | <b>70,50,000</b> |

## Budgeting Production

Once the sales forecast is established, it is the task of the budget committee to prepare plans for making the product available for sale. The requirements of the sales plan must be translated into the supporting activities of the other major functions. In the case of a service company, the sales plan must be converted to service capability requirements; for a retail or wholesale enterprise, the sales plan must be translated into merchandise purchases requirements; and in the case of a manufacturing enterprise, the sales plan must be converted to production (manufacturing) requirements.

## Outputs

As the sales forecast deals with the number of units to be sold, production budget deals with the products that are to be produced/manufactured. In rare cases production output equals sales. It is highly possible that some of the items sold comes from the inventory held or some of the units products add up to the inventory held. So, production management should not only co-ordinate with sales management but also with inventory management.

The general equation which deals with flow of goods is:

Beginning inventory + Production – Sales = Ending inventory.

This can also be expressed as:

Production = Sales + Change in Inventory.

Where change in inventory is equal to

Ending Inventory – Beginning Inventory.

Thus, if there is no change in inventory then cost of production will be equal to cost of goods to be sold. But, if the management feels that the future sales will be growing it will seek to utilise as much production capacity as possible in case of inflation in order to produce at the lowest cost possible and to earn revenues later. In this case, as the inventories have to be increased in anticipation of being sold at higher prices, production must also be increased. On contrast, if a decline in future demand is expected, it is appropriate to reduce the inventory in order to avoid holding losses from decline in prices and thus production has to be below sales volume.

Table 4.2 exhibits a specimen of production budget.

**Table 4.2: ABC Company Ltd.  
Production Budget for the year ended December 31, 2001**

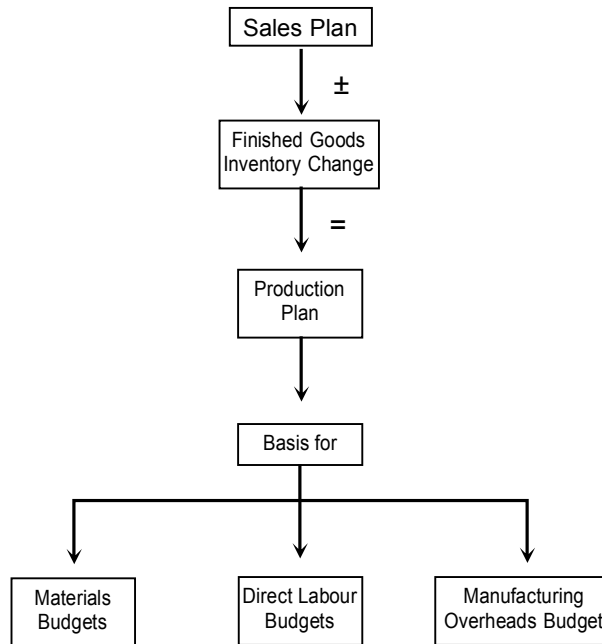
|  | Products |          |
|--|----------|----------|
|  | A        | B        |
| Budgeted Sales (in units)                            | 70,000   | 80,000   |
| <i>Add:</i> Desired closing finished goods inventory | 20,000   | 30,000   |
|  | 90,000   | 1,10,000 |
| <i>Less:</i> Beginning finished goods inventory      | 40,000   | 20,000   |
| Budgeted production requirement                      | 50,000   | 90,000   |

The Schedule presented above is the overall production budget for ABC Company Ltd. The publication of the production budget accomplishes the co-ordination of the efforts of the production

and sales divisions. The latter group knows what it has to sell and the former knows what it has to produce.

### Inputs

The production budget forms the basis for direct labour budgets, material budgets and manufacturing overheads budgets. Figure 4.5 presents graphically the flow of the planning activity from sales through the manufacturing executive's plan.



**Figure 4.5**

Thus, after co-ordinating plans for output, the next step for the production manager is to anticipate the acquisition of direct labour, direct material and manufacturing overhead expenses.

Direct labour costs consists of wages paid to employees who are engaged directly in specific productive output. Thus, direct labour budget represents the direct labour requirements necessary to produce the types and quantities of outputs planned in the production budget.

In planning for direct labour, the manager needs to examine such areas: manpower needs, recruitment, training, job evaluation and specification, performance evaluation, union negotiations and wage contracts.

The manager should identify his needs for skilled labour and see whether he can provide for them from the existing payroll or whether he can train some of his employees. He has to determine the price per labour hour. He must also carefully consider the requirements of union contracts before preparing a labour budget.

Table 4.3 illustrates the preparation of a direct labour budget.

**Table 4.3: ABC Company Ltd.  
Direct Labour budget for the year ended December 31, 2001**

|                          | Products |          | Total     |
|--------------------------|----------|----------|-----------|
|                          | A        | B        |           |
| Budgeted Production      |          |          |           |
| Direct labour            | 50,000   | 90,000   |           |
| Hours/Units              | 3        | 2        |           |
| Total direct labour      | 1,50,000 | 1,80,000 | 3,30,000  |
| Hours                    |          |          |           |
| Direct labour            | ₹ 5      | ₹ 5      | ₹ 5       |
| Cost/hour                |          |          |           |
| Total direct labour cost | 7,50,000 | 9,00,000 | 16,50,000 |

Labourers cannot produce a product unless they have materials and production planning requires anticipating the need for materials.

A direct materials budget indicates the expected amount of direct materials required to produce the budgeted units of finished good. This budget specifies the cost of direct materials used and the cost of the direct materials purchased. Table 4.4 explains the calculation of the direct materials budget. The usage part of the direct materials budget determines the cost of purchases of direct materials.

**Table 4.4: ABC Company Direct Materials Budget for the Year Ending December 2001**

|  | Products                 |             | Total     |
|--|--------------------------|-------------|-----------|
|  | A                        | B           |           |
| <b>A. Usage Budget</b>                           |                          |             |           |
| Budgeted product in units                        | 50,000                   | 90,000      |           |
| Direct materials requirement                     |                          |             |           |
| Product A: 5 kg per unit                         | × 5                      |             |           |
| Product B: 8 kg per unit                         |                          | × 8         |           |
| Direct materials usage (kg)                      | 2,50,000                 | 7,20,000    |           |
| Cost per kg (₹)                                  | 1.00                     | 1.50        |           |
| Cost of direct materials                         | 2,50,000                 | 10,80,000   | 13,30,000 |
| <b>B. Purchase Budget</b>                        | Direct materials (In kg) |             |           |
| Direct material usage                            | 2,50,000                 | 7,20,000    |           |
| Add: Budgeted closing direct materials Inventory | 50,000                   | 75,000      |           |
| Total Requirements                               | 3,00,000                 | 7,95,000    |           |
| Less: Beginning direct materials inventory       | 70,000                   | 1,00,000    |           |
| Purchase of direct materials                     | 2,30,000                 | 6,95,000    |           |
| Cost per kg                                      | ₹ 1.00                   | ₹ 1.50      |           |
| Cost of purchase                                 | ₹ 2,30,000               | ₹ 10,42,500 |           |

The direct materials budget is useful in the following ways:

- It helps the purchasing department to prepare a schedule to ensure delivery of materials when needed.
- It helps in fixing minimum and maximum levels of inventories in the stores department.
- It helps the finance manager to determine the financial requirements to meet production targets.

The materials budget usually deals with direct materials only. Supplies and indirect materials are generally included in the factory overhead budget.

In addition to direct labour and materials budget, the production manager may need to plan for other manufacturing overhead items like indirect labour, supplies, repairs, power and other factory overheads.

The factory overhead budget estimates the requirements and costs of the above overheads for the production of the budgeted units. It requires that expenses should be classified by departments since expenses are incurred by various departments. In this way departmental heads should be held accountable for expenses incurred by their departments. Generally, the department heads prepare budgets for their respective departments for the budget period. However, they need considerable help and advice from the budget director in order to achieve production budget.

Table 4.5 depicts the factory overhead budget wherein overhead costs have been classified into fixed and variable components.

**Table 4.5: ABC Company  
Factory Overhead Budget for the Year Ending December 2001  
(based on budgeted capacity of 3,30,000 direct labour hours)**

| Items   | Direct Labour hours | Rate per direct labour hour (₹) | Total Cost |
|---|---------------------|---------------------------------|------------|
| <b>A. Variable factory overheads</b>          |                     |                                 |            |
| Supplies                                      | 3,30,000            | 0.70                            | 2,31,000   |
| Repairs                                       | 3,30,000            | 0.30                            | 99,000     |
| Indirect Labour                               | 3,30,000            | 0.70                            | 2,31,000   |
| Others  | 3,30,000            | 0.25                            | 82,500     |
| Total variable factory Overheads cost         |                     |                                 | 6,43,500   |
| <b>B. Fixed Factory</b>                       |                     |                                 |            |
| Overheads cost                                |                     |                                 |            |
| Supervision                                   |                     | 3,00,000                        |            |
| Depreciation                                  |                     | 3,50,000                        |            |
| Property tax                                  |                     | 1,50,000                        |            |
| Others  |                     | 2,06,500                        |            |
| Total fixed factory Overheads cost            |                     |                                 | 10,06,500  |
| Total factory Overheads cost                  |                     |                                 | 16,50,000  |
| pre-determined overhead rate                  |                     |                                 |            |
| = $\frac{₹16,50,000}{3,30,000 \text{ hours}}$ |                     |                                 |            |
| = ₹ 5 per direct                              |                     |                                 |            |

### Budgeting Closing Inventories

An inventory budget can be prepared to find out the values of direct materials and finished goods inventory as shown in Table 4.6

**Table 4.6: ABC Company  
Ending Inventory Budget for the Year Ending December, 2001**

|                                     | ₹         |
|-------------------------------------|-----------|
| Direct materials inventory          | 50,000    |
| Product A 50,000 kg × ₹ 1.00 per kg | 1,12,500  |
| Product B 75,000 kg × ₹1.50 per kg  | 1,62,500  |
| Finished goods inventory            | 7,00,000  |
| Product A 20,000 units × ₹ 35.00    | 9,60,000  |
| Product B 30,000 units × ₹ 32.00    | 16,60,000 |

\* Manufacturing cost per finished unit (calculated in Table.4.7)

**Table 4.7**

|                          | Product A                    |                |                        | Product B                    |                |                        |
|--------------------------|------------------------------|----------------|------------------------|------------------------------|----------------|------------------------|
|                          | Quantity Required<br>Kgs/hrs | Unit cost<br>₹ | Product Unit Cost<br>₹ | Quantity Required<br>Kgs/hrs | Unit cost<br>₹ | Product Unit Cost<br>₹ |
| Direct material          | 5                            | 1.00           | ₹ 5.00                 | 8                            | 1.5            | ₹ 12.00                |
| Direct labour            | 3                            | 5.00           | ₹ 15.00                | 2                            | 5              | ₹ 10.00                |
| Factory overheads        | 3                            | 5.00           | ₹ 15.00                | 2                            | 5              | ₹ 10.00                |
| Total manufacturing cost |                              |                |                        |                              |                |                        |
| Cost per finished unit   |                              |                | <b>₹ 35.00</b>         |                              |                | <b>₹ 32.00</b>         |

### Budgeting Cost of Goods Sold

After preparing direct materials, direct labour, factory overhead, and ending inventory budgets, the cost of goods sold budget can be prepared. The cost of goods sold budget summarises all the above budgets as shown in Table 4.8.

**Table 4.8: ABC Company  
Cost of Goods Sold Budget for the Year Ending December 31, 2001**

|   |           |           |
|---|-----------|-----------|
| Direct materials                                      | 2,20,000  |           |
| Beginning inventory (70,000 × 1.00 + 1,00,000 × 1.50) | 12,72,500 |           |
| Purchases (Table 4.4 B)                               | 14,92,500 |           |
| Less: Closing inventory                               | 1,62,500  | 13,30,000 |
| Cost of direct materials used (Table 4.4 A)           |           | 16,50,000 |
| Direct labour (Table 4.3)                             |           | 16,50,000 |
| Factory overheads (Table 4.5)                         |           | 46,30,000 |
| Total factory cost                                    |           |           |

|  |  |           |
|--|--|-----------|
| <i>Add:</i> beginning finished goods inventory (40,000 × 35 + 20,000 × 32) |  | 20,40,000 |
| Total goods available for sale   |  | 66,70,000 |
| <i>Less:</i> finished goods inventory (Table 4.6)                          |  | 16,60,000 |
| Cost of goods sold   |  | 52,10,000 |

### Budgeting Administration

The administrative expense budget covers the administrative costs for non-manufacturing business activities. Budgeting administrative expense is often difficult. Perhaps the first difficulty is in classifying certain costs as production or administrative. For example, costs like purchasing, engineering, personnel, research and development can be administrative as well as production. Unless such and other expenses are properly classified, their proper budgeting and subsequent control cannot be exercised. The second difficulty is in determining the persons responsible for the incurrence and control of these costs.

However, in order to accomplish the purpose of cost control in cost accounting, it is necessary that each item of cost should be under the jurisdiction and control of a responsible person who is accountable for incurring the cost. Table 4.9 presents an administrative expense budget.

**Table 4.9: ABC Company  
Administrative Expenses Budget for the year ending December 31, 2001**

| Items                                       | Amount (₹) | Amount (₹) |
|---|------------|------------|
| <b>A. Variable administrative expenses:</b> |            |            |
| (i) Supplies                                | 30,000     |            |
| (ii) Clerical wages                         | 65,000     |            |
| Total variable administrative expenses      |            | 95,000     |
| <b>B. Fixed Administrative Expenses:</b>    |            |            |
| (i) Directors' remuneration                 | 3,00,000   |            |
| (ii) Legal charges                          | 20,000     |            |
| (iii) Depreciation                          | 2,50,000   |            |
| (iv) Salaries                               | 43,000     |            |
| (v) Rent                                    | 60,000     |            |
| (vi) Postage, telephone, etc.               | 32,000     |            |
| Total fixed administrative expenses         |            | 7,05,000   |
| Total administrative expenses               |            | 8,00,000   |

### Budgeting Selling Expenses

Closely related to the sales budget is the selling and distribution cost budget which shows the budgeted costs of promoting sales for the budget period. It is also known as the marketing expense budget. A selling expense budget consists mainly of the following major items:

- Sales representatives (salaries, commissions, entertaining and travelling).
- Sales office (office supplies, salaries, postage, telephone, rent and rates).
- Publicity office (salaries, office costs, press, journals, television, cinema, samples, sundries).
- Warehousing, packing and dispatch (salaries, packing wages, drivers wages, vehicle, costs, sundries).

Table 4.10 exhibits an annual selling expense budget classified according to fixed and variable expenses. The annual budget should be broken down on a monthly basis so that actual expenses can be compared with the budget monthly. Also, separate budgets for each of these expenses may be prepared especially in the case of a large company.

**Table 4.10: ABC Company  
Selling Expenses Budget for the year ending December 31, 2001**

| Items                                | Amount (₹) | Amount (₹) |
|--------------------------------------|------------|------------|
| <b>A. Variable Selling Expenses:</b> |            |            |
| (i) Sales commission                 | 1,00,000   |            |
| (ii) Salary and wages                | 60,000     |            |
| (iii) Advertising                    | 30,000     |            |
| (iv) Travelling                      | 60,000     |            |
| Total variable selling expenses      |            | 2,50,000   |
| <b>B. Fixed Selling Expenses:</b>    |            |            |
| (i) Warehousing                      | 1,00,000   |            |
| (ii) Advertising                     | 75,000     |            |
| (iii) Marketing Managers' salary     | 1,25,000   |            |
| (iv) Depreciation                    | 50,000     |            |
| Total fixed selling expenses         |            | 3,50,000   |
| Total selling expenses               |            | 6,00,000   |

### Budgeting Cash

The next step in the budgeting process is to prepare cash budget. Managers must be concerned with the amount of cash that flows in and out of the firm, as well as the amount that happens to be on hand at any particular time. If the firm has less cash than enough to keep the creditors satisfied it may have to face a suit filed by the creditors. On the other hand, if the firm has excess cash on hand, the firm would earn no income on it. So, the cash manager must have neither too little nor too much.

The first step, then, in preparing cash budget is to establish the desired amount to have on hand, i.e., which will be enough to meet any emergencies. The second step requires the manager to identify all the sources from which cash flows into the firm, like revenues from sales, borrowings, etc. He must also estimate the timing of the cash inflow. The third step is to identify the applications or uses of cash, such as payment for purchases, utility bills, salaries, etc. Even here he has to estimate the timing of the flow. Finally, these predictions are brought together in the cash budget, and the results are analysed. If there will be excess funds on hand, then plans should be made to find profitable temporary investments to occupy them and if shortages are predicted the manager should plan for short-term loans.

Table 4.11 presents a typical cash budget.

**Table 4.11: ABC Company Cash Budget for the year ended**

|  | Amount (₹) | Amount (₹) |
|--|------------|------------|
| Beginning cash balance                   |            | 2,00,000   |
| <i>Add:</i> Receipts:                    |            |            |
| Cash Sales (50% of current year's sales) | 35,25,000  |            |

|  |           |           |
|--|-----------|-----------|
| Receivables Collections (50% of previous year's sales) | 32,50,000 |           |
| Investment income                                      | 0         | 67,75,000 |
| Total cash available for use                           |           | 69,75,000 |
| <i>Less:</i> Expenditures:                             |           |           |
| Cash Purchases   | 12,72,500 |           |
| Labour and Factory Overheads                           | 33,00,000 |           |
| Administrative and Selling Expenses                    | 14,00,000 |           |
| Total cash to be used                                  |           | 59,72,500 |
| Net cash available                                     |           | 10,02,500 |

### Budgeted Financial Statements

After plans have been made for the firm's cash, revenues, costs and asset acquisitions, it is possible to prepare budgeted financial statements. These statements will be identical to ordinary ones except that they will show the expected results of the operations for the forthcoming year and expected financial position as on that particular future date.

Tables 4.12 and 4.13 shows the Budgeted Income Statement of ABC Co. Ltd. and a typical balance sheet respectively. These statements along with cash budget represents the Master Budget which is presented to the board of directors by the budget committee.

**Table 4.12: ABC Company Ltd.  
Budgeted Income Statement for the year ended December 31, 2001**

|                                     | Amount (₹) | Amount (₹) |
|-------------------------------------|------------|------------|
| Sales (Table 4.1)                   |            | 70,50,000  |
| Cost of goods sold (Table 4.8)      |            | 52,10,000  |
| Gross Margins                       |            | 18,40,000  |
| Selling Expenses (Table 4.10)       | 6,00,000   |            |
| Administrative Expenses (Table 4.9) | 8,00,000   | 14,00,000  |
| Income before taxes                 |            | 4,40,000   |
| Income taxes (assuming 40%)         |            | 1,76,000   |
| Net income                          |            | 2,64,000   |

**Table 4.13: ABC Company Ltd.  
Budgeted Balance Sheet as on December 31, 2001**

| Capital and Liabilities            |          | Amount (₹) | Assets   |           | Amount (₹) |
|------------------------------------|----------|------------|--|-----------|------------|
| Equity Capital                     |          | 60,00,000  | Fixed Assets:                                  | 25,00,000 |            |
| Reserves and Surplus               | 7,00,000 |            | <i>Less:</i> Depreciation @<br>26% Investments | 6,50,000  | 18,50,000  |
| <i>Add:</i> Budgeted Net<br>Income | 2,64,000 | 9,64,000   |  |           |            |
| Long-term Loans                    |          | 10,00,000  | Current Assets:                                |           |            |

|                      |  |                  |                       |                  |
|----------------------|--|------------------|-----------------------|------------------|
| Current liabilities: |  |                  | Cash                  | 10,02,500        |
| Sundry Creditors     |  | 60,000           | Sundry debtors        | 35,25,000        |
| Accrued Expenses:    |  |                  | Closing Inventories   | 18,22,500        |
|                      |  |                  | (1,62,500 + 6,60,000) |                  |
| Income-tax payable   |  | 1,76,000         |                       |                  |
|                      |  | <b>82,00,000</b> |                       | <b>82,00,000</b> |

## Revision of Budgets

As stated earlier in the chapter, successful budgets should have adequate flexibility to meet changing business conditions. Since budgets are used for planning, operation, co-ordination and control, they should be revised if changes occur in the environment. Revision of budgets may be necessary due to the following factors some of which might have been considered earlier in the development of budgets:

- Errors committed in preparing the budgets which may subsequently be known.
- Emergence of unforeseen and unanticipated situations which may cause the budget to be revised.
- Changes in internal factors, e.g., production forecast, sales forecast, capacity utilisation, etc.
- Changes in external factors, e.g., market trends, nature of the economy, prices of inputs and resources, consumers' tastes and fashions.

## Fixed and Flexible Budgeting

### Fixed Budgeting

A fixed budget is the budget which is designed to remain unchanged irrespective of the level of activity actually attained. It is based on a single level of activity. A fixed budget performance report compares data from actual operations with the single level of activity reflected in the budget. It is based on the assumption that the company will work at some specified level of activity and that a stated production will be achieved. Fixed budgets do not change when production level changes.

However, in practice, fixed budgeting is rarely used. The main reason is that actual output is often significantly different from the budgeted control. The performance report may be misleading and will not contain very useful information. For example, if actual production is 12,000 units in place of the budgeted 10,000 units the cost incurred cannot be compared with the budget which relates to different levels of activity. Since, in fixed budgeting, units are overlooked, a cost to cost comparison without considering the units may give misleading results.

### Flexible Budgeting

A flexible budget is defined as "a budget which by recognising the difference between fixed, semi-fixed and variable costs, is designed to change in relation to the level of activity attained."

A flexible budget is a budget that is prepared for a range, i.e., for more than one level of activity. It is a set of alternative budgets to different expected levels of activity. Thus, a flexible budget might be developed that would apply to a "relevant range" of production, say 8,000 to 12,000 units. Under this approach, if actual production slips to 9,000 units from a projected 10,000 units, the manager has

a specific tool (i.e., the flexible budget) that can be used to determine budgeted cost at 9,000 units of output. The flexible budget provides a reliable basis for comparisons because it is automatically geared to changes in production activity.

### Steps in Flexible Budgeting

The following steps (stages) are involved in developing a flexible budget:

- Deciding the range of activity to which the budget is to be prepared.
- Determining the cost behavior patterns (fixed, variable, semi-variable) for each element of cost to be included in the budget.
- Selecting the activity levels (generally in terms of production) to prepare budgets at those levels.
- Preparing the budget at each activity level selected by associating the activity level with corresponding costs. The corresponding costs to be attached with each activity level are determined in terms of their behaviour, i.e., fixed, variable and semi-variable.

**Zero-based budgeting:** A budget is developed usually on the concept of incrementalism. In case of budgeting in organisations, past events are considered in the light of future probabilities. The influence of past is strong in the budget of an ongoing activity and many entries may ultimately become just last year's figures plus a fixed percentage over and above that value. Since previous year's figures are considered as base, any inaccuracies in those figures are carried forward year after year.

But in zero-based budgeting, this can be avoided. In case of ZBB, each manager is asked to prepare his own requirement of funds beginning from scratch, ignoring the past and he has to justify the requirements mentioned by him. Hence, the main idea behind ZBB is to challenge the existence of every budgetary unit and every budget period.

### Illustrations

**Illustration 1:** Prepare the Sales Budget from the following data:

| Product | January    | February   |
|---------|------------|------------|
| X       | 1200 units | 1800 units |
| Y       | 3600 units | 5400 units |

The sales area A and B account for 60% and 40% sale of product X and 30% and 70% sale of product Y respectively.

The selling price per unit of product X ₹ 24 and the selling price per unit of product Y ₹ 30 in both the sales areas.

**Solution:**

#### January Sales Budget

| Product      | Area | Units        | ₹  | ₹               |
|--------------|------|--------------|----|-----------------|
| X            | A    | 720          | 24 | 17,280          |
|              | B    | 480          | 24 | 11,520          |
| <b>Total</b> |      | <b>1,200</b> |    | <b>28,800</b>   |
| Y            | A    | 1,080        | 30 | 32,400          |
|              | B    | 2,520        | 30 | 75,600          |
| <b>Total</b> |      | <b>3,600</b> |    | <b>1,08,000</b> |

## February Sales Budget

| Product      | Area | Units        | ₹  | ₹               |
|--------------|------|--------------|----|-----------------|
| X            | A    | 1,080        | 24 | 25,920          |
|              | B    | 720          | 24 | 17,280          |
| <b>Total</b> |      | <b>1,800</b> |    | <b>43,200</b>   |
| Y            | A    | 1,620        | 30 | 48,600          |
|              | B    | 3,780        | 30 | 1,13,400        |
| <b>Total</b> |      | <b>5,400</b> |    | <b>1,62,000</b> |

## Total Sales Budget

| Product      | Area | Units        | ₹  | ₹               |
|--------------|------|--------------|----|-----------------|
| X            | A    | 1,800        | 24 | 43,200          |
|              | B    | 1,200        | 24 | 28,800          |
| <b>Total</b> |      | <b>3,000</b> |    | <b>72,000</b>   |
| Y            | A    | 2,700        | 30 | 81,000          |
|              | B    | 6,300        | 30 | 1,89,000        |
| <b>Total</b> |      | <b>9,000</b> |    | <b>2,70,000</b> |

**Illustration 2:** A manufacturing company is operating at 75% of its full capacity. It is proposed to offer a price reduction of 5% to 10% depending upon volume desired. Given below are the relevant data:

| Capacity               | 75%    | 85%      | 100%     |
|------------------------|--------|----------|----------|
| Output (units)         | 75,000 | 85,000   | 1,00,000 |
| Selling price unit     | ₹ 96   | 5% off   | 10% off  |
| Material cost per unit | ₹ 40   | 10% less | 15% less |
| Wages cost per unit    | ₹ 10   | ₹ 10     | ₹ 10     |

**Fixed overheads:**

Production ₹ 14,00,000

Selling and distribution ₹ 5,00,000

**Variable overheads: (at full capacity)**

Selling and administration ₹ 4,40,000

Production ₹ 14,00,000

- (a) Prepare a statement showing variable cost, fixed cost, total cost and profit/loss in terms of ₹ and per unit at 75%, 85% and 100% capacity.
- (b) Indicate which of the three levels is most profitable.

**Solution:**

| Capacity            | 75%    |           | 85%    |           | 100%     |           |
|---------------------|--------|-----------|--------|-----------|----------|-----------|
|                     | 75,000 |           | 85,000 |           | 1,00,000 |           |
|                     | p/u    | Amt.      | p/u    | Amt.      | p/u      | Amt.      |
| Sales               | 96     | 72,00,000 | 91.20  | 77,52,000 | 86.40    | 86,40,000 |
| Less: Variable Cost |        |           |        |           |          |           |
| Material            | 40     | 30,00,000 | 36     | 30,60,000 | 34       | 34,00,000 |
| Wages               | 10     | 7,50,000  | 10     | 8,50,000  | 10       | 10,00,000 |

|                                |       |           |       |           |       |           |
|--------------------------------|-------|-----------|-------|-----------|-------|-----------|
| Variable production o/h        | 14    | 10,50,500 | 14    | 11,90,000 | 14    | 14,00,000 |
| Variable selling and admn. o/h | 4.40  | 3,30,000  | 4.40  | 3,74,000  | 4.40  | 4,40,000  |
| Total variable cost            | 68.4  | 51,30,000 | 64.4  | 54,74,000 | 62.40 | 62,40,000 |
| Contribution                   | 27.6  | 20,70,000 | 26.8  | 22,78,000 | 24    | 24,00,000 |
| Fixed overheads:               |       |           |       |           |       |           |
| Production                     | 18.67 | 14,00,000 | 16.47 | 14,00,000 |       | 14,00,000 |
| Selling and Administration     | 6.67  | 5,00,000  | 5.88  | 5,00,000  | 14    | 5,00,000  |
| Profit                         | 2.27  | 1,70,000  | 4.47  | 3,78,000  | 6     | 5,00,000  |

Recommendation: Operating at 100%, i.e., at full capacity is most profitable.

**Illustration 3:** A Factory is currently working at 50% capacity and produces 30,000 units and also sold each at ₹ 225 per unit. Prepare a Flexible Budget and estimate the profit of the company when it works to 75% and 90% capacity. Assume that all units produced are sold at the same selling price per unit as shown above.

Following information is provided to you:

**(i) Variable Expenses:**

|                |               |
|----------------|---------------|
| Materials      | ₹ 60 per unit |
| Labours        | ₹ 40 per unit |
| Other Expenses | ₹ 15 per unit |

**(ii) Semi-variable Expenses: (at 50% capacity)**

|                                 |            |
|---------------------------------|------------|
| Indirect Labour                 | ₹ 1,50,000 |
| Indirect Materials              | ₹ 2,10,000 |
| General Administrative Expenses | ₹ 2,70,000 |
| Repairs and Maintenance         | ₹ 1,20,000 |
| Salesmen Salaries               | ₹ 1,80,000 |

**(iii) Fixed Expenses:**

|   |            |
|---|------------|
| Office and Management Salaries          | ₹ 5,40,000 |
| Office and Factory Rent and Taxes       | ₹ 6,00,000 |
| Sundry Administrative Expenses          | ₹ 7,20,000 |
| Depreciation on Machinery and Furniture | ₹ 4,50,000 |

**(iv)** Semi-variable expenses remain constant up to 60% of capacity, increasing by 10% between 60% and 80% capacity and by 20% between 80% and 100% capacity.

**(v)** Rate per unit of variable expenses remains same.

**Solution:**

**Flexible Budget**

|                             | 30,000 units<br>50% | 45,000 units<br>75% | 54,000 units<br>90% |
|-----------------------------|---------------------|---------------------|---------------------|
| <b>(i) Variable Expense</b> | ₹                   | ₹                   | ₹                   |
| Materials                   | 18,00,000           | 27,00,000           | 32,40,000           |
| Labours                     | 12,00,000           | 18,00,000           | 21,60,000           |
| Other Expenses              | 4,50,000            | 6,75,000            | 8,10,000            |

|   |                       |                       |                     |
|---|-----------------------|-----------------------|---------------------|
| <b>(ii) Semi-variable Expenses</b>      |                       |                       |                     |
| Indirect Labour                         | 1,50,000              | 1,65,000              | 1,80,000            |
| Indirect Materials                      | 2,10,000              | 2,31,000              | 2,52,000            |
| General Administrative Expenses         | 2,70,000              | 2,97,000              | 3,24,000            |
| Repairs and Maintenance                 | 1,20,000              | 1,32,000              | 1,44,000            |
| Salesmen Salaries                       | 1,80,000              | 1,98,000              | 2,16,000            |
| <b>(iii) Fixed Expenses</b>             |                       |                       |                     |
| Office and Management Salaries          | 5,40,000              | 5,40,000              | 5,40,000            |
| Office and Factory Rent and Taxes       | 6,00,000              | 6,00,000              | 6,00,000            |
| Sundry Administrative Expenses          | 7,20,000              | 7,20,000              | 7,20,000            |
| Depreciation on Machinery and Furniture | 4,50,000              | 4,50,000              | 4,50,000            |
| <b>Total Cost</b>                       | <b>66,90,000</b>      | <b>85,08,000</b>      | <b>96,36,000</b>    |
|   | <b>₹</b>              | <b>₹</b>              | <b>₹</b>            |
|   | <b>(30,000 × 225)</b> | <b>(45,000 × 225)</b> | <b>54,000 × 225</b> |
| Sales                                   | 67,50,000             | 1,01,25,000           | 1,21,50,000         |
| Less: total cost                        | 66,90,000             | 85,08,000             | 96,36,000           |
| <b>Profit</b>                           | <b>60,000</b>         | <b>16,17,000</b>      | <b>25,14,000</b>    |

**Illustration 4:** The following information relates to the productive activities of Delta Ltd. For 3 months ending on 31<sup>st</sup> March 2008:

**Particulars**

**Variables Expenses: (at 50% capacity)**

₹

|                         |                  |
|-------------------------|------------------|
| – Materials             | 6,00,000         |
| – Labour                | 6,40,000         |
| – Salesmen's Commission | 95,000           |
|                         | <u>13,35,000</u> |

**Semi-variable Expenses: (at 50% capacity)**

|                       |                 |
|-----------------------|-----------------|
| – Plant Maintenance   | 62,500          |
| – Indirect Labour     | 2,47,500        |
| – Salesmen's salaries | 72,500          |
| – Sundry              | 65,000          |
|                       | <u>4,47,500</u> |

**Fixed Expense:**

|                             |                 |
|-----------------------------|-----------------|
| – Management Salaries       | 2,10,000        |
| – Rent and Taxes            | 1,40,000        |
| – Depreciation of Machinery | 1,75,000        |
| – Sundry Office Expenses    | 2,22,500        |
|                             | <u>7,47,500</u> |

It is further noted that semi-variable expense remain constant between 40% and 70% capacity, increase by 10% of the above figures between 70% and 85% capacity and increased by 15% of the above figures between 85% and 100% capacity.

Fixed expenses remain constant whatever the level of activity may be. Sales at 60% capacity are ₹ 25,50,000, at 80% capacity are ₹ 34,00,000 and at 100% capacity are ₹ 42,50,500.

Assuming that all items produced are sold, you are required to prepare a flexible budget at 60%, 80% and 100% capacity.

**Solution:**

**In the Books of Delta Ltd.  
Flexible Budget for 3 months ending 31-3-2008**

| Capacity                          | 60%              | 80%              | 100%             |
|-----------------------------------|------------------|------------------|------------------|
| <b>A. Fixed Expenses:</b>         |                  |                  |                  |
| Management Salaries               | 2,10,000         | 2,10,000         | 2,10,000         |
| Rent and Taxes                    | 1,40,000         | 1,40,000         | 1,40,000         |
| Depreciation of Machinery         | 1,75,000         | 1,75,000         | 1,75,000         |
| Sundry Office Expenses            | 2,22,500         | 2,22,500         | 2,22,500         |
| <b>Total (A)</b>                  | <b>7,47,500</b>  | <b>7,47,500</b>  | <b>7,47,500</b>  |
| <b>B. Semi-variable Expenses:</b> |                  |                  |                  |
| Plant Maintenance                 | 62,500           | 68,750           | 71,875           |
| Indirect Labour                   | 2,47,500         | 2,72,250         | 2,84,625         |
| Salesmen's salaries               | 72,500           | 79,750           | 83,375           |
| Sundry                            | 65,000           | 71,500           | 74,750           |
| <b>Total (B)</b>                  | <b>4,47,500</b>  | <b>4,92,950</b>  | <b>5,14,625</b>  |
| <b>C. Variable Expense:</b>       |                  |                  |                  |
| Materials                         | 7,20,000         | 9,60,000         | 12,00,000        |
| Labour                            | 7,68,000         | 10,24,000        | 12,80,000        |
| Salesmen's Commission             | 1,14,000         | 1,52,000         | 1,90,000         |
| <b>Total (C)</b>                  | <b>16,02,000</b> | <b>21,36,000</b> | <b>26,70,000</b> |
| D. Total Exp. (A + B + C)         | 27,97,000        | 33,75,750        | 39,32,125        |
| E. Sales                          | 25,50,000        | 34,00,000        | 42,50,000        |
| F. Profit/Loss                    | <b>2,47,000</b>  | <b>24,250</b>    | <b>3,17,875</b>  |

**Illustration 5:** The Jaydeep Co. Ltd. has completed most of the functional budgets and it is now time to prepare the cash budget. An analysis of the various budgets concerned reveals the requirements.

## Requirements for Cash Budgets

| Month    | Sales  | Materials | Wages  | Production Exp. | Admin Exp. | Selling Exp. | Distribution Exp. | Research and Development Exp. |
|----------|--------|-----------|--------|-----------------|------------|--------------|-------------------|-------------------------------|
|          | ₹      | ₹         | ₹      | ₹               | ₹          | ₹            | ₹                 | ₹                             |
| Oct. 08  | 80,000 | 40,000    | 10,000 | 8,400           | 3,400      | 5,000        | 3,000             | 1,000                         |
| Nov. 08  | 60,000 | 30,000    | 9,000  | 8,000           | 3,300      | 4,500        | 2,500             | 1,000                         |
| Dec. 08  | 40,000 | 20,000    | 8,000  | 7,500           | 3,500      | 4,000        | 2,000             | 1,000                         |
| Jan. 09  | 50,000 | 40,000    | 9,000  | 8,000           | 3,700      | 4,400        | 2,400             | 1,200                         |
| Feb. 09  | 60,000 | 50,000    | 10,000 | 8,500           | 3,900      | 4,800        | 2,600             | 1,200                         |
| March 09 | 80,000 | 60,000    | 11,000 | 9,000           | 3,600      | 5,200        | 2,900             | 1,200                         |
| April 09 | 70,000 | 50,000    | 9,000  | 8,000           | 3,500      | 5,000        | 2,600             | 1,500                         |
| May 09   | 60,000 | 30,000    | 8,000  | 7,500           | 3,700      | 4,800        | 2,500             | 1,500                         |
| June 09  | 50,000 | 40,000    | 9,000  | 8,000           | 3,900      | 4,500        | 2,400             | 1,500                         |

Period of Credit allowed by creditors – 2 months

Period of Credit allowed to debtors – 3 months

Lag in Payment of overheads – 1 month

Lag in Payment of wages 1/8 month

The cash balance on 1<sup>st</sup> January, 2009 is expected to be ₹ 1,00,000.

Further:

- Plant and Machinery to be installed in April, 2009 at a cost of ₹ 50,000 will be paid by monthly instalments of ₹ 10,000 as from 1<sup>st</sup> May, 2009. Extensions to the Research and Development Department at a cost of ₹ 10,000 will be completed on 1<sup>st</sup> January, 2009 payment to be made on 1<sup>st</sup> February, 2009.
- A sales commission of 10% on sales is to be paid within the month following actual credit sales.
- Cash sales of ₹ 5,000 per month are expected; no commission is payable on them.
- The company has hire purchase agreement under which ₹ 5,000 a month is being paid for plant purchased before this budget period. The said payment will continue throughout this budget period.
- Preference share dividends of 8% on capital of ₹ 2 million are to be paid on 1<sup>st</sup> April, 2009.
- Tax of ₹ 1,00,000 is due on 1<sup>st</sup> April, 2009.
- Dividends from investments, amounting to ₹ 70,000 are expected on 1<sup>st</sup> May, 2009.
- Three calls of ₹ 0.25 each on 2,00,000 ordinary shares are due on 1<sup>st</sup> January 09, 1<sup>st</sup> March 09 and 1<sup>st</sup> June, 09.

Prepare cash Budget for 6 months from January 2009 to June 2009.

**Solution:**

| Particulars                         | Jan. '09        | Feb. '09        | Mar. '09        | April '09         | May '09         | June '09        |
|-------------------------------------|-----------------|-----------------|-----------------|-------------------|-----------------|-----------------|
| <b>A. Opening Balance</b>           | 1,00,000        | 1,69,125        | 1,64,550        | 1,76,675          | (1,22,475)      | (98,200)        |
| <b>B. Receipts:</b>                 |                 |                 |                 |                   |                 |                 |
| Cash Sales                          | 5,000           | 5,000           | 5,000           | 5,000             | 5,000           | 5,000           |
| Receipt from Debtor                 | 80,000          | 60,000          | 40,000          | 50,000            | 60,000          | 80,000          |
| Dividend from Investment            | —               | —               | —               | —                 | 70,000          | —               |
| Calls on Shares                     | 50,000          | —               | 50,000          | —                 | —               | 50,000          |
| <b>Total Receipts (B)</b>           | <b>1,35,000</b> | <b>65,000</b>   | <b>95,000</b>   | <b>55,000</b>     | <b>1,35,000</b> | <b>1,35,000</b> |
| <b>Total (A + B)</b>                | <b>2,35,000</b> | <b>2,34,125</b> | <b>2,59,550</b> | <b>2,31,675</b>   | <b>12,525</b>   | <b>36,800</b>   |
| <b>C. Payments:</b>                 |                 |                 |                 |                   |                 |                 |
| Materials                           | 30,000          | 20,000          | 40,000          | 50,000            | 60,000          | 50,000          |
| Labour                              | 8,875           | 9,875           | 10,875          | 9,250             | 8,125           | 8,875           |
| Production Overhead                 | 7,500           | 8,000           | 8,500           | 9,000             | 8,000           | 7,500           |
| Adm. Overhead                       | 3,500           | 3,700           | 3,900           | 3,600             | 3,500           | 3,700           |
| Selling Overhead                    | 4,000           | 4,400           | 4,800           | 5,200             | 5,000           | 4,800           |
| Distribution Overhead               | 2,000           | 2,400           | 2,600           | 2,900             | 2,600           | 2,500           |
| R&D Overhead                        | 1,000           | 1,200           | 1,200           | 1,200             | 1,500           | 1,500           |
| Plant & Machinery                   | —               | —               | —               | —                 | 10,000          | 10,000          |
| Extension to R&D                    | —               | 10,000          | —               | —                 | —               | —               |
| Hire Purchase Payment               | 5,000           | 5,000           | 5,000           | 5,000             | 5,000           | 5,000           |
| Sales Commission                    | 4,000           | 5,000           | 6,000           | 8,000             | 7,000           | 6,000           |
| Preference Dividend (8%)            | —               | —               | —               | 1,60,000          | —               | —               |
| Tax                                 | —               | —               | —               | 1,00,000          | —               | —               |
| <b>Total (C)</b>                    | <b>65,875</b>   | <b>69,575</b>   | <b>82,875</b>   | <b>(3,54,150)</b> | <b>1,10,725</b> | <b>99,875</b>   |
| <b>Cash Available (A + B + C)</b>   | <b>1,69,125</b> | <b>1,64,550</b> | <b>1,76,675</b> | <b>1,22,475</b>   | <b>(98,200)</b> | <b>63,075</b>   |
| Loans/Overhead<br>(Closing Balance) |                 |                 |                 |                   |                 |                 |

**Illustration 6:** The following are the estimated sales of a company for eight months ending 30-11-2008:

| Months         | Estimated Sales (Units) |
|----------------|-------------------------|
| April 2008     | 12,000                  |
| May 2008       | 13,000                  |
| June 2008      | 9,000                   |
| July 2008      | 8,000                   |
| August 2008    | 10,000                  |
| September 2008 | 12,000                  |
| October 2008   | 14,000                  |
| November 2008  | 12,000                  |

As a matter of policy, the company maintains the closing balance of finished goods and raw materials as follows:

|                |   |
|----------------|---|
| Stock Items    | Closing balance of a month                    |
| Finished goods | 50% of the estimated sales for the next month |
| Raw Materials  | Estimated consumption for the next month.     |

Each unit of production requires 5 kg. of raw material costing ₹ 5 per kg.

Prepare Production Budget (in units) and Raw Material Purchase Budget (in units and cost) of the company for the half year ending 30<sup>th</sup> September, 2008.

**Solution:**

**Production Budget (in units)  
For the half year ending 30<sup>th</sup> Sept. 2008**

| Month  | Sales in Units | Closing Bal. 50% of Estimated Sales for Next Month | Opening Bal. | Production (2 + 3 + 4) |
|--------|----------------|--|--------------|------------------------|
| (1)    | (2)            | (3)  | (4)          | (5)                    |
| April  | 12,000         | 6,500  | 6,000        | 12,500                 |
| May    | 13,000         | 4,500  | 6,500        | 11,000                 |
| June   | 9,000          | 4,000  | 4,500        | 8,500                  |
| July   | 8,000          | 5,000  | 4,000        | 9,000                  |
| August | 10,000         | 6,000  | 5,000        | 11,000                 |
| Sept.  | 12,000         | 7,000  | 6,000        | 13,000                 |
|        | <b>64,000</b>  |  |              | <b>65,000</b>          |

**Purchase Budget (in Cost and Units)  
For the half year ending 30<sup>th</sup> Sept. 2008**

| Month  | Production in Units | Consumption kg. ₹ 2/- per Unit | Closing Balance | Opening Balance | Purchase in kg. | Rate ₹ | Amount          |
|--------|---------------------|--------------------------------|-----------------|-----------------|-----------------|--------|-----------------|
| April  | 12,500              | 25,000                         | 22,000          | 25,000          | 22,000          | 5      | 1,10,000        |
| May    | 11,000              | 22,000                         | 17,000          | 22,000          | 17,000          | 5      | 85,000          |
| June   | 8,500               | 17,000                         | 18,000          | 17,000          | 18,000          | 5      | 90,000          |
| July   | 9,000               | 18,000                         | 22,000          | 18,000          | 22,000          | 5      | 1,10,000        |
| August | 11,000              | 22,000                         | 26,000          | 22,000          | 26,000          | 5      | 1,30,000        |
| Sept.  | 13,000              | 26,000                         | 26,000          | 26,000          | 26,000          | 5      | 1,30,000        |
|        | <b>65,000</b>       | <b>1,30,000</b>                |                 | <b>1,30,000</b> |                 |        | <b>6,55,000</b> |

**Illustration 7:** One 30<sup>th</sup> September, 2009, following was the Balance Sheet of MD Pvt. Ltd.

| Liabilities                     | ₹      | Assets             | ₹      |
|---------------------------------|--------|--------------------|--------|
| Equity shares (₹ 10) fully paid | 20,000 | Equipment (cost)   | 2,000  |
| Reserves and Surplus            | 10,000 | Less: Depreciation | 5,000  |
| Creditors                       | 40,000 | Stock              | 20,000 |

|                   |               |         |        |               |
|-------------------|---------------|---------|--------|---------------|
| Proposed Dividend | 15,000        | Debtors | 15,000 |               |
|                   |               | Bank    | 35,000 |               |
|                   | <b>85,000</b> |         |        | <b>85,000</b> |

The company is developing a system of forward planning and on 1<sup>st</sup> October, 2009, it submits the following information:

|                          | Credit Sales<br>(₹) | Cash Sales<br>(₹) | Credit Purchases<br>(₹) |
|--------------------------|---------------------|-------------------|-------------------------|
| September 2009 (actual)  | 15,000              | 14,000            | 40,000                  |
| October 2009 (budgeted)  | 18,000              | 5,000             | 23,000                  |
| November 2009 (budgeted) | 20,000              | 6,000             | 27,000                  |
| December 2009 (budgeted) | 25,000              | 8,000             | 26,000                  |

On 1<sup>st</sup> October, 2009 the equipment will be replaced at a cost of ₹ 30,000, ₹ 14,000 will be allowed in exchange for the old equipment and a net payment of ₹ 16,000 will be made. Depreciation is to be provided at the rate of 10% per annum.

The proposed dividend will be paid in December 2009.

The following expenses will be paid:

Wages ₹ 3,000 per month.

Administration ₹ 15,000 per month.

Rent ₹ 3,600 (for the year to 30<sup>th</sup> September, 2010) to be paid in October, 2009. You are required to prepare a cash budget for the months of October, November and December, 2009.

**Solution:**

**Cash Budget for the Period Oct. to Dec. 2009**

| Particulars             | Oct.<br>(₹)    | Nov.<br>(₹)     | Dec.<br>(₹)     |
|-------------------------|----------------|-----------------|-----------------|
| <b>Inflows:</b>         |                |                 |                 |
| Receipt from Debtors    | 15,000         | 18,000          | 20,000          |
| Cash Sale               | 5,000          | 6,000           | 8,000           |
| Total Inflow (A)        | <b>20,000</b>  | <b>24,000</b>   | <b>28,000</b>   |
| <b>Outflows:</b>        |                |                 |                 |
| Creditors               | 40,000         | 23,000          | 23,000          |
| Dividend                | —              | —               | 15,000          |
| New Equipment (net)     | 16,000         | —               | —               |
| Wages                   | 3,000          | 3,000           | 3,000           |
| Admin. Exp.             | 1,500          | 1,500           | 1,500           |
| Rent                    | 3,600          | —               | —               |
| Total Outflow (B)       | 64,100         | 27,500          | 46,500          |
| Surplus/Deficit (A – B) | (44,100)       | (3,500)         | 18,500          |
| (+) Op. Cash/Bank       | 35,000         | (9,100)         | (12,600)        |
| Closing Cash/Bank       | <b>(9,100)</b> | <b>(12,600)</b> | <b>(31,100)</b> |

**Illustration 8:** From the information set out below, prepare a monthly cash budget for the period January to June, 2010 for A Ltd.

- (a) Prices and costs are assumed to remain unchanged during the period.  
 (b) Credit sales affected are 75% of the total sales each month.  
 (c) The company's collection of credit sales is made as follows:  
 60% – One month after sale; 30 – Second month after sale; 5% –Third month after sale.  
 (d) The sales forecast is as below:

| Month          | Sales [₹ (000's)] | Month       | Sales [₹ (000's)] |
|----------------|-------------------|-------------|-------------------|
| October, 2009  | 120               | March, 2010 | 80                |
| November, 2009 | 140               | April, 2010 | 120               |
| December, 2009 | 160               | May, 2010   | 100               |
| January, 2010  | 60                | June, 2010  | 80                |
| February, 2010 | 80                | July, 2010  | 140               |

- (e) The company maintains a gross profit margin of 20%.  
 (f) The probable sales of each month are purchased and settled in the preceding month.  
 (g) The salaries and wages to be paid are as follows:

| 2010     | ₹      | 2010  | ₹      |
|----------|--------|-------|--------|
| January  | 12,000 | April | 20,000 |
| February | 16,000 | May   | 16,000 |
| March    | 20,000 | June  | 14,000 |

- (h) Interest on 12% convertible debentures of ₹ 1,00,000 is due for payment of 31<sup>st</sup> March, 2010 and 30<sup>th</sup> June, 2010.  
 (i) The company has to pay ₹ 1,00,000 as a tax on income of year 1998, but is disputed. However, it is decided that 20% of the disputed amount will be paid in April, 2010.  
 (j) The company intends to import a machine at a capital cost of ₹ 8,000 which along with the import duty of 50% will be payable in June, 2010.  
 (k) The company has a cash balance of ₹ 40,000 on 31<sup>st</sup> December, 2009. Annual rent of the company amounts to ₹ 9,600 payable monthly.

**Solution:**

**Cash Budget for the Period Jan. 2010 to June 2010**

|                             | Jan.            | Feb.          | Mar.          | April         | May             | June          |
|-----------------------------|-----------------|---------------|---------------|---------------|-----------------|---------------|
| <b>Inflows</b>              |                 |               |               |               |                 |               |
| Cash Sales                  | 15,000          | 20,000        | 20,000        | 30,000        | 25,000          | 20,000        |
| Receipts from Debtor (WN-1) | 1,08,000        | 68,250        | 55,500        | 56,250        | 75,000          | 7,500         |
| <b>Total (A)</b>            | <b>1,23,000</b> | <b>88,250</b> | <b>75,500</b> | <b>86,250</b> | <b>1,00,000</b> | <b>95,000</b> |
| <b>Outflows</b>             |                 |               |               |               |                 |               |
| Purchase (80% of sale)      | 64,000          | 64,000        | 96,000        | 80,000        | 64,000          | 1,12,000      |

|   |               |               |                 |                 |               |                  |
|---|---------------|---------------|-----------------|-----------------|---------------|------------------|
| Salaries & Wages                                | 12,000        | 16,000        | 20,000          | 20,000          | 16,000        | 14,000           |
| Int. on deb. (10000@<br>12% x <sup>3</sup> /12) | –             | –             | 3,000           | –               | –             | 3,000            |
| Tax for the year 2010                           | –             | –             | –               | 20,000          | –             | –                |
| Imports of Machines                             | –             | –             | –               | –               | –             | 12,000           |
| Rent  | 800           | 800           | 800             | 800             | 800           | 800              |
| <b>Total (B)</b>                                | <b>76,800</b> | <b>80,800</b> | <b>1,19,800</b> | <b>1,20,800</b> | <b>80,800</b> | <b>1,41,800</b>  |
| Surplus/Deficit (A–B)                           | 46,200        | 7,450         | (–)44,300       | (–)34,550       | 19,200        | (–)46,800        |
| (+) Op. Cash Bal.                               | 40,000        | 86,200        | 93,650          | 49,350          | 14,800        | 34,000           |
| <b>Cl. Cash Bal.</b>                            | <b>36,200</b> | <b>93,650</b> | <b>49,350</b>   | <b>14,800</b>   | <b>34,000</b> | <b>(–)12,800</b> |

**Working Notes:**

Rec. Pyts in resp of sales and purchase.

|                                  | Nov.   | Dec.     | Jan.            | Feb.          | Mar.          | April           | May             | June          |
|----------------------------------|--------|----------|-----------------|---------------|---------------|-----------------|-----------------|---------------|
| Credit Sales                     | 10,500 | 1,20,000 | 45,000          | 60,000        | 60,000        | 90,000          | 75,000          | 60,000        |
| Cash Sales                       |        |          | 15,000          | 20,000        | 20,000        | 30,000          | 25,000          | 20,000        |
| <b>Total Sales</b>               |        |          | <b>60,000</b>   | <b>80,000</b> | <b>80,000</b> | <b>1,20,000</b> | <b>1,00,000</b> | <b>80,000</b> |
| <b>Receipts</b>                  |        |          |                 |               |               |                 |                 |               |
| 60% in next Month                | 54,000 | 63,500   | 72,000          | 27,000        | 36,000        | 36,000          | 54,000          | 45,000        |
| 30% in the 2 <sup>nd</sup> Month |        | 27,000   | 31,500          | 36,000        | 13,500        | 18,000          | 18,000          | 27,000        |
| 5% in the 3 <sup>rd</sup> Month  |        |          | 4,500           | 5,250         | 6,000         | 2,250           | 3,000           | 3,000         |
|                                  |        |          | <b>1,08,000</b> | <b>68,250</b> | <b>55,500</b> | <b>56,250</b>   | <b>75,000</b>   | <b>25,000</b> |
| <b>I+II</b>                      |        |          | <b>1,23,000</b> | <b>88,250</b> | <b>75,500</b> | <b>86,250</b>   | <b>1,00,000</b> | <b>95,000</b> |
| Purchase                         |        |          | 64,000          | 64,000        | 96,000        | 80,000          | 64,000          | 1,12,000      |
| 80% of 1 of Next Month           |        |          |                 |               |               |                 |                 |               |

**Illustration 9:** At 90% capacity, ABCD Ltd. produces 10,800 units and incurred the expenses as under:

| Particulars              | Cost per Unit ₹  |
|--------------------------|------------------|
| Direct Material          | 7                |
| Direct Labour            | 5                |
| Other Variable Expenses  | 4.50             |
| Administrative Overheads | 6 (40% variable) |
| Selling Overheads        | 3 (75% variable) |
| Production Overheads     | 3 (20% variable) |

Selling price per unit ₹ 60.

Prepare Flexible Budget for 70%, 80% and 100% utilisation of the capacity.

**Solution:**

| Level of Output            | 70%   |          | 80%   |          | 90%    |          | 100%   |          |
|----------------------------|-------|----------|-------|----------|--------|----------|--------|----------|
| No. of Units               | 8,400 |          | 9,600 |          | 10,800 |          | 12,000 |          |
|                            | P/U   | Amt.     | P/U   | Amt.     | P/U    | Amt.     | P/U    | Amt.     |
| Sales                      | 60    | 5,04,000 | 60    | 5,76,000 | 60     | 6,48,000 | 60     | 7,20,000 |
| <b>Less: Variable Cost</b> |       |          |       |          |        |          |        |          |
| Direct Materials           | 7     | 58,800   | 7     | 67,200   | 7      | 75,600   | 7      | 84,000   |
| Direct Labour              | 5     | 42,000   | 5     | 48,000   | 5      | 54,000   | 5      | 60,000   |
| Other Variable             | 4.50  | 37,800   | 4.50  | 43,200   | 4.50   | 48,600   | 4.50   | 54,000   |
| Variable Admn o/u          | 2.40  | 20,160   | 2.40  | 23,040   | 2.40   | 25,920   | 2.40   | 28,800   |
| Selling o/u                | 2.25  | 18,900   | 2.25  | 21,600   | 2.25   | 24,300   | 2.25   | 27,000   |
| Production                 | 0.80  | 6,720    | 0.80  | 7,680    | 0.80   | 8,640    | 0.80   | 9,600    |
| Total U.C. (A)             | 21.95 | 1,84,380 | 21.95 | 2,10,720 | 21.95  | 2,37,060 | 21.95  | 2,63,400 |
| <b>Fixed Cost o/u</b>      |       |          |       |          |        |          |        |          |
| Admin.                     | 4.63  | 38,880   | 4.05  | 38,880   | 3.60   | 38,880   | 3.24   | 38,880   |
| Selling                    | 0.96  | 8,100    | 0.84  | 8,100    | 0.75   | 8,100    | 0.68   | 8,100    |
| Prodn.                     | 4.11  | 34,560   | 3.60  | 34,560   | 3.20   | 34,560   | 2.88   | 34,560   |
| Total F o/u (B)            | 9.70  | 81,540   | 8.49  | 81,540   | 7.55   | 81,540   | 6.80   | 81,540   |
| Total Cost (A + B)         | 31.65 | 2,65,920 | 30.44 | 2,92,260 | 29.50  | 3,18,600 | 28.75  | 3,44,940 |
| Profit                     | 28.35 | 2,38,080 | 29.56 | 2,83,740 | 30.50  | 3,29,400 | 31.25  | 3,75,060 |

**Illustration 10:** A manufacturing company submits the following figures for the first Quarter of 2003.

| Sales/Month | Product in units |        |
|-------------|------------------|--------|
|             | X                | Y      |
| January     | 25,000           | 30,000 |
| February    | 20,000           | 25,000 |
| March       | 30,000           | 35,000 |

Selling price per unit product X ₹10 product Y ₹ 20

Prepare a sales budget based, on the above data for the first Quarter of 2004 assuming,

- Sales quantity increase of X by 20%, Y by 10%
- Sales price increase of X : nil, Y : 10%

**Solution:**

NOTE: U = units, SP = selling price, A = Amount

**Sales Budget**  
**Actuals for 2003**

|           | January   |    |          | February  |    |          | March     |    |           | Total     |    |           |
|-----------|-----------|----|----------|-----------|----|----------|-----------|----|-----------|-----------|----|-----------|
|           | U x SP= A |    |          | U x SP= A |    |          | U x SP= A |    |           | U x SP= A |    |           |
| Product X | 25,000    | 10 | 2,50,000 | 20,000    | 10 | 2,00,000 | 30,000    | 10 | 3,00,000  | 75,000    | 10 | 7,50,000  |
| Product Y | 30,000    | 20 | 6,00,000 | 25,000    | 20 | 5,00,000 | 35,000    | 20 | 7,00,000  | 90,000    | 20 | 18,00,000 |
|           | –         | –  | 8,50,000 | –         | –  | 7,00,000 | –         | –  | 10,00,000 | –         | –  | 25,50,000 |

**Budgeted for 2004**

|           | January   |    |           | February  |    |          | March     |    |           | Total     |    |           |
|-----------|-----------|----|-----------|-----------|----|----------|-----------|----|-----------|-----------|----|-----------|
|           | U x SP= A |    |           | U x SP= A |    |          | U x SP= A |    |           | U x SP= A |    |           |
| Product X | 30,000    | 10 | 3,00,000  | 24,000    | 10 | 2,40,000 | 36,000    | 10 | 3,60,000  | 90,000    | 10 | 9,00,000  |
| Product Y | 33,000    | 22 | 7,26,000  | 27,500    | 22 | 6,05,000 | 38,500    | 22 | 8,47,000  | 99,000    | 22 | 21,78,000 |
|           | –         | –  | 10,26,000 | –         | –  | 8,45,000 | –         | –  | 12,07,000 | –         | –  | 30,78,000 |

**Illustration:11 (Flexible budget)**

Lucky Ltd. is currently operating at 75% of its capacity. In the past two years, the levels of operation were 55% and 65% respectively. Presently the production is 75000 units. The company is planning for 85% capacity level during 2005-2006. The cost details are as follows:

| Particulars              | ₹                |                  |                  |
|--------------------------|------------------|------------------|------------------|
|                          | 55%              | 65%              | 75%              |
| Direct Materials         | 11,00,000        | 13,00,000        | 15,00,000        |
| Direct Labour            | 5,50,000         | 6,50,000         | 7,50,000         |
| Factory overheads        | 3,10,000         | 3,30,000         | 3,50,000         |
| Selling overheads        | 3,20,000         | 3,60,000         | 4,00,000         |
| Administrative overheads | 1,60,000         | 1,60,000         | 1,60,000         |
| <b>TOTAL</b>             | <b>24,40,000</b> | <b>28,00,000</b> | <b>31,60,000</b> |

Profit is estimated @ 20% on Sales

The following increase, in costs are expected during the year:

(in percentage)

|                            |    |
|----------------------------|----|
| Direct Materials           | 8  |
| Direct Labour              | 5  |
| Variable Factory Overhaeds | 5  |
| Variable Selling Overheads | 8  |
| Fixed Factory Overheads    | 10 |

|                          |    |
|--------------------------|----|
| Fixed Selling Overheads  | 15 |
| Administrative Overheads | 10 |

Prepare Flexible budget for the current year as well as for the period 2005-2006 at 85% of capacity.

**Solution:**

**Flexible Budget**

| Units                      | 75%              |              | 85%              |              |
|----------------------------|------------------|--------------|------------------|--------------|
|                            | Total<br>75000   | Per unit     | Total<br>85000   | Per unit     |
| <b>Variable Cost:</b>      |                  |              |                  |              |
| Direct Material            | 15,00,000        | 20.00        | 18,36,000        | 21.60        |
| Direct labour              | 7,50,000         | 10.00        | 8,92,500         | 10.50        |
| Variable Factory Overheads | 1,50,000         | 2.00         | 1,78,500         | 2.10         |
| Variable selling Overheads | 3,00,000         | 4.00         | 3,67,200         | 4.32         |
| <b>Total Variable Cost</b> | <b>27,00,000</b> | <b>36.00</b> | <b>32,74,200</b> | <b>38.52</b> |
| <b>Fixed cost :</b>        |                  |              |                  |              |
| Fixed Factory Overhead     | 2,00,000         | 2.67         | 2,20,000         | 2.59         |
| Fixed Selling Overheads    | 1,00,000         | 1.33         | 1,15,000         | 1.35         |
| Administrative overheads   | 1,60,000         | 2.13         | 1,76,000         | .07          |
| <b>Total Fixed Cost:</b>   | <b>4,60,000</b>  | <b>6.13</b>  | <b>5,11,000</b>  | <b>6.01</b>  |
| Total Cost[VC+FC]          | 31,60,000        | 42.13        | 37,85,200        | 44.53        |
| Profit                     | 7,90,000         | 10.54        | 9,46,300         | 11.13        |
| Sales                      | 39,50,000        | 52.67        | 47,31,500        | 55.66        |

**Working note:**

1. Direct Materials per unit =  $15,00,000/7500 = ₹ 20$
2. Direct labour per unit =  $7,50,000/75,000 = ₹10$
3. Factory overheads:  
Variable = Difference in cost/Difference in units =  $20,000/10,000 = ₹ 2$   
Therefore Fixed overheads =  $3,50,000 - [7500 \times 2] = ₹ 2,00,000$
4. Selling Overheads: Variable = difference in cost / difference in units =  $40000/10000 = ₹ 4$
5. Administrative Overheads Fixed = ₹ 1,60,000

**Illustration 12: (Flexible Budget)**

A manufacturing company is operating at 75% of normal capacity. It is proposed to offer a price reduction of 5% to 10% depending upon the sales volume desired given below are the relevant data.

|                    |        |           |          |
|--------------------|--------|-----------|----------|
| Capacity           | 75%    | 85%       | 100%     |
| Output (units )    | 75,000 | 85,000    | 1,00,000 |
| Selling price unit | ₹ 96   | 5%off     | 10%off   |
| Unit               | ₹ 40   | ₹ 10%less | 15%less  |
| Unit               | ₹ 10   | ₹ 10      | ₹ 10     |

Production ₹ 14,00,000

Selling and administration ₹ 5,00,000

Variable overheads:

Production ₹ 14,00,000@ normal capacity

Selling and administration ₹ 4,40,000@ normal unit total cost unit total cost at capacity

- Prepare a single statement to show profit/loss at each level of output
- Compute unit variable cost, unit fixed cost and at different levels of outputs and
- Indicate which of the 3 levels is most profitable

**Solution:**

|                            | Currently capacity |            |           |            | Normal capacity |            |
|----------------------------|--------------------|------------|-----------|------------|-----------------|------------|
| Units                      | 75,000             |            | 85,000    |            | 1,00,000        |            |
| Capacity                   | 75%                |            | 85%       |            | 100%            |            |
|                            | ₹<br>P.U.          | Total<br>₹ | ₹<br>P.U. | Total<br>₹ | ₹<br>P.U.       | Total<br>₹ |
| Sales                      | 96.00              | 72,00,000  | 91.20     | 77,52,000  | 86.4            | 86,40,000  |
| (-) Material               | 40.00              | 30,00,000  | 36.00     | 30,60,000  | 34.0            | 34,00,000  |
| Wages                      | 10.00              | 7,50,000   | 10.00     | 8,50,000   | 10.0            | 10,00,000  |
| <b>Variable Overheads:</b> |                    |            |           |            |                 |            |
| Production                 | 14.00              | 10,50,000  | 14.00     | 11,90,000  | 14.0            | 14,00,000  |
| Selling and administration | 4.40               | 3,30,000   | 4.40      | 3,74,000   | 4.4             | 4,40,000   |
| Total variable cost        | 68.40              | 51,30,000  | 64.40     | 54,74,000  | 62.4            | 62,40,000  |
| Contribution               | 27.60              | 20,70,000  | 26.80     | 22,78,000  | 24.0            | 24,00,000  |
| <b>Fixed overheads:</b>    |                    |            |           |            |                 |            |
| Production                 | 18.67              | 14,00,000  | 16.47     | 14,00,000  | 14.0            | 14,00,000  |
| Selling and administration | 6.67               | 5,00,000   | 5.88      | 5,00,000   | 5.0             | 5,00,000   |
| Profit                     | 2.27               | 1,70,000   | 4.45      | 3,78,000   | 5.0             | 5,00,000   |

Recommendation: operating at 100% i.e., Normal capacity is most profitable

**Illustration 13: (Purchase Budget)**

Solo products manufactures single product and has sales of ₹ 126 lacs. Profit is 20%. Materials required are A = 3lbs of ₹ 6 per lb and B = 1.5 of ₹ 4 per lb.

Labour charges are : Machine shop = ₹ 4 per hour  
Assembly shop = ₹ 3.20 per hour

Number of Employees : Machine shop = 600  
Assembly shop = 180

Details of materials, finished goods:

|               | Finished Good | Material<br>A | Material<br>B |
|---------------|---------------|---------------|---------------|
| Opening stock | 20,000 units  | 54,000lbs     | 33,000 lbs    |
| Closing stock | 25,000 units  | 30,000lbs     | 66,000 lbs    |

Processing time: Machine shop = 7 hrs

(per unit of output) Assembly shop = 2 and half hrs

Factory works for 5 days of 8 hrs in a week in a normal 52 weeks a year.

Excepted Holidays = 96 hrs }

Excepted Leave = 80 hrs } in a year

Expected Absenteesim = 64 hrs}

**Calculate:**

1. Number of units to be sold.
2. Purchase budget
3. Capacity utilisation of machine and assembly shops

**Solution:**

**Cost Sheet of.....**

|   | ₹ Per unit |
|---|------------|
| Material cost:<br>A: $3 \times 6 = 18$<br>B: $1.5 \times 4 = 6$   | 24         |
| Labour cost:<br>Machine shop : $7 \text{ hrs} \times 4 = 28$<br>Assembly shop : $2 \frac{1}{2} \text{ hrs} \times 3.20 = 8$ | 36         |
| Total cost  | 60         |
| Profit = 20%(i.e. profit on sales)  | 15         |
| Sales price   | 75         |

Total sales = 126 lacs

Therefore quantity of sales = sales value/ selling price per unit

=  $126 \text{ lacs} / 75$

= 1,68,000 units

Material Budget:

Total finished goods units to be produced:

= sales + closing stock – opening stock

Production =  $1,68,000 + 25000 - 20,000$

**PRODUCTION = 1,73,000 UNITS**

Materials required to produce:

$$A: 1,73,000 \times 3 \text{ Ibs} = 5,19,000 \text{ Ibs}$$

$$B: 1,73,000 \times 1.5 \text{ Ibs} = 2,59,500 \text{ Ibs}$$

Value

$$\text{For A: } 4,95,000 \text{ Ibs} \times 6 = ₹ 29,70,000$$

$$\text{For B: } 2,92,500 \text{ Ibs} \times 4 = ₹ 11,70,000$$

₹ 41,40,000

Capacity utilisation of machine and assembly shops:

Total hours in machine shops utilised for production

$$= 1,73,000 \times 7 \text{ hrs} = 12,11,000 \text{ hrs required}$$

Total hours in assembly shops utilised

$$= 1,73,000 \times 2 \frac{1}{2} \text{ hrs} = 4,32,500 \text{ hrs required}$$

Total hours available:

$$\text{Machine shop } 5 \text{ days} \times 8 \text{ hrs} \times 52 \text{ weeks} \times 600 \text{ employees} = 12,48,000 \text{ hrs}$$

$$\text{Assembly shop } 5 \text{ days} \times 8 \text{ hrs} \times 52 \text{ weeks} \times 180 \text{ employees} = 3,74,400 \text{ hrs}$$

Actual hours available:

$$\begin{aligned} \text{Machine shop} &= 12,48,000 \text{ hrs} - (*240 \times 600) \\ &= 12,48,000 \text{ hrs} - 1,44,000 = 11,04,000 \\ &\quad *96 + 80 + 64 = 240 \end{aligned}$$

$$\begin{aligned} \text{Assembly shop} &= 3,74,400 \text{ hrs} - (240 \times 180) \\ &= 3,74,400 \text{ hrs} - 43,200 = 3,31,200 \end{aligned}$$

Capacity utilised = HOURS REQUIRED/Actual hours available or Total hours available  $\times$  100

$$\begin{aligned} \text{Machine shop} &= 12,11,000/11,04,000 \times 100 \\ &= 109.69\% = 1.1 \text{ times} \\ &= 130.59\% = 1.31 \text{ times} \end{aligned}$$

#### Illustration 14: (Manpower Budget)

The direct labour requirements of three of the products manufactured in a factory, each involving more than one labour operation, are estimated as follows;

Direct labour hours per unit (in minutes)

#### Products

| Operation | Product 1 | Product 2 | Product 3 |
|-----------|-----------|-----------|-----------|
| 1         | 18        | 42        | 30        |
| 2         | -         | 12        | 24        |
| 3         | 9         | 6         | -         |

The factory works 8 hrs a day, 6 days a week. The budget quarter is taken as 13 weeks and during a quarter lost hours due to leave and holiday and other causes are estimated to be 124 hrs.

The budget hourly rates for the workers manning the operation 1, 2 and 3 are ₹ 2.00, ₹ 2.50, ₹ 3.00 respectively. The budgeted sales of the product during the quarter are:

Product 1 9,000 units

Product 2 15,000 units

Product 3 12,000 units

There is a carry over of 5000 units of product 2 and 4000 units of product 3 and it is proposed to build up a stock at the end of the budget quarter as follows;

Product 1 1,000 units

Product 2 2,000 units

Prepare a manpower budget for the quarter showing for each operation (i) direct labour hours (ii) direct labour cost and (iii) the number of workers.

**Solution:**

Preparation of labour budget

Computation of units to be produced

|                     | Product 1 | Product 2 | Product 3 |
|---------------------|-----------|-----------|-----------|
| Units to be sold    | 9,000     | 15,000    | 12,000    |
| Add: closing stock  | 1,000     | 2,000     | —         |
| Less: opening stock | —         | 5,000     | 4,000     |
| Production          | 10,000    | 12,000    | 8,000     |

Time required (Mts)

| Operation |    |    |    | Total |
|-----------|----|----|----|-------|
| 1         | 18 | 42 | 30 | 90    |
| 2         | —  | 12 | 24 | 36    |
| 3         | 9  | 6  | -  | 15    |

Total time required for production;

Operation 1:

For product 1 =  $10,000 \times 18$  = 1,80,000 Mts

For product 2 =  $12,000 \times 42$  = 5,04,000 Mts

For product 3 =  $8,000 \times 30$  = 2,40,000 Mts  
= 9,24,000 Mts

Operation 2:

For product 1 =  $10,000 \times -$  = —

For product 2 =  $12,000 \times 12$  = 1,44,000 Mts

For product 3 =  $8,000 \times 24$  = 1,92,000  
= 3,36,000 Mts

Operation 3:

$$\text{For product 1} = 10,000 \times 9 = 90,000 \text{ Mts}$$

$$\begin{aligned} \text{For product 2} &= 12,000 \times 6 = \underline{72,000} \text{ Mts} \\ &= 1,62,000 \text{ Mts} \end{aligned}$$

$$\text{Total number of hours available} \quad 6264 \text{ hours}$$

$$\text{Hours lost in leave, holiday etc.} \quad 124 \text{ hours}$$

$$500 \text{ hours}$$

$$500 \text{ hrs} \times 60 \text{ Mts per hour} = 30,000 \text{ Mts}$$

Therefore number of labourers required for:

$$\text{For operation 1} = 9,24,000/30,000 = 30.8 \text{ labourers} = 31 \text{ labourers}$$

For operation 2:

$$\text{Time required} = 3,36,000/30,000 = 11.2 \text{ labourers} = 12 \text{ labourers}$$

For operation 3:

$$\text{Time required } 1,62,000 \text{ Mts}$$

$$\text{Time available } 30,000 \text{ Mts}$$

$$\text{Therefore labourers required} = 1,62,000/30,000 = 5.4 \text{ labourers} = 6 \text{ labourers}$$

Labourer hours required:

$$\text{Operation 1} = 9,24,000/60 = 15,400 \text{ hrs}$$

$$\text{Operation 2} = 3,36,000/60 = 5,600 \text{ hrs}$$

$$\text{Operation 3} = 1,62,000/60 = 2,700 \text{ hrs}$$

Labour cost:

$$\text{Operation 1} = 9,24,000/60 \times 2 = ₹ 30,800$$

$$\text{Operation 2} = 3,36,000/60 \times 2.50 = ₹ 14,000$$

$$\text{Operation 3} = 1,62,000/60 \times 3 = ₹ \underline{8,100}$$

$$\text{Total} = ₹ 52,900$$

#### Illustration 15: (Flexible budget)

A factory engaged in manufacturing plastic bucket is working to 40% capacity and produces 10,000 buckets per annum. The present cost break up for one bucket is as under:

$$\text{Materials} \quad ₹ 10$$

$$\text{Labour cost} \quad ₹ 3$$

$$\text{Overhead (60% FIXED)} \quad ₹ 5$$

The selling price is ₹ 2 per bucket. It is decided to work the factory at 50% capacity, the selling price falls by 3%. at 90% capacity the selling price falls by 5% accompanied by a similar fall even points for the same capacity of production.

**Solution:**

| Capacity           | 100%        |          | 90%         |          | 50%         |          | 40% (given) |          |
|--------------------|-------------|----------|-------------|----------|-------------|----------|-------------|----------|
| Units              | 25,000      |          | 22,500      |          | 12,500      |          | 10,000      |          |
| Particulars        | ₹           |          | ₹           |          | ₹           |          | ₹           |          |
| Sales              | 20          | 5,00,000 | 19          | 4,27,500 | 19.4        | 2,42,500 | 20          | 2,00,000 |
| (-)variable costs: |             |          |             |          |             |          |             |          |
| Material           | 10          | 2,50,000 | 9.5         | 2,13,750 | 10          | 1,25,000 | 10          | 1,00,000 |
| Labour             | 3           | 75,000   | 3           | 67,500   | 3           | 37,500   | 3           | 30,000   |
| Variable Overheads | 2           | 50,000   | 2           | 45,000   | 2           | 25,000   | 2           | 20,000   |
| Contribution       | 5           | 1,25,000 | 4.5         | 1,01,250 | 4.4         | 55,000   | 5           | 50,000   |
| (-)fixed costs     | 1.2         | 30,000   | 1.33        | 30,000   | 2.4         | 30,000   | 3           | 30,000   |
| Profit             | 3.8         | 95,000   | 3.17        | 71,250   | 2           | 25,000   | 2           | 20,000   |
| P/v ratio = C/S    | 0.25        |          | 0.24        |          | 0.23        |          | 0.25        |          |
| BEP = FC/P/V       | 30,000/0.25 |          | 30,000/0.24 |          | 30,000/0.23 |          | 30,000/0.25 |          |
| BEP(₹)             | 1,20,000    |          | 1,26,667    |          | 1,32,273    |          | 1,20,000    |          |
| BEP (units)        | 6,000       |          | 6,667       |          | 6,818       |          | 6,000       |          |

**Illustration 16:** PRONTO Company plant had operated at 60% capacity in the year 2005. The summarised results were;

Sales – ₹ 40 lakhs                      Material cost ₹12 lakhs  
 Direct labour ₹ 6 lakhs                Overheads ₹ 10 lakhs

It is expected that market will expand to match 75% capacity, when overheads are expected to touch ₹ 12 lakhs, during 2006

I. Based on above information calculate

- (1) Break even points in the years 2005-2006
- (2) Margin of safety in 2006

ii Further capacity utilisation (increases in sales quantity) can be achieved only with 5% price reduction.

Calculate the sales target and capacity utilisation to earn profit of ₹ 17 lakhs in the year 2006.

**Solution:**

|                    | 2005 | 2006 |
|--------------------|------|------|
| Capacity           | 60%  | 75%  |
| Material           | 12   | 15   |
| Labour             | 6    | 7.5  |
| Overheads:         |      |      |
| Variable overheads | 8    | 10   |
| Fixed overheads    | 2    | 2    |
| Sales              | 40   | 50.0 |
| (-)variable costs  | 26   | 32.5 |

|                |    |      |
|----------------|----|------|
| Contribution   | 14 | 17.5 |
| (-)fixed costs | 2  | 2.0  |
| Profit         | 12 | 15.5 |

|     |    |    |    |    |    |
|-----|----|----|----|----|----|
| 60% | 10 | 10 |    | 12 |    |
| 75% | 12 | VC | FC | VC | FC |
| 15% | 2  | 8  | 2  | 10 | 2  |

$$15 \times 4 = 60 \quad 2 \times 4 = 8 \text{ variable cost}$$

$$15 \times 5 = 75 \quad 2 \times 5 = 10 \text{ variable cost}$$

For variable overhead = differential cost/ differential capacity

|           | 2005  | 2006   |
|-----------|-------|--------|
| P/V Ratio | 0.35  | 0.35   |
| BEP       | 5.71  | 5.71   |
| MOS       | 34.29 | 44.29  |
| MOS%      | 85.71 | 88.57% |

|                     | PRICE ↓ 5% |       |
|---------------------|------------|-------|
| Sales               | 47.5       | 60.17 |
| Less: variable cost | 32.5       | 41.17 |
| Contribution        | 15.0       | 19.00 |
| Less : fixed cost   | 2.0        | 2.00  |
| Profit              | 13.0       | 17.00 |

$$P/V \text{ Ratio} = C/S = 154/47.5$$

$$= 0.31$$

$$\text{Sales required} = \text{Target profit} + \text{Fixed cost}/P/V \text{ Ratio}$$

$$= 17 + 2/0.31 = ₹ 60.17 \text{ lakhs}$$

**Illustration 17:** Cost accountant of Norma Ltd. has prepared following flexible budget (₹ 100)

| Capacity →              | 70%  | 80% |
|-------------------------|------|-----|
| Depreciation            | 11   | 11  |
| Insurance               | 3    | 3   |
| Indirect labour         | 10.5 | 12  |
| Power                   | 17   | 20  |
| Repairs and maintenance | 19   | 20  |
| Salaries                | 10   | 10  |
| Stores consumable       | 3.5  | 4   |

If 100% capacity represents 50 tonnes.

What would be the budgeted overhead cost per tone at production level of 33 tonnes?

If the prime cost is ₹ 5,000 per tone, what is the production cost per tone at 100% capacity utilisation?

**Solution:**

|                                      |           |           |           |             |
|--------------------------------------|-----------|-----------|-----------|-------------|
| Capacity                             | 100%      | 80%       | 70%       | 66%         |
| Quantity (tonne)                     | 50        | 40        | 35        | 33          |
| Variable cost:                       |           |           |           |             |
| Indirect labour                      | 15        | 12        | 10.5      | 9.9         |
| Stores consumable                    | 5         | 4         | 3.5       | 3.3         |
| Semi-variable cost:                  |           |           |           |             |
| Power                                | 26        | 20        | 17        | 15.8        |
| Repairs and maintenance              | 22        | 20        | 19        | 18.6        |
| Fixed cost:                          |           |           |           |             |
| Depreciation                         | 11        | 11        | 11        | 11.0        |
| Insurance                            | 3         | 3         | 3         | 3.0         |
| Salaries                             | 10        | 10        | 10        | 10.0        |
| <b>Total cost</b>                    | <b>92</b> | <b>80</b> | <b>74</b> | <b>71.6</b> |
| Overhead cost per tone i.e. 1,000kgs | 1,840     | 2,000     | 2,114.28  | 2,169.70    |
| (+) prime cost per tone              | 5,000     |           |           |             |
| Production cost per tonne            | 6,840     |           |           |             |

**Illustration 18: (sales, production and materials purchase budget)**

A company manufactures product A and product B. During the year ending December, 2006, it is expected to sell 15,000 kgs of product A and 75,000 of product B at ₹ 15 and ₹ 8 per kgs respectively. The direct material P, Q and R are mixed in the proportion of 3:5:2 in the manufacture of product A. MATERIAL Q and R are mixed in the proportion of 1:2 in the manufacture of product B. The actual and budgeted inventories for the year for the year are given below:

|            | Opening stock<br>Kgs. | Expected closing<br>stock kgs | Anticipated cost per<br>Kg. ₹ |
|------------|-----------------------|-------------------------------|-------------------------------|
| Material P | 4,500                 | 3,000                         | 6/-                           |
| Q          | 3,000                 | 6,000                         | 5/-                           |
| R          | 30,000                | 9,000                         | 4/-                           |
| Material A | 3,000                 | 1,500                         | -                             |
| B          | 4,000                 | 5,500                         | -                             |

Prepare sales budget, production budget and material purchase budget, showing the expenditure for the material for the year ending 31-12-2006.

**Solution:****Product A**

EXCEPTED SALE 15000kgs  
@ ₹ 15 per kg

**Product B**

75,000kgs  
@ ₹ 15 per kg.

|            |  |            |  |             |
|------------|--|------------|--|-------------|
| PQR        | 3/10: 5/10: 2/10                         | QR         | 1/3: 2/3                                 | Requirement |
| P          | $13500 \times 3/10 = 4,050$              | P          | $- = -$                                  | 4,050       |
| Q          | $13,500 \times 5/10 = 6,750$             | Q          | $76,500 \times 1/3 = 25,500$             | 32,250      |
| R          | $13,500 \times 2/10 = \underline{2,700}$ | R          | $76,500 \times 2/3 = \underline{51,000}$ | 53,700      |
| Production | 13,500                                   | Production | 76,500                                   |             |

Production budget = Sales + Closing Stock – Opening stock

|                     |        |        |
|---------------------|--------|--------|
| Sale                | 15,000 | 75,000 |
| ADD: closing stock  | 1,500  | 5,500  |
| Less: opening stock | 3,000  | 4,000  |
| Production          | 13,500 | 76,500 |

Material purchase budget = requirement for production = closing stock – opening stock

|                     | P      | Q        | R        | Total    |
|---------------------|--------|----------|----------|----------|
| Requirement         | 4,050  | 32,250   | 53,700   | -        |
| (+) closing stock   | 3,000  | 6,000    | 9,000    | -        |
| (-) opening stock   | 4,500  | 3,000    | 30,000   | -        |
| Purchase Quantity   | 2,550  | 35,250   | 32,700   | -        |
| ×                   |        |          |          |          |
| Cost per kg         | ₹ 6    | ₹ 5      | ₹ 4      | -        |
| Purchase budget (₹) | 15,300 | 1,76,250 | 1,30,800 | 3,22,350 |

#### Illustration 19:

Calculate the budgeted overhead cost per tonne at production level of 35 tonne based on following details at 80% capacity (40 tonnes)

|                                     | ₹ 000 |
|-------------------------------------|-------|
| Depreciation                        | 22    |
| Indirect labour                     | 24    |
| Insurance                           | 6     |
| Power (80% variable)                | 40    |
| Repairs and maintenance (50% fixed) | 40    |
| Salaries                            | 20    |
| Stores consumable                   | 8     |

#### Solution:

| Capacity             | 100% |    | 80% |   | 70%  |     |
|----------------------|------|----|-----|---|------|-----|
| Production (tonnes)  | 50   |    | 40  |   | 35   |     |
| Variable:            |      |    |     |   |      |     |
| Stores consumable    |      | 10 |     | 8 |      | 7.0 |
| Semi-variable:       |      |    |     |   |      |     |
| Power (80% variable) | 40   |    | 32  |   | 28.0 |     |

|                          |                |            |                |            |                   |              |
|--------------------------|----------------|------------|----------------|------------|-------------------|--------------|
| (20% fixed)              | 8              | 48         | 8              | 40         | 8.0               | 36.0         |
| Repairs and maintenance  |                |            |                |            |                   |              |
| 50% variable             | 25             |            | 20             |            | 17.5              |              |
| 50% fixed                | 20             | 45         | 20             | 40         | 20.0              | 37.5         |
| Depreciation             |                | 22         |                | 22         |                   | 22.0         |
| Indirect labour          |                | 24         |                | 24         |                   | 24.0         |
| Insurance                |                | 6          |                | 6          |                   | 6.0          |
| Salaries                 |                | 20         |                | 20         |                   | 20.0         |
| <b>Total cost</b>        |                | <b>175</b> |                | <b>160</b> |                   | <b>152.5</b> |
| <b>Cost per tone (₹)</b> | <b>₹ 3,500</b> |            | <b>₹ 4,000</b> |            | <b>₹ 4,357.14</b> |              |

**Illustration 20**

Maya Limited has made the following sales estimates for April, May and June of the year 2005 from which you are required to prepare sales budget by units and rupees for each of the three months for each sale area and in total.

| Sales area | April | May | June |
|------------|-------|-----|------|
| A          | 40%   | 30% | 30%  |
| B          | 45%   | 35% | 20%  |
| C          | 40%   | 35% | 25%  |
| D          | 30%   | 40% | 30%  |

The area-wise unit sales are expected as follows:

| Sales area   | Sales (units) |
|--------------|---------------|
| A            | 2,500         |
| B            | 2,000         |
| C            | 3,000         |
| D            | 6,000         |
| <b>TOTAL</b> | <b>13,500</b> |

The selling price has been fixed at ₹ 6 per unit in area A, ₹ 8 per unit in Area B, ₹ 12 per unit in area Area D, and ₹ 10 per unit in area C.

**Solution:**

| Sales area   | April        | May          | June         | Total         |
|--------------|--------------|--------------|--------------|---------------|
| A            | 1,000        | 750          | 750          | 2,500         |
| B            | 900          | 700          | 400          | 2,000         |
| C            | 1,200        | 1,050        | 750          | 3,000         |
| D            | 1,800        | 2,400        | 1,800        | 6,000         |
| <b>Total</b> | <b>4,900</b> | <b>4,900</b> | <b>3,700</b> | <b>13,500</b> |

## Sales budget

| Sales area | April        |    |        | May          |    |        | June         |    |        | Total        |    |          |
|------------|--------------|----|--------|--------------|----|--------|--------------|----|--------|--------------|----|----------|
|            | U × P.U.=AMT |    |        | U × P.U.=AMT |    |        | U × P.U.=AMT |    |        | U × P.U.=AMT |    |          |
| A          | 1,000        | 6  | 6,000  | 750          | 6  | 4,500  | 750          | 6  | 4,500  | 2,500        | 6  | 15,000   |
| B          | 900          | 8  | 7,200  | 700          | 8  | 5,600  | 400          | 8  | 3,200  | 2,000        | 8  | 16,000   |
| C          | 1,200        | 10 | 12,000 | 1050         | 10 | 10,500 | 750          | 10 | 7,500  | 3,000        | 10 | 30,000   |
| D          | 1,800        | 12 | 21,600 | 2400         | 12 | 28,800 | 1,800        | 12 | 21,600 | 6,000        | 12 | 72,000   |
| Total      | 4,900        | -  | 48,800 | 4,900        | -  | 49,400 | 3,700        | -  | 36,800 | 13,500       | -  | 1,33,000 |

## Illustration 21: (Flexible budget)

Company ABC Ltd. Produces 10,000 units. The company expenses to 1 unit of the product is listed below:

|                         |   |                    |
|-------------------------|---|--------------------|
| Direct material         | - | ₹ 7                |
| Direct labour           | - | ₹ 5                |
| Other variable expenses | - | ₹ 4.5              |
| Administrative overhead | - | ₹ 6 (40%variable)  |
| Selling overhead        | - | ₹ 3 (75%variable)  |
| Production              | - | ₹ 4 (20% variable) |
| Purchase of equipment   | - | ₹ 30,000           |
| Selling price           | - | ₹ 120              |

Prepare budget for 70%, 80% and 100% utilization of the capacity if the details listed above is for 90% utilisation of installed capacity.

## Solution:

| Level activity          | 70%          |                    | 80%          |                    | 90%          |                 | 100%         |                    |
|-------------------------|--------------|--------------------|--------------|--------------------|--------------|-----------------|--------------|--------------------|
| Units                   | 7,778        |                    | 8,889        |                    | 10,000       |                 | 11,111       |                    |
|                         | ₹ per unit   | Total ₹            | ₹ per unit   | Total ₹            | ₹ per unit   | Total ₹         | ₹ per unit   | Total ₹            |
| <b>Variable cost:</b>   |              |                    |              |                    |              |                 |              |                    |
| Direct material         | 7            | 54,446.00          | 7            | 62,223.00          | 7            | 70,000          | 7            | 77,777.00          |
| Direct labour           | 5            | 38,890.00          | 5            | 44,445.00          | 5            | 50,000          | 5            | 55,555.00          |
| Other variable exp.     | 4.5          | 35,001.00          | 4.5          | 40,000.50          | 4.5          | 45,000          | 4.5          | 49,999.50          |
| Administrative overhead | 2.4          | 18,667.20          | 2.4          | 21,333.60          | 2.4          | 24,000          | 2.4          | 26,666.40          |
| Selling overhead        | 2.25         | 17,500.50          | 2.25         | 20,000.25          | 2.25         | 22,500          | 2.25         | 24,999.75          |
| Production overhead     | 0.8          | 6,222.40           | 0.8          | 7,111.20           | 0.8          | 8,000           | 0.8          | 8,888.80           |
| (A)                     | <b>21.95</b> | <b>1,70,727.10</b> | <b>21.95</b> | <b>1,95,113.55</b> | <b>21.95</b> | <b>2,19,500</b> | <b>21.95</b> | <b>2,43,886.45</b> |

|                     |             |               |             |               |             |               |             |               |
|---------------------|-------------|---------------|-------------|---------------|-------------|---------------|-------------|---------------|
| <b>Fixed cost:</b>  |             |               |             |               |             |               |             |               |
| Administrative      | 4.62        | 36,000        | 4.04        | 36,000        | 3.6         | 36,000        | 3.24        | 36,000        |
| Selling overhead    | 0.96        | 7,500         | 0.84        | 7,500         | 0.75        | 7,500         | 0.67        | 7,500         |
| Production overhead | 4.11        | 32,000        | 3.59        | 32,000        | 3.2         | 32,000        | 2.88        | 32,000        |
| <b>(B)</b>          | <b>9.70</b> | <b>75,500</b> | <b>8.49</b> | <b>75,000</b> | <b>7.55</b> | <b>75,500</b> | <b>6.79</b> | <b>75,000</b> |
| Total cost (A+B)    | 31.65       | 2,46,227.10   | 30.44       | 2,70,613.55   | 29.5        | 2,95,000      | 28.74       | 3,19,386.45   |
| (+) profit          | 88.34       | 6,87,132.90   | 89.55       | 7,96,066.46   | 90.5        | 9,05,000      | 91.25       | 10,13,993.55  |
| Selling price       | 120         | 9,33,360      | 120         | 10,66,680     | 120         | 12,00,000     | 120         | 13,33,320     |

**Illustration 22:** A manufacturer operates three sales divisions X,Y,Z which sell three branded products A, B and C. The budget committee needs a sales budget for the next year from the following information:

Budget sales units for current year:

| Product | X      | Y      | Z      |
|---------|--------|--------|--------|
| A       | 80,000 | 12,000 | 12,000 |
| B       | 6,000  | 16,000 | 8,000  |
| C       | 4,000  | 24,000 | 10,000 |

Actual sales units for the current year based on actual sales to the date and estimated sales for the balance of the year are:

| Product | X      | Y      | Z      |
|---------|--------|--------|--------|
| A       | 10,000 | 16,000 | 14,000 |
| B       | 4,000  | 20,000 | 10,000 |
| C       | 2,000  | 20,000 | 8,000  |

The selling prices per unit of A, B and C are ₹ 5, ₹ 10 and ₹ 20 respectively applicable for all the divisions.

The discussions with divisional sales managers have product "A" is oversold and if the price is increased by 10%, even then it finds a ready market: product is overpriced and the price of it can be reduced by 5%. By incorporating these changes, the sales will be as follows:

| Product | X    | Y    | Z    |
|---------|------|------|------|
| A       | +30% | +40% | +20% |
| B       | -10% | +30% | -10% |
| C       | +10% | +20% | +10% |

You are required to prepare the budget for the current year as well as budget for next year.

**Solution:****Sales Budget for the**

| Divisions          | Brand Product | Budget Current Year |         |                  | Actual Current Year |          |                  | Budget Next Year  |          |                   |
|--------------------|---------------|---------------------|---------|------------------|---------------------|----------|------------------|-------------------|----------|-------------------|
|                    |               | Unit *P.U.=Amount   |         |                  | Unit *P.U.=Amount   |          |                  | Unit *P.U.=Amount |          |                   |
| X                  | A             | 80,000              | 5       | 4,00,000         | 10,000              | 5        | 50,000           | 1,04,000          | 5.5      | 5,72,000          |
|                    | B             | 6,000               | 10      | 60,000           | 4,000               | 10       | 40,000           | 5,400             | 10       | 54,000            |
|                    | C             | 4,000               | 20      | 80,000           | 2,000               | 20       | 50,000           | 4,400             | 19       | 8,600             |
|                    | Total of X    |                     |         | 5,40,000         |                     |          | 1,30,000         |                   |          | 7,09,600          |
| Y                  | A             | 12,000              | 5       | 60,000           | 16,000              | 5        | 80,000           | 16,800            | 5.5      | 92,400            |
|                    | B             | 16,000              | 10      | 1,60,000         | 20,000              | 10       | 2,00,000         | 20,800            | 10       | 2,08,000          |
|                    | C             | 24,000              | 20      | 4,80,000         | 20,000              | 20       | 4,00,000         | 28,800            | 19       | 5,47,200          |
|                    | Total of Y    |                     |         | 7,00,000         |                     |          | 6,80,000         |                   |          | 8,47,600          |
| Z                  | A             | 12,000              | 5       | 60,000           | 14,000              | 5        | 70,000           | 14,400            | 5.5      | 79,200            |
|                    | B             | 8,000               | 10      | 80,000           | 10,000              | 10       | 1,00,000         | 7,200             | 10.0     | 72,000            |
|                    | C             | 10,000              | 20      | 2,00,000         | 8,000               | 20       | 1,60,000         | 11,000            | 19.0     | 2,09,000          |
|                    | Total of Z    | -                   | -       | 3,40,000         | -                   | -        | 3,30,000         | -                 | -        | 3,60,000          |
|                    | Total of A    | 1,04,000            | 5       | 5,20,000         | 40,000              | 5        | 2,00,000         | 1,35,200          | 5.5      | 7,43,000          |
|                    | Total of B    | 30,000              | 10      | 3,00,000         | 34,000              | 10       | 3,40,000         | 33,400            | 10.0     | 3,34,000          |
| Total of C         | 38,000        | 20                  | 30,0004 | 30,000           | 20                  | 6,00,000 | 44,200           | 19.0              | 8,39,000 |                   |
| <b>Grand Total</b> |               | -                   | -       | <b>15,80,000</b> | -                   | -        | <b>11,40,000</b> | -                 | -        | <b>19,17,0000</b> |

**Illustration 23:** ACC Ltd. manufactures two products X and Y and sells them through two divisions: North and south for the submission of sales budget to the budget committee the following information has been made:

Budgeted sales for the current year:

| Product | North              | South              |
|---------|--------------------|--------------------|
| X       | 4,000 units at ₹ 9 | 6,000 units at ₹ 9 |
| Y       | 3,000 unit at ₹ 24 | 5,000 unit at ₹ 24 |

Actual sales for the current year:

| Product | North              | South              |
|---------|--------------------|--------------------|
| X       | 5,000 units at ₹ 9 | 7,000 units at ₹ 9 |
| Y       | 2,000 unit at ₹ 24 | 4,000 unit at ₹ 24 |

Adequate market studies reveal that product X is popular but under priced it is observed that if the price of X is increased by ₹ 1 it will still find the read market on the other hand, Y is over price and the market could absorb more if sales price of Y be reduced by ₹ 4 the management has agreed to do so.

For the information on this price changes and reports from salesman the following estimates have been prepared by divisional managers.

Percentage increased in sales over current budget

| Product | North | South |
|---------|-------|-------|
| X       | +10%  | +5%   |
| Y       | +20%  | +10%  |

Prepare a sales budget, showing budgeted sales and actual sales of the current year as well as budget for the next year:

#### Sales of budget

| Sales division     | Product         | Unit × P.U.=AMT |    |                 | Unit × P.U.=AMT |        |                 | Unit × P.U.=AMT |        |                 |
|--------------------|-----------------|-----------------|----|-----------------|-----------------|--------|-----------------|-----------------|--------|-----------------|
|                    |                 | North           | X  | 4,000           | 9               | 36,000 | 5,000           | 9               | 45,000 | 4,400           |
|                    | Y               | 3,000           | 24 | 72,000          | 2,000           | 24     | 48,000          | 3,600           | 20     | 72,000          |
|                    | Total for North |                 |    | 1,8,000         |                 |        | 93,000          |                 |        | 1,16,000        |
|                    | X               | 6,000           | 9  | 54,000          | 7,000           | 9      | 63,000          | 6,300           | 10     | 63,000          |
|                    | Y               | 5,000           | 24 | 1,20,000        | 4,000           | 24     | 96,000          | 5,500           | 20     | 1,10,000        |
|                    | Total for South |                 |    | 1,74,000        |                 |        | 1,59,000        |                 |        | 1,73,000        |
|                    | Total o X       | 10,000          | 9  | 90,000          | 12,000          | 9      | 1,08,000        | 10,700          | 10     | 1,07,000        |
|                    | Total of Y      | 8,000           | 24 | 1,92,000        | 6,000           | 24     | 1,44,000        | 9,100           | 20     | 1,82,000        |
| <b>Grand Total</b> |                 |                 |    | <b>2,82,000</b> |                 |        | <b>2,52,000</b> |                 |        | <b>2,89,000</b> |

#### Illustration 24: (sales budget)

A marketing company submits the following fig. to the first quarter of 2004

| Month    | Product soap in units |       |       |
|----------|-----------------------|-------|-------|
|          | X                     | Y     | Z     |
| January  | 2,500                 | 3,000 | 1,000 |
| February | 2,000                 | 2,500 | 1,000 |
| March    | 3,000                 | 3,500 | 1,000 |

Selling price per unit was X ₹ 10, Y ₹ 20 and Z ₹ 40

Target for the first quarter of 2005

| Particulars              | Product |     |     |
|--------------------------|---------|-----|-----|
|                          | X       | Y   | Z   |
| Sales Quantity Increases | 20%     | 10% | 10% |
| Sales price increases    | Nil     | 10% | 25% |

Prepare the sales budget for the first quarter of 2005.

**Solution:**

| Product      | January |    |                 | February |    |                 | March |    |                 | Total |    |                 |
|--------------|---------|----|-----------------|----------|----|-----------------|-------|----|-----------------|-------|----|-----------------|
|              | Units   | SP | Amount          | Units    | SP | Amount          | Units | SP | Amount          | Units | SP | Amount          |
| X            | 3,000   | 10 | 30,000          | 2,400    | 10 | 24,000          | 3,600 | 10 | 36,000          | 9,000 | 10 | 90,000          |
| Y            | 3,300   | 22 | 72,600          | 2,750    | 22 | 60,500          | 3,850 | 22 | 84,700          | 9,900 | 22 | 2,17,000        |
| Z            | 1,100   | 50 | 55,000          | 1,100    | 50 | 55,000          | 1,100 | 50 | 55,000          | 3,300 | 50 | 1,65,000        |
| <b>Total</b> | -       | -  | <b>1,57,600</b> | -        | -  | <b>1,39,500</b> | -     | -  | <b>1,75,700</b> | -     | -  | <b>4,72,800</b> |

Working : product X; sales quantity increases = 20%

January 2,500 + 20% = 3,000

February 2,000 + 20% = 2,400

March 3,000 + 20% = 3,600

Product Y

January 3000 + 10% = 3,300

February 2,500 + 10% = 2750

March 3,500 + 10% = 3,850

PRODUCT Z : Sales quantity increases = 10%

January 1,000 + 10% = 1,100

February 1,000 + 10% = 1,100

March 1,000 + 10% = 1,100

Selling price increases

X 10 + NIL% = 10

Y 20 + 10% = 22

Z 40 + 25% = 50

#### Illustration 25: (Flexible Budget)

The following information at 50% capacity is given. Prepare a flexible budget and forecast the profit or loss at 60%, 70% and capacity.

|                          | Expenses at 50% capacity (₹) |
|--------------------------|------------------------------|
| Fixed Expenses           |                              |
| Salaries                 | 50,000                       |
| Rent and taxes           | 40,000                       |
| Depreciation             | 60,000                       |
| Administrative expenses  | 70,000                       |
| Variable expenses        |                              |
| Materials                | 2,00,000                     |
| Labour                   | 2,50,000                     |
| Others                   | 40,000                       |
| Semi – variable expenses |                              |
| Repairs                  | 1,00,000                     |
| Indirect labour          | 1,50,000                     |
| Others                   | 90,000                       |

It is estimated that fixed expenses will remain constant at all capacities. semi –variable expenses will not change between 45% and 60% capacity, will rise by 10% between 60% and 75% capacity, a further increase of 5% when the capacity crosses by 75%.

Estimated sales:

|          |           |
|----------|-----------|
| Capacity | ₹         |
| 60%      | 11,00,000 |

|     |           |
|-----|-----------|
| 70% | 13,00,000 |
| 90% | 15,00,000 |

**Solution:****Flexible budget**

| Particulars<br>Capacity levels   | 50%             | 60%             | 70%             | 90%             |
|----------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                  | ₹               | ₹               | ₹               | ₹               |
| Variable expenses:               |                 |                 |                 |                 |
| Material                         | 2,00,000        | 2,40,000        | 2,80,000        | 3,60,000        |
| Labour                           | 2,50,000        | 3,00,000        | 3,50,000        | 4,50,000        |
| Others                           | 40,000          | 48,000          | 56,000          | 72,000          |
| <b>Total variable exp.</b>       | <b>4,90,000</b> | <b>5,88,000</b> | <b>6,86,000</b> | <b>8,82,000</b> |
| Semivariable exp.                |                 |                 |                 |                 |
| Repairs                          | 1,00,000        | 1,00,000        | 1,10,000        | 1,15,000        |
| Indirect labour                  | 1,50,000        | 1,50,000        | 1,65,000        | 1,72,500        |
| Others                           | 90,000          | 90,000          | 99,000          | 1,03,500        |
| <b>Total Semi- variable exp.</b> | <b>3,40,000</b> | <b>3,40,000</b> | <b>3,74,000</b> | <b>3,91,000</b> |
| Fixed expenses                   |                 |                 |                 |                 |
| Salaries                         | 50,000          | 50,000          | 50,000          | 50,000          |
| Rent and taxes                   | 40,000          | 40,000          | 40,000          | 40,000          |
| Depreciation                     | 60,000          | 60,000          | 60,000          | 60,000          |
| Administration exp.              | 70,000          | 70,000          | 70,000          | 70,000          |
| <b>Total Fixed exp.</b>          | <b>2,20,000</b> | <b>2,20,000</b> | <b>2,20,000</b> | <b>2,20,000</b> |
| Total cost                       | 10,50,000       | 11,48,000       | 12,80,000       | 14,93,000       |
| Add/less: profit/loss            | N.A             | 48,000          | 20,000          | 7,000           |
| Sales                            | N.A             | 11,00,000       | 13,00,000       | 15,00,000       |

**Working:**

Semi-variable expenses:

At 60% = same as at 50% capacity level

At 70% = 10% increases to given amount at 50% capacity level

Repairs = 1,00,000 + 10% = 1,10,000

Indirect labour = 1,50,000 + 10% = 1,65,000

Others = 90,000 + 10% = 99,000

At 90% = 15% {i.e. 10% + 5%} increases to given amount at 50% capacity level

Repairs = 1,00,000 + 15% = 1,15,000

Indirect labour = 1,50,000 + 15% = 1,72,000

Others = 90,000 + 15% = 1,03,500

|                    |        |   |   |          |
|--------------------|--------|---|---|----------|
| Variable expenses: |        |   |   |          |
| Material           | At 50% |   |   | 2,00,000 |
|                    | 60%    | ? | = | 2,40,000 |
|                    | 70%    | ? | = | 2,80,000 |
|                    | 90%    | ? | = | 3,60,000 |
| Labour             | At 50% |   |   | 2,50,000 |
|                    | 60%    | ? | = | 3,00,000 |
|                    | 70%    | ? | = | 3,50,000 |
|                    | 90%    | ? | = | 4,50,000 |
| Others             | At 50% |   |   | 40,000   |
|                    | 60%    | ? | = | 48,000   |
|                    | 70%    | ? | = | 56,000   |
|                    | 90%    | ? | = | 72,000   |

**Illustration 26: (Flexible Budget)**

AB Ltd. has furnished the following estimation pertaining to Product "A" at 80% of its normal capacity level for the quarter ending March 31, 2005.

|                         |             |
|-------------------------|-------------|
| Sales                   | ₹ 6,00,000  |
| Administrative costs :  |             |
| Office salaries         | ₹ 90,000    |
| General expenses        | 2% of Sales |
| Depreciation            | ₹ 7,500     |
| Rates and taxes         | ₹ 8,750     |
| Selling Costs:          |             |
| Salaries                | 8% of sales |
| Travelling exp.         | 2% of sales |
| Sales office expenses   | 1% of sales |
| General office expenses | 1% of sales |
| Distribution Costs:     |             |
| Wages                   | ₹ 15,000    |
| Rent                    | 1% of sales |
| Other expenses          | 4% of sales |

Prepare the budget for the total administration, Selling and Distribution expenses at 70% & 90% capacity levels.

**AB Ltd.**  
**Flexible Budget of Product "A"**

| Particulars<br>Capacity levels      |            | 70%             | 80% Given       | 90%             |
|-------------------------------------|------------|-----------------|-----------------|-----------------|
|                                     |            | ₹               | ₹               | ₹               |
| Sales                               | (A)        | 5,25,000        | 6,00,000        | 6,75,000        |
| <b>Less: Costs:</b>                 |            |                 |                 |                 |
| <b>(1) Administrative Costs:</b>    |            |                 |                 |                 |
| Office salaries                     |            | 90,000          | 90,000          | 90,000          |
| General expenses (2% of sales)      |            | 10,500          | 12,000          | 13,500          |
| Depreciation                        |            | 7,500           | 7,500           | 7,500           |
| Rates and Taxes                     |            | 8,750           | 8,750           | 8,750           |
| <b>Total Administrative Costs</b>   | <b>(B)</b> | <b>1,16,750</b> | <b>1,18,250</b> | <b>1,19,750</b> |
| <b>(2) Selling costs:</b>           |            |                 |                 |                 |
| Salaries (8% of sales)              |            | 42,000          | 48,000          | 54,000          |
| Travelling expenses (2% of sales)   |            | 10,500          | 12,000          | 13,500          |
| Sales office expenses (1% of Sales) |            | 5,250           | 6,000           | 6,750           |
| General Expenses (1% of sales)      |            | 5,250           | 6,000           | 6,750           |
| <b>Total Selling Costs</b>          | <b>(C)</b> | <b>63,000</b>   | <b>72,000</b>   | <b>81,000</b>   |
| <b>(3) Distribution Costs:</b>      |            |                 |                 |                 |
| Wages                               |            | 15,000          | 15,000          | 15,000          |
| Rent (1% of sales)                  |            | 5,250           | 6,000           | 6,750           |
| Other expenses (4% of sales)        |            | 21,000          | 24,000          | 27,000          |
| <b>Total Distribution Costs</b>     | <b>(D)</b> | <b>41,250</b>   | <b>45,000</b>   | <b>48,750</b>   |
| Total Costs (e) = [B+C+D]           |            | 2,21,000        | 2,35,250        | 2,49,500        |
| Profits (F) = [A-E]                 |            | 3,04,000        | 3,64,750        | 4,25,500        |

**Illustration 27: (Production Budget)**

Fun Toys Ltd manufactures a toy monkey with moving parts and a built in voice box. Projected Sales for 5 months are as follows:

| Month          | Projected Sales in Units |
|----------------|--------------------------|
| July 2004      | 4,200                    |
| August 2004    | 4,500                    |
| September 2004 | 4,800                    |
| October 2004   | 4,600                    |
| November 2004  | 4,700                    |

Each toy requires direct material from a supplier at ₹ 3 for moving parts. Voice boxes are purchased from another supplier at ₹ 10 per toy. Labour cost is ₹ 20 per toy and variable overhead cost is ₹ 5 per toy. Fixed manufacturing overhead applicable to production is ₹ 45,000 per month. It is the practice of the company to manufacture an output in a month which is equivalent to 1.2 times of the

following months sales. Prepare the production budget and the production cost budget for July 2004 to October 2004.

**Solution:**

**Fun Toys Ltd.**

| Particulars                      | ₹ Per unit | ₹ Per unit | Total for ----- units<br>₹ per month |
|----------------------------------|------------|------------|--------------------------------------|
| (1) Variable Cst:                |            |            |                                      |
| Direct Materials:                |            |            |                                      |
| Moving parts                     | 35         |            |                                      |
| Voice boxes                      | 10         | 45         |                                      |
| Labour                           |            | 20         |                                      |
| Variable Overhead                |            | 5          |                                      |
| Total Variable cost              |            | 70         |                                      |
| (2) Fixed manufacturing overhead |            |            | 45,000                               |

**1. Production Budget**

Production during the month = 1.2 times of the following months sales

|   | Units |
|---|-------|
| July 1.2*August sales 4,500 units       | 5,400 |
| August 1.2*September sales 4,800 units  | 5,760 |
| September 1.2*October sales 4,600 units | 5,520 |
| October 1.2*November sales 4,700 units  | 5,640 |

**2. Production cost budget**

| Production output in units       | July            | August          | September       | October         |
|----------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                  | 5,400           | 5,760           | 5,520           | 5,640           |
|                                  | ₹               | ₹               | ₹               | ₹               |
| <b>(1) Variable Cost:</b>        |                 |                 |                 |                 |
| Direct Materials:                |                 |                 |                 |                 |
| Moving parts (₹ 35 p.u.)         | 1,89,000        | 201,600         | 1,93,200        | 1,97,400        |
| Voice Boxes ₹ ( 10 p.u.)         | 54,000          | 57,600          | 55,200          | 56,400          |
| Labour (20 p.u.)                 | 1,08,000        | 1,15,200        | 1,10,400        | 1,12,800        |
| Variable Overhead (₹ 5 p.u.)     | 27,000          | 28,800          | 27,600          | 28,200          |
| Total Variable Cost (₹ 70 p.u.)  | 3,78,000        | 4,03,200        | 3,86,400        | 3,94,800        |
| (2) Fixed manufacturing overhead | 45,000          | 45,000          | 45,000          | 45,000          |
| <b>Total Cost</b>                | <b>4,23,000</b> | <b>4,48,200</b> | <b>4,31,400</b> | <b>4,39,800</b> |

**Illustration 28: (Sale Budget)**

Prepare an areawise and productwise sales budget for the following data:

| Product | Jan         | Feb         | March       |
|---------|-------------|-------------|-------------|
| X       | 500 units   | 800 units   | 200 units   |
| Y       | 1,000 units | 1,100 units | 1,500 units |

| Sales area      | Product | January |    |        | February |    |        | March |    |        | unit  | amt    |
|-----------------|---------|---------|----|--------|----------|----|--------|-------|----|--------|-------|--------|
|                 |         | Unit    | SP | amt    | unit     | SP | amt    | unit  | SP | amt    |       |        |
| A               | X       | 100     | 5  | 500    | 160      | 5  | 800    | 40    | 5  | 200    | 300   | 1,500  |
|                 | Y       | 300     | 10 | 3,000  | 330      | 10 | 3,300  | 450   | 10 | 4,500  | 1,080 | 10,800 |
| Total of area A |         | -       | -  | 3,500  | -        | -  | 4,100  | -     | -  | 4,700  | -     | 12,300 |
| B               | X       | 150     | 5  | 750    | 240      | 5  | 1,200  | 60    | 5  | 300    | 450   | 2,250  |
|                 | Y       | 700     | 10 | 7,000  | 770      | 10 | 7,700  | 1050  | 10 | 10,500 | 2,520 | 25,200 |
| Total of area B |         | -       | -  | 7,750  | -        | -  | 8,900  | -     | -  | -      | -     | 27,450 |
| C               | X       | 250     | 5  | 1,250  | 400      | 5  | 2,000  | 100   | 5  | 500    | 750   | 3,750  |
|                 | Y       | -       | 10 | -      | -        | 10 | -      | -     | 10 | -      | -     | -      |
| Total of area C |         | -       | -  | 1,250  | -        | -  | 2,000  | -     | -  | 500    | -     | 3,750  |
| Total of X      |         | 500     | 5  | 2,500  | 800      | 5  | 4,000  | 200   | 5  | 1,000  | 1,500 | 7,500  |
| Total of Y      |         | 1,000   | 10 | 10,000 | 110      | 10 | 11,000 |       | 10 | 15,000 | 3,600 | 36,000 |
| Grand Total     |         | -       | -  | 12,500 | -        | -  | 15,000 | -     | -  | 16,000 | -     | 43,500 |

**Exercise**

- The Bright Ltd. manufactures two brands of pen – one sold under the name of 'bright' and another under name of 'hans'. The sales department of the company has three departments in different areas of country.

The sales budget for the year ending 31st December, 2015 were:

**Bright**

Department I            3,00,000

Department II         5,62,500

Department III        1,80,000

**Hans**

Department I           4,00,000

Department II         6,00,000

Department III        20,000

Sales prices are ₹ 3 and ₹ 1.20 in all departments.

It is estimated that by forced sales promotion the sale of 'Hans' in department I will increase by 1,75,000. It also expected that by increasing production and arranging extensive advertisement department III will be enabled to increase the sale of 'Hans' to 50,000.

It is recognised that the estimated sales by department II represent an unsatisfactory target. It is agreed to increase both estimates by 20%.

Prepare a sales budget for the year to 31st December, 2015.

2. The sales director of a manufacturing company reports that next year he expects to sell 54,000 units of a certain product.

The production manager consults the shopkeeper and casts his figure as follows:

Two kinds of raw material, A and B, are required for manufacturing the product. Each unit of the product required 2 units of A and 3 units of B. The estimated opening balances at the commencement of the next year are:

Finished : 10,000 units

A : 12,000 units

B : 15,000 units

The desirable closing balance at the end of the next year are:

Finished products : 14,000 units

A. : 13,000 units

B. : 16,000 units

Draw up a quantitative chart showing the material purchase budget for the next year.

3. It is estimated that on 1st January, 2015 the Alpha Manufacturing Co. Ltd. will have the following raw material inventory:

| Type of materials | Quantity    | Price (₹) | Amount (₹) |
|-------------------|-------------|-----------|------------|
| L                 | 700         | 3         | 2100       |
| M                 | 15 tons     | 35        | 525        |
| N                 | 1500 kg.    | 0.75      | 1125       |
| O                 | 800 gallons | 1.00      | 800        |
| P                 | 10,500      | 0.20      | 2100       |
|                   |             |           | 6650       |

The management summarised the consumption of different types of raw material for various departments in the following manner:

| Materials | I    | II   | III  | IV   |
|-----------|------|------|------|------|
| L units   | 4500 | —    | 3000 | 500  |
| M tons    | 11   | 3    | —    | 4    |
| N kg      | —    | 600  | 700  | 1350 |
| O gallons | 350  | 700  | —    | —    |
| P units   | 5600 | 6300 | 1500 | 800  |

The following inventory at 31st December, 2015 is desired:

L : 800

M : 7 tons

N : 1050 kg.

O : 750 gallons

P : 600

Assuming that all prices will remain constant, prepare the purchase budget.

4. The golden company plans to sell 1,08,000 units of a certain product line in the first fiscal quarter 1,20,000 units in the second quarter 1,32,000 units in the third quarter and 1,56,000 units in the fourth quarter and 1,38,000 units in the first quarter of the following year. At the beginning of the first quarter of the current year there are 18,000 units of product in the stock. At the end of each quarter, the company plans to have an inventory equal to one sixth of the sales of the sales for the next fiscal year.
5. Shangrilla Foods Products Limited has prepared the following sales budget for the first five Year months of 2015.

Sales budget (in units)

|          |        |
|----------|--------|
| January  | 10,800 |
| February | 15,600 |
| March    | 12,200 |
| April    | 10,400 |
| May      | 9,800  |

The inventory of finished products at the end of every month is to be equal to 25 per cent of the sales estimate for the next month. On 1st January, 2010 there were 2,700 units of product on hand. There is no work in process at the end of any month.

Every unit of product requires two types of materials in the following quantities:

Material A : 4 kg, Material B : 5 kg

Material equal to one half of the next month's production are to be in hand at the end of every month. This requirements was met on 1st January, 2015.

Budgeted prices of the purchase of materials are:

Material A : ₹ 3 per kg., Material B : ₹ 2 per kg.

Prepare a material budget for the first quarter of 2015 in a logical form showing the quantities of each type of material to be purchased every month. Also prepare a purchase budget.

6. The following are the estimated sales of a company for eight months ending 30th October 2015.

| Months     | Estimated sales (units) |
|------------|-------------------------|
| April 2015 | 12,000                  |
| May 2015   | 13,000                  |
| June 2015  | 9,000                   |
| July 2015  | 8,000                   |
| Aug 2015   | 10,000                  |
| Sept. 2015 | 12,000                  |
| Oct. 2015  | 14,000                  |
| Nov. 2015  | 12,000                  |

As a matter of policy the company maintain the closing balance of finished goods and raw materials as follows:

Stock item. Closing balance of month

Finished goods 50% of the estimated sales for the next month

Raw materials estimated consumption for the next month

prepare production budget (in units) and raw material purchase budget (in units and cost) of the company for the half year ending 30th September 2015.

7. Prepare a cash budget for the three months ended 30th September, 2015 based on the following information:

Cash and bank balance as on 1st July, 2015. ₹ 25,000

Salaries and wages estimated monthly. ₹ 10,000

Interest payable – August 2010. ₹ 5,000

| Estimated      | June (₹) | July (₹) | August (₹) | September (₹) |
|----------------|----------|----------|------------|---------------|
| Cash sales     | –        | 1,40,000 | 1,52,000   | 1,21,000      |
| Credit sales   | 1,00,000 | 80,000   | 1,40,000   | 1,20,000      |
| Purchase       | 1,60,000 | 1,70,000 | 2,40,000   | 1,80,000      |
| Other expenses | –        | 20,000   | 22,000     | 21,000        |

Credit sales are collected 50% in the month sales are made and 50% in the month following. Collections from credit sales are subject to 50% discount. If payment is received during the month of purchases and 2½% if payment is received in the following month. Creditors are paid either on a prompt or 30 days basis. It is estimated that 10% of the creditors are in the prompt category.

8. A company expects to have ₹ 37,500 cash in hand on 1st April, 2015 and requires you to prepare an estimate of cash position during the three months, April to June, 2015. The following information is supplied to you:

|          | Sales    | Purchases | Wages  | Factory expenses | Office expenses | Selling expenses |
|----------|----------|-----------|--------|------------------|-----------------|------------------|
| February | 75,000   | 45,000    | 9,000  | 7,500            | 6,000           | 4,500            |
| March    | 84,000   | 48,000    | 9,750  | 8,250            | 6,000           | 4,500            |
| April    | 90,000   | 52,500    | 10,500 | 9,000            | 6,000           | 5,250            |
| May      | 1,20,000 | 60,000    | 13,500 | 11,250           | 6,000           | 6,570            |
| June     | 1,35,000 | 60,000    | 14,250 | 14,000           | 7,000           | 7,000            |

Other information:

1. Period of credit allowed by suppliers – 2 months
2. 20% of sales is for cash and period of credit allowed to customer for credit sales is one month.
3. Delay in payment of all expenses – 1 month
4. Income tax of ₹ 57,500 is due to be paid on June 15th, 2015
5. The company is to pay dividends to shareholders and bonus to worker of ₹ 15,000 and ₹ 22,500 respectively in the month of April.
6. Plans has been ordered to be received and paid in May. It will cost ₹ 1,20,000.

9. Prepare a cash budget of Hypothetic Ltd. From March, 2015 to August, 2015.

|          | Sales    | Selling expenses | Purchases | Wages  | Factory expenses | Administrative expenses |
|----------|----------|------------------|-----------|--------|------------------|-------------------------|
| January  | 1,70,000 | 7,000            | 80,000    | 15,000 | 10,000           | 5,000                   |
| February | 1,60,000 | 7,500            | 84,000    | 16,000 | 11,000           | 5,500                   |
| March    | 1,82,000 | 6,500            | 83,000    | 16,800 | 8,000            | 4,500                   |
| April    | 1,55,000 | 6,800            | 83,000    | 12,000 | 10,500           | 4,750                   |
| May      | 1,65,000 | 7,400            | 76,000    | 18,000 | 12,000           | 5,400                   |
| June     | 2,00,000 | 7,000            | 68,000    | 16,000 | 9,600            | 5,700                   |
| July     | 1,80,000 | 6,000            | 70,000    | 17,000 | 8,000            | 5,000                   |
| August   | 2,20,000 | 5,500            | 58,000    | 16,500 | 9,600            | 5,500                   |

Other information:

- Opening cash balance on 1st March, 2015 – ₹ 20,000
  - Period of credit allowed to customer and by suppliers – one month.
  - Lag in the payment of factory expenses, administrative expenses, and selling expenses – one month
  - Machinery purchased for ₹ 30,000 in march payable on delivery.
  - Building purchased – In April for ₹ 1,50,000 payable in two equal installments in May and July.
  - 5% commission on sales payable two months after sales.
  - Delay in payment of wages – one month
10. The expenses budgeted for production of 100% capacity in a factory are given below:

|                                   | At 100% capacity |
|-----------------------------------|------------------|
| Materials                         | 6,00,000         |
| Labour                            | 2,00,000         |
| Variable expenses (direct)        | 40,000           |
| Variable overheads                | 2,00,000         |
| Fixed overheads                   | 80,000           |
| Administrative expenses (fixed)   | 40,000           |
| Selling expenses (10% fixed)      | 1,20,000         |
| Distribution expenses (20% fixed) | 60,000           |

Prepare a budget for the production of:

- 60% capacity
- 80% capacity

## Questions for Self-practice

### I. Short Question

- What is a budget?
- Who decides the budget period?
- What is budget period?

4. What is the use of a budget?
5. What is budget manual?
6. Give one function of budget committee?
7. What is the basis of sales budget?
8. Mention any two factors which decides production budget?
9. What is flexible budget?
10. Why is budget controller appointed?

## II. Short Notes

1. Budgetary Control
2. Objectives of Budgetary Control
3. Budget Key Factor
4. Flexible Budget
5. Master Budget

## Objective Questions

### I. Fill in the Blanks

1. Budget is drawn for \_\_\_\_\_.
2. Key factor is also known as \_\_\_\_\_.
3. \_\_\_\_\_ requires classifications of cost as fixed, variable and semi-variable.
4. Flexible budget is drawn for \_\_\_\_\_ level of activity.
5. \_\_\_\_\_ budget is prepared for a longer period.
6. \_\_\_\_\_ is a summary of all the functional budgets.
7. \_\_\_\_\_ shows estimate of sales in future.
8. Flexible budget is useful for \_\_\_\_\_.
9. Budget defines \_\_\_\_\_ of a concerned manager.
10. \_\_\_\_\_ shows budgeted receipts and payments.

[Ans.: 1. Future, 2. Limiting factor, 3. Flexible budget, 4. Fixed, 5. Capital, 6. Master budget, 7. Sales budget, 8. Control, 9. Responsibility, 10. Cash budget.]

### II. True or False

1. Budget is prepared for the future period.
2. The scarce factor of production is known as key factor.
3. Flexible budget is drawn for one level of activity.
4. Flexible budget is drawn for multiple levels of activities.
5. A budget is expressed in financial terms only.
6. Capital expenditure budget is prepared for a longer period.
7. Master budget is a summery of all the functional budgets.
8. Budget period depends on management policy.
9. Production budget is expressed in quantity and cost.

10. Sales budget is prepared by production manager.

[Ans.: True: (1, 2, 6, 7, 8, 9), False: (3, 4, 5, 10).]

### III. Match the Columns

| Group 'A'            | Group 'B'                             |
|----------------------|---------------------------------------|
| 1. Budget            | (i) Future oriented                   |
| 2. Key factor        | (ii) Drawn for one level              |
| 3. Fixed budget      | (iii) Drawn for multiple levels       |
| 4. Flexible budget   | (iv) Limiting factors                 |
| 5. Master budget     | (v) Summary of all functional budgets |
| 6. Budgetary control | (vi) Estimates of sales               |
| 7. Sales budget      | (vii) Estimate of production          |
|                      | (viii) Control through budgets        |

[Ans.: 1. (i), 2. (vi), 3. (ii), 4. (iii), 5. (v), 6. (viii), 7. (vii).]

### IV. Multiple Choice Questions

1. One of the following is not a basic element of a budget:
 

|   |  |
|---|--|
| (a) Defines the responsibility of each employee | (b) Comprehensive plan                 |
| (c) Expressed in financial terms                | (d) Future plan for a specified period |
2. Information to prepare flexible budget includes:
  - (a) Total fixed cost, total variable cost
  - (b) Total fixed cost, total variable cost and capacity
  - (c) Total fixed cost, variable cost per unit and several levels of activity.
  - (d) None of the above
3. Flexible budget are useful for
  - (a) Planning purpose only
  - (b) Planning, performance evaluation & feedback control
  - (c) Control of performance only
  - (d) None of the above
4. A flexible budget takes into account
 

|                             |  |
|-----------------------------|--|
| (a) Fixed cost only         | (b) Variable cost only                     |
| (c) Semi-variable cost only | (d) Fixed, variable and semi-variable cost |
5. A budget is prepared for
 

|              |                        |
|--------------|------------------------|
| (a) One year | (b) One month          |
| (c) 6 months | (d) A specified period |
6. Master budget is a summary of
 

|                       |                           |
|-----------------------|---------------------------|
| (a) Cash budget       | (b) Sales budget          |
| (c) Production budget | (d) All functional budget |

7. Budget period depends on  
(a) Type of budget (b) Management policy  
(c) Government policy (d) None of the above
8. Budgetary control system is costly for  
(a) Large organisation (b) Small organisation  
(c) Public sector organisation (d) None of the above
9. Production budget is expressed in  
(a) Quantity only (b) Cost only  
(c) Quantity and cost (d) None of the above
10. Sales budget shows  
(a) Estimate of future sales (b) Estimate of future production  
(c) Estimate of inventory (d) None of the above

[Ans.: 1. (a), 2. (c), 3. (b), 4. (d), 5. (d), 6. (d), 7. (b), 8. (b), 9. (a), 10. (a).]



## OPERATING COSTING

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### Introduction to Operating Costing

Operating costing is a method of costing applied by undertakings which provide service rather than production of commodities. Like unit costing and process costing, operating costing is thus a form of operation costing.

The emphasis under operating costing is on the ascertainment of cost of rendering services rather than on the cost of manufacturing a product. It is applied by transport companies, gas and water works, electricity supply companies, canteens, hospitals, theatres, schools, etc. Within an organisation itself, certain departments too are known as service departments which provide ancillary services to the production departments. For example, maintenance department, power house, boiler house, canteen, hospital, internal transport, etc.

Operation costing offers better scope for control. It facilitates the computation of unit operation cost at the end of each operation by dividing the total operation cost by total input units. It is the category of the basic costing method, applicable, where standardised goods or services result from a sequence of repetitive and more or less continuous operations, or processes to which costs are charged before being averaged over the units produced during the period. The two costing methods included under this head are process costing and service costing.

CIMA has defined 'Operating Costing' "as that form of operation costing which applies when standardised services are provided either by an undertaking or by a service cost center within an undertaking".

Cost Accounting Standard – 1 by ICWA defines 'Operating Cost' "as the cost incurred in conducting a business activity. Operating costs refer to the cost of undertakings, which do not manufacture any product but which provide services".

Because of the varied nature of activities carried out by the service undertaking, the cost system used is obviously different from that followed in manufacturing concerns.

The essential features of operating costs are as follows:

1. The operating costs can be classified under three categories. For example, in the case of transport undertaking, these three categories are as follows:
  - **Operating and running charges:** It includes expenses of variable nature. For example, expenses on petrol, diesel, lubricating oil and grease, etc.
  - **Maintenance charges:** These expenses are of semi-variable nature and include the cost of tyres and tubes, repairs and maintenance, spares and accessories, overhaul, etc.
  - **Fixed or standing charges:** These includes garage rent, insurance, road license, depreciation, interest on capital, salary of operating manager, etc.

The cost unit used is a double unit like passenger-mile; kilowatt-hour, etc. It can be implemented in all firms of transport, airlines, bus service, etc. and by all firms of distribution undertakings.

## Applications of Operating Costing

1. **Transport Service:** Under this method of costing, the operating cost of each vehicle is determined. The common unit of service is tonne kilometer in case of goods transport, and passenger kilometer in case of passenger transport. Examples of transport service are truck operators, road transport, railways, airlines, etc.
2. **Supply Service:** It includes services like electricity, steam, gas, water, etc. where steam is used for the purpose of generating electricity. It is possible to compute the cost of electricity generated by aggregating the steam production costs with other related cost of electricity generation. A cost unit is generally in terms of kilograms.
3. **Welfare Services:** It includes services like canteen, hospital, library, etc. Hotels, restaurants, etc. employ operating costing. The total operation of a hotel can be divided into number of cost centers like restaurant, housekeeping, laundry, etc. The cost unit is generally in terms of per meal/dish.

## Cost Unit

For ascertaining costs, it is necessary to decide suitable cost units for each type of service industry. Basically, Operating Costing is a type of Process Costing. Thus, it uses the methods of Process Costing when ascertaining the cost of supply of electricity, steam, etc. However, sometimes Operating Costing may adopt a particular job as a unit of costs as, for example, when costing a particular trip by a bus so as to quote the charges. In such cases, Operating Costing uses the methods of Job Costing by treating a specific trip as a separate job. A cost unit under operating costing may be of two types:

- (a) Simple cost unit; or
- (b) Composite cost unit.

Following is the list of different cost units used in different types of service enterprises:

| Service Industries  | Simple Cost Unit                 |
|---------------------|----------------------------------|
| Passenger Transport | Per kilometer                    |
| Goods Transport     | Per Kilometer                    |
| Road Maintenance    | Per km of road maintained        |
| Water Supply        | Per kilo liter of water supplied |
| Canteen             | Per meal/dish                    |

| Service Industries  | Composite Cost Unit |
|---------------------|---------------------|
| Passenger Transport | Per passenger km    |
| Goods Transport     | Per ton km          |
| Electricity         | Per kilowatt hour   |
| Steam, Gas          | Per kg/cubic ft     |
| Hospital            | Per patient day     |
| Library             | Per member book     |

Thus, it can be seen that in Operating Costing, in most cases, the cost unit is a compound unit. It refers to both the Quantum of Service and Period of Service. Thus, a transporter charges for carrying so much weight (tons) for so much distance (km); an electricity company charges one for use of both the Quantum (Kilowatt) and the Period (Hours); and so on.

## Transport Costing

Transport operating costs refer to costs that vary with vehicle usage, including fuel, tires, maintenance, repairs, and mileage-dependent depreciation costs (Booz Allen and Hamilton, 1999). Projects that alter vehicle miles travelled, traffic speed and delay, roadway surfaces, or roadway geometry may affect travellers' vehicle operating costs, which should be considered in a benefit-cost analysis.

Vehicle ownership costs refer to fixed costs that are not directly affected by vehicle mileage, including time-dependent depreciation, insurance and registration fees, financing and residential parking.

Projects that change per capita vehicle ownership rates, such as significant changes in the quality of alternative modes and land use accessibility, may affect vehicle ownership costs, which should be considered in benefit-cost analysis.

- Estimate changes in total vehicle miles travelled along a corridor.
- Estimate changes in vehicle travel speeds and delay due to road and traffic conditions.
- Estimate fuel consumption rates, fuel prices, and non-fuel-related operating costs.
- Calculate total changes in vehicle operating costs.
- For improvements to ride quality, such as pothole repairs and curve or grade reductions, estimate effects on vehicle wear.
- Estimate changes in per capita vehicle ownership in an area.
- Estimate average vehicle ownership costs.
- Calculate total changes in vehicle ownership costs.

### COST SHEET for (Month/Year)

| Step | Costs   | ₹         | ₹  |
|------|---|-----------|----|
| A    | Fixed Cost:   |           |    |
|      | Insurance   | XX        |    |
|      | License Fee, Permit Fee and Taxes                                 | XX        |    |
|      | Depreciation  | XX        |    |
|      | Other Fixed Costs (specify)                                       | <u>XX</u> | XX |
| B    | Variable Cost:  |           |    |
|      | Salaries and Wages of Drivers, Cleaners and other Operating Staff |           |    |
|      | Fuel and Lubricants   | XX        |    |
|      | Consumables   | XX        |    |
|      | Amortization Cost of Tyre, Tube and Battery                       | XX        |    |
|      | Laundry   | XX        |    |

|   |                                     |           |           |
|---|-------------------------------------|-----------|-----------|
|   | Spares                              | <u>XX</u> | <u>XX</u> |
| C | Repairs and Maintainable            |           | XX        |
| D | Other Variable Cost (specify)       |           | <u>XX</u> |
| E | <b>Total Operating Cost [A + B]</b> |           | <u>XX</u> |
|   | <b>Profit/Loss</b>                  |           |           |
|   | <b>Revenue [Takings]</b>            |           |           |

Vehicle No. XXX

Carriage Capacity [Seats or Tonnes] XXX

Days Operated XXX

## Hotel Costing

Hotel and lodges, providing daily accommodation facility to general public, have mushroomed all over the country due to the impetus provided by modern civilization to 'travel' both on personal and commercial work.

The Operating Costing is applied in lodging houses in order to find out the cost of accommodation provided.

The convenient form measuring the accommodation facility is in terms of 'Room day'.

Cost per room day means the cost of maintaining one room in usable condition for one day when occupied.

When different classes of rooms are provided, they can be expressed in terms of a single class with the help of weights based on appropriate width.

While determining the cost per room day, factors such as room accommodation available, whether cubicles or dormitories, number of persons lodging, facilities provided to the lodgers, etc. are to be taken into account.

Most of the costs in the lodging houses are fixed in nature like depreciation, staff salaries, maintenance, etc.

Hence, the distinctions between fixed and operating charges are rarely observed. In case the customers are provided food and drinks along with accommodation facility, a separate charge may be levied from them.

The cost per room day is arrived at by dividing the total cost with the number of room day.

Some amount of profit is added to the cost per room per day to determine charge per room day.

Once the charge per room day is determined, the same is to be multiplied with the assigned weights to arrive at the rate to be charged for different classes of room per day.

Hotels and restaurants employ operating costing. The total operation of a hotel is divided into number of cost centers.

Restaurant – cost unit is number of meals served.

Housekeeping – cost unit is number of rooms cleaned.

Laundry – cost unit is number of clothes washed.

The important heads of expenditure is:

Provisions: Vegetables, fruits, meat, flour, milk, oil and sugar.

Labour: Salary of cooks, kitchen assistance, supervisors.

Service: Steam, gas, electricity, power and light.

Consumable stores: Crockery, glassware.

Misc. overheads: Rent, rates, depreciation, insurance.

Credit: Charges of meals, tea and other sales.

#### Cost Sheet for the Year/Month

| Step | Costs                         | ₹  | ₹  |
|------|-------------------------------|----|----|
|      | Salaries to Staff             |    | XX |
|      | Room Attendant Wages          |    | XX |
|      | Repairs and Renovation        |    | XX |
|      | Lighting and Heating          |    | XX |
|      | Power                         |    | XX |
|      | Linen                         |    | XX |
|      | Interior Decoration           |    | XX |
|      | Sundries                      |    | XX |
|      | Depreciation:                 |    |    |
|      | – Buildings                   | XX |    |
|      | – Furniture and Fixtures      | XX |    |
|      | – Air-conditioners            | XX | XX |
|      | Premises Rent                 |    | XX |
|      | Other Administration Expenses |    | XX |
|      | Interest on Investment        |    | XX |
|      | Total Operating Cost (1)      |    | XX |
|      | No. of Room Days(2)           |    | XX |
|      | Cost per Room Day (1 + 2)     |    | XX |

## Hospital Costing

A concern of most countries is health sector resources: the sources of finance for health services, the ability to maintain past funding levels, resource allocation patterns, and the efficiency of health services delivery. The hospitals of these countries are an important element of the concern about health resources because they are the largest and most costly operational unit of these health systems and account for a large portion of the health sector's financial, human and capital resources. In aggregate terms,

- hospitals utilise nearly half of the total national expenditure for the health sector;
- hospitals commonly account for 50% to 80% of government recurrent health sector expenditure;

- hospitals use a large proportion of the most highly trained health personnel.

A hospital is engaged in providing various types of medical services to the patients.

Hospital costing is applied to decide the cost of these services. A hospital may have the following departments for providing various types of services:

### 1. Outdoor Patient Department (OPD)

- Indoor Patient Department (Medical Wards).
- Medical Services Department:
  - X-ray Department,
  - Scanning Centre,
  - Pathology Laboratory,
  - Sonography Department.
- General Services Departments:
  - Boiler House,
  - Power House,
  - Catering Department,
  - Laundry Room,
  - Administrative Department,
- Miscellaneous Services Departments:
  - Transport Department,
  - Dispensary Department,
  - General Porting Department.

### Unit of Cost

The common units of costs of various departments in a hospital are as follows:

| Department                    | Unit of Cost            |
|-------------------------------|-------------------------|
| 1. Outdoor Patient Department | Per Outpatient          |
| 2. Indoor Patient Department  | Per Room Day            |
| 3. X-ray Department           | Per 100 Units           |
| 4. Scanning Centre            | Per Case                |
| 5. Pathology Laboratory       | Per 100 Requests        |
| 6. Laundry Department         | Per 100 Items Laundered |
| 7. Catering Department        | Per Patient Per Week    |

The cost of hospital is divided into fixed and variable costs. Fixed costs include staff salaries, depreciations of building, rent of building whereas variable cost include light and power, water, laundry charges, food supplied to patients, etc.

### Why are Hospital Costs Important?

Hospital cost information is derived by relating the inputs of resources in monetary terms to the outputs of services provided by the hospital. Cost information is part of the basic information needed by managers and policymakers for making decisions about how to improve the performance of a hospital, where to allocate the resources within or among hospitals, or to compare the performance of different hospitals to one another. Some of the basic reasons for wanting cost information are to improve efficiency, increase effectiveness, enhance sustainability and improve quality.

### How Does One Do a Hospital Costing Exercise?

The process of determining the costs of a hospital involves six steps:

1. Defining the major and relevant activity areas of the hospital.
2. Gathering information on the services provided or the output of the hospital.
3. Determining the labour and other recurrent costs.
4. Ascertaining the capital costs of the hospital.
5. Allocating indirect costs.
6. Reviewing and using the hospital cost summary.

### Illustrations

**Illustration 1:** From the following information, prepare operating cost statement for Hotel “Sea Link” and also suggest room rent to be charged per day so that owner earns profit @ 20% on capital employed ₹ 75,70,000:

- (a) Staff salaries ₹ 4,00,000 p.a.
- (b) Room attendant charges ₹ 200 per day per room when occupied.
- (c) Power ₹ 250 p.m. per room when occupied during summer and ₹ 150 p.m. per room when occupied during winter.
- (d) Repairs to building ₹ 30,000 p.a.
- (e) Sundries ₹ 1,50,000 p.a.
- (f) Furnishings ₹ 80,000 p.a.
- (g) Depreciate building at 10% p.a. on ₹ 40,00,000 and furniture on ₹ 10,00,000 at 15% p.a.

There are 200 rooms in the hotel. 60% of the rooms are occupied in summer and 20% of the rooms are occupied in winter.

During the year, summer is 7 months and winter is of 5 months. Assume 30 days a month.

**Solution:**

#### Operating Cost Statement of Hotel Sea Link (for the year)

| Particulars                 | ₹        | ₹ |
|-----------------------------|----------|---|
| <b>Fixed Cost Per Annum</b> |          |   |
| Staff Salaries              | 4,00,000 |   |
| Repairs to Building         | 30,000   |   |
| Sundries                    | 1,50,000 |   |
| Furnishings                 | 80,000   |   |

|   |           |           |
|---|-----------|-----------|
| Depreciation on Building  | 4,00,000  |           |
| Depreciation on Furniture   | 1,50,000  |           |
|   |           | 12,10,000 |
| <b>Variable Costs Per Annum</b>   |           |           |
| Room Attendant Charges<br>(Summer = $200 \times 60\% = 120 \times 7 \times 30 \times 200$ )<br>(Winter = $200 \times 20\% = 40 \times 5 \times 30 \times 200$ ) | 62,40,000 |           |
| Power<br>(Summer = $200 \times 60\% = 120 \times 7 \times 250$ )<br>(Winter = $200 \times 20\% = 40 \times 5 \times 150$ )                                      | 2,40,000  | 64,80,000 |
| Total Operating Cost for the Year   |           | 76,90,000 |
| Add: Profit (20% on ₹ 75,70,000)  |           | 15,14,000 |
| Total Taking for the Year   |           | 92,04,000 |

Total Occupancy during the Year:

$$\text{Summer} = 200 \times 60\% = 120 \times 7 \times 30 = 25,200$$

$$\text{Winter} = 200 \times 20\% = 40 \times 5 \times 30 = \underline{6,000}$$

$$\text{Total} = \underline{31,200}$$

$$\text{Room Rent per day per room} = 92,04,000/31,200 = \underline{\underline{₹ 925}}$$

**Illustration 2:** A truck carries 20 tonnes load from point 'P' and unloads 4 tonnes at point 'Q' and unloads the balance at point 'R'. It returns with 8 tonnes load from point 'R' to 'P'. Distance between P to Q is 40 kms, Q to R is 60 kms and R to P is 80 kms.

You are required to calculate Absolute Tonnes Kilometre.

**Solution:** Absolute tonnes kilometre =  $20 \times 40 + 16 \times 60 + 8 \times 80 = 2,400$

**Illustration 3:** Raj Transport Company supplies the following details in respect of a Truck of 5 tonne capacity:

|                             |                   |
|-----------------------------|-------------------|
| Cost of the Truck           | ₹ 10,00,000       |
| Estimate Useful Life        | 10 years          |
| Estimated Scrap Value       | ₹ 1,00,000        |
| Diesel, Oil and Grease      | ₹ 3 per km        |
| Repairs and Maintenance     | ₹ 5,000 per month |
| Driver's Wages              | ₹ 5,000 per month |
| Cleaner's Wages             | ₹ 2,500 per month |
| Insurance                   | ₹ 48,000 p.a.     |
| Tax                         | ₹ 24,000 p.a.     |
| General Supervision Charges | ₹ 48,000 p.a.     |

The truck carries goods to and from the city covering a distance of 50 kms one way. On outward trip, freight is available to the extent of full capacity and on return 20% of capacity.

Assuming that the truck makes 25 round trips a month on an average, compute:

- (a) Operating cost per tonne km.  
 (b) Rate per tonne km that the company should charge if a profit of 50% on freight is to be earned.

**Solution:**

**Raj Transport Operating Cost Statement of a Truck**

| Particulars   | ₹        | ₹                                     |
|---|----------|---------------------------------------|
| <b>Fixed Cost Per Annum</b>                           |          |                                       |
| Depreciation  | 90,000   |                                       |
| Insurance   | 48,000   |                                       |
| Tax   | 24,000   |                                       |
| General Supervision Charges                           | 48,000   |                                       |
| Average Fixed Cost per Month (2,10,000/12)            | 2,10,000 | 17,500                                |
| <b>Fixed Cost per Month</b>                           |          |                                       |
| Repairs and Maintenance                               | 5,000    |                                       |
| Driver's Wages  | 5,000    |                                       |
| Cleaner's Wages                                       | 2,500    |                                       |
| Monthly Fixed Cost                                    |          | 12,500                                |
| <b>Variable Costs Per Annum</b>                       |          |                                       |
| Diesel, Oil and Grease (50 × 2 × 25) = 2,500 kms × 3  |          | 7,500                                 |
| Total Operating Cost for the Month                    |          | 37,500                                |
| Total Tonne km during the Month                       |          |                                       |
| Outward = 5 × 50 × 25 = 6,250                         |          |                                       |
| Return = 5 × 20% × 50 × 25 = 1,250                    |          |                                       |
| Total tonne kms = 7,500                               |          |                                       |
| Operating Cost per tonne km                           |          | 37,500/7,500                          |
| Rate per tonne km considering Profit @ 50% on Freight |          | ₹ 5 per tonne km<br>₹ 10 per tonne km |

**Illustration 4:** Mr. X runs Atithi Inn which has 20 rooms and each room has maximum capacity of 5 beds. 80% of the rooms were fully occupied for the whole year and 20% of the rooms were occupied by the customers to the extent of 50% of the room capacity. Assume a year comprises of 360 days.

The following costs were incurred during the year ended 31-12-2012:

| Particulars       | ₹        |
|-------------------|----------|
| Salaries to Staff | 3,00,000 |
| Rates and Taxes   | 2,95,600 |
| Electricity       | 3,20,000 |
| Depreciation on:  |          |
| Building          | 1,80,000 |
| Furniture         | 30,000   |
| Equipments        | 40,000   |
| Sundry Expenses   | 76,000   |

A room attendant is paid @ ₹ 36 per day per room when occupied.

Food cost ₹ 30 per customer per day.

Ascertain the amount to be charged per customer per day to cover both, accommodation and food costs, plus profit @ 10% return on capital employed which is ₹ 31,36,000.

**Solution:**

**Operating Cost Statement of Atithi Inn for the year ended 31-12-2012**

| Particulars                              | ₹        | ₹         |
|--|----------|-----------|
| <b>Fixed Cost Per annum</b>              |          |           |
| Staff Salaries                           | 3,00,000 |           |
| Rates and Taxes                          | 2,95,600 |           |
| Electricity                              | 3,20,000 |           |
| Sundry Expenses                          | 76,000   |           |
| Depreciation on Building                 | 1,80,000 |           |
| Depreciation on Furniture                | 30,000   |           |
| Depreciation on Equipments               | 40,000   | 12,41,600 |
| <b>Variable Costs Per annum</b>          |          |           |
| Room Attendant Charges (20 × 360 × 36)   | 2,95,200 |           |
| Food Cost:                               |          |           |
| (20 × 80% × 4 × 360 × 30) = 6,91,200     |          |           |
| (20 × 20% × 4 × 50% × 360 × 30) = 86,400 | 7,77,600 | 10,36,800 |
| Total Operating Cost for the Year        |          | 22,78,400 |
| <b>Add: Profit @ 10% on ₹ 31,36,000</b>  |          | 3,13,600  |
| Total Takings for the Year               |          | 25,92,000 |

Total Customers for the Year =  $(20 \times 80\% \times 4 \times 360) + (20 \times 20\% \times 4 \times 50\% \times 360) = 25,920$

Charges per Customer per Day =  $25,92,000 / 25,920 = ₹ 100$

**Illustration 5:** Star Transport Company has a fleet of 30 buses. 20 buses with carrying capacity of 50 passengers each and 10 buses with carrying capacity of 40 passengers each. Each bus makes four trips per day covering a distance of 10 kms in each trip. On an average, 80% of the seats are occupied in each trip and 5 buses are under repairs every day.

The total cost incurred as under:

|                       |          |           |
|-----------------------|----------|-----------|
| Salary of 30 Drivers  | 3,000    | each p.m. |
| Salary of 30 Cleaners | 1,000    | each p.m. |
| Diesel Expenses       | 4,15,000 | p.m.      |
| Oil, Grease, etc.     | 5,600    | p.m.      |
| Tyres, Tubes, etc.    | 2,500    | p.m.      |
| Repairs               | 30,000   | p.a.      |
| Garage Rent           | 42,000   | p.a.      |
| Road Licenses         | 21,000   | p.a.      |

|                             |        |               |
|-----------------------------|--------|---------------|
| Taxes                       | 5,400  | per half year |
| Interest                    | 27,000 | p.a.          |
| Salary of Operating Manager | 5,100  | p.m.          |
| Office Overheads            | 10,800 | p.a.          |

Assuming that the company operates its fleet 30 days a month, you are required to:

- (a) Prepare operating cost statement for a month.
- (b) Ascertain operating cost per passenger km.
- (c) Determine the fare per passenger km to yield a profit of 50% on fare.

**Solution:**

**Operating Cost Sheet (for the year)**

| Particulars                                   | ₹         | ₹                |
|---|-----------|------------------|
| <b>A. Fixed/Standing Charges:</b>             |           |                  |
| Road Licence                                  | 21,000    |                  |
| Taxes (5,400 × 2)                             | 10,800    |                  |
| Interest                                      | 27,000    |                  |
| Wages of 30 Drivers (30 × 3,000 × 12)         | 10,80,000 |                  |
| Wages of 30 Cleaners (30 × 1,000 × 12)        | 3,60,000  |                  |
| Salary of Operating Manager (5,100 × 12)      | 61,200    |                  |
| General Supervision Charges (Office Overhead) | 10,8000   |                  |
| Garage Rent                                   | 42,000    |                  |
|   |           | 16,12,800        |
| <b>B. Running or Operating Charges:</b>       |           |                  |
| Diesel (4,15,000 × 12)                        | 49,80,000 |                  |
| Oil, Grease, etc. (5,600 × 12)                | 67,200    |                  |
| Tyres, Tubes, etc. (2,500 × 12)               | 30,000    |                  |
| Repairs                                       | 30,000    |                  |
|   |           | 51,07,200        |
| <b>Total Operation Cost</b>                   |           | <b>67,20,000</b> |

$$\begin{aligned}
 \text{Effective Passenger km} &= (20 \times 50) + (10 \times 40) \\
 &= 1,000 + 400 \\
 &= 1,400 \text{ effective passenger}
 \end{aligned}$$

$$\begin{aligned}
 \text{(a) } 1,400 \times 4 \text{ trips} \times 10 \text{ kms} \times \frac{80}{100} \times \frac{25}{30} \times 365 \\
 = 1,36,26,666 \text{ passenger kms}
 \end{aligned}$$

$$\text{(b) Cost per passenger km} = \frac{67,20,000}{1,36,26,666} = ₹ 0.49315$$

$$(c) \text{ Fare Rate per passenger km} = \frac{0.49315}{1} \times \frac{100}{50} = ₹ 0.9863$$

**Illustration 6:** The following expenses were incurred by Reliable Transport Company in operating two trucks (for the conveyance of raw materials) and a bus (for the conveyance of staff) during the month of March, 2012:

| Particulars              | Monthly Cost in ₹ |             |        |
|--------------------------|-------------------|-------------|--------|
|                          | Truck No. 1       | Truck No. 2 | Bus    |
| Driver's Salaries        | 8,000             | 8,500       | 9,000  |
| Cleaner's Wages          | 4,000             | 5,000       | 4,000  |
| Diesel                   | 17,000            | 19,000      | 11,000 |
| Oil                      | 500               | 600         | 500    |
| Administrative Overheads | 3,000             | 2,000       | 3,000  |
| Depreciation             | 15,000            | 18,000      | 20,000 |
| Supervision              | 6,000             | 6,000       | 6,000  |
| Garage Rent              | 2,000             | 2,500       | 2,000  |
| Road and Other Taxes     | 4,000             | 4,000       | 3,000  |
| Other Fixed Overheads    | 3,500             | 4,000       | 2,000  |

The above vehicles carried the following raw materials and passengers:

Truck No. 1 : 100 tonnes of raw material carried evenly spreadover 25 days during the month

Truck No. 2 : 120 tonnes of raw material carried evenly spreadover 25 days during the month

Bus : 25 passengers daily for 25 days during the month

Total running of the vehicles distributed evenly spreadover 25 days during the month:

Truck No. 1 : 7,200 kms

Truck No. 2 : 10,000 kms

Bus : 2,000 kms

From the above information, prepare Operating Cost Sheet for three vehicles and calculate:

(a) Cost per tonne km per day for Truck No. 1 and Truck No. 2.

(b) Cost per passenger km per day for Bus.

**Solution:**

Operating Cost Sheet

A 4 tonnes × 25 days × 300 kms = 30,000 tonnes kms

B 4.8 tonnes × 25 days × 400 kms = 48,000 tonnes kms

C 25 × 25 days × 80 kms = 50,000 passenger kms

| Particulars                         | A             | B                | C                   |
|-------------------------------------|---------------|------------------|---------------------|
|                                     | Truck 1       | Truck 2          | Bus                 |
| <b>Fixed Expenses (Standing):</b>   |               |                  |                     |
| Road and Other Taxes                | 3,000         | 2,000            | 3,000               |
| Supervision                         | 6,000         | 6,000            | 6,000               |
| Garage (Rent)                       | 2,000         | 2,500            | 2,000               |
| Other Fixed Overheads               | 3,500         | 4,000            | 2,000               |
| Driver's Salaries                   | 8,000         | 8,500            | 9,000               |
| Depreciation                        | 15,000        | 18,000           | 20,000              |
| <b>Variable Expenses (Running):</b> |               |                  |                     |
| Cleaner's Wages                     | 4,000         | 5,000            | 4,000               |
| Diesel                              | 17,000        | 19,000           | 11,000              |
| Oil                                 | 500           | 600              | 500                 |
| <b>Total Operating Cost</b>         | <b>63,000</b> | <b>69,600</b>    | <b>60,500</b>       |
| Cost per km                         | <u>63,000</u> | <u>69,600</u>    | <u>60,500</u>       |
|                                     | 30,000        | 48,000           | 50,000              |
|                                     | ₹ 2.1 per km  | ₹ 1.45 per tonne | ₹ 1.2 per passenger |

**Illustration 7:** Promod Automobiles has been distributing goods to its prominent customer situated at a place 40 kms, away from its own place using a single truck. The truck has been purchased at a cost of ₹ 7,50,000 (excluding tyres), and has a capacity of carrying 10 tonnes of load of goods. It makes the journey twice a day carrying its full load on the outward journey whereas it returns empty. The truck operates five days in a week.

The following is the relevant data for a month equated to a four weekly period.

|                           | ₹   |
|---------------------------|---|
| Insurance                 | 9,000 per annum                           |
| Licence, Road tax, etc.   | 4,000 per annum                           |
| Garage Rent               | 1,500 per week                            |
| Repairs and Maintenance   | 500 per week                              |
| Tyres and Tubes           | 20,000 (Life: 25,000 kms.)                |
| Other Overheads Allocated | 60,000                                    |
| Driver's Remuneration     | 800 per week                              |
| Oil                       | 300 per week                              |
| Petrol                    | 25 per litre (consumed @ 8 kms per litre) |

The effective life of the vehicle is worth running 80,000 kms at the end of which the vehicle will have scrap value of ₹ 25,000.

You are required to submit a statement showing the total cost for a month and decide the fare to be charged per tonne km that allows 20% profit on fares.

**Solution:****Operating Cost Statement (for 4 Weeks)**

| Particulars   | Per 4 weeks   |
|---|---------------|
| <b>Fixed Costs:</b>   |               |
| Oil (300 × 4)   | 1,200         |
| Driver's Wages (800 × 4)  | 3,200         |
| Repairs (500 × 4)   | 2,000         |
| Garage Rent (1500 × 4)  | 6,000         |
| Licence Cost (4,000/12 months)  | 1,333         |
| Other Overheads (60,000/12 months)  | 5,000         |
| Insurance (9,000/12 months)   | 750           |
| (A)   | 18,483        |
| <b>Running Costs:</b>   |               |
| Petrol<br>(40 km × 2 × 2 = 160 km per day)<br>(160 km × 5 days × 4 weeks × ₹ 25/8)                          | 10,000        |
| Depreciation on Lorry<br>(160 km × 5 days × 4 weeks = 3,200 km)<br>(7,50,000 – 25,000) × 3200 km/80,000 km) | 29,000        |
| Depreciation on Tyres (20,000 × 3200 km/25,000 km)  | 2,560         |
| (B)   | 41,560        |
| <b>Total Cost = (A) + (B)</b>   | <b>60,043</b> |

Vehicle cost per km = 60,043/3200 km = ₹ 18.76 per km.

Tonne km = 40 km × 10 tonnes × 2 trips × 5 days × 4 weeks = 16,000 tonnes per km

Vehicle cost per tonne km = ₹ 60,043/16,000 = ₹ 3.75 per tonne km

Add: Profit (25% of 3.75) = 0.94 = 4.69 per ton/km – fare

**Illustration 8:** Mr. Hakim runs a tempo service in the town and has three vehicles. He furnishes you the following data and wants you to compute the cost per running mile:

| Particulars                      | Vehicle A<br>₹ | Vehicle B<br>₹ | Vehicle C<br>₹ |
|----------------------------------|----------------|----------------|----------------|
| Cost of Vehicle                  | 25,000         | 15,000         | 50,000         |
| Road License Fee per year        | 750            | 750            | 750            |
| Supervision Salary (yearly)      | 1,800          | 1,200          | 1,500          |
| Driver's Wage per hour           | 4              | 4              | 4              |
| Cost of Fuel per litre           | 1.50           | 1.50           | 1.50           |
| Repairs and Maintenance per mile | 1.50           | 2.00           | 3.00           |
| Tyre Cost per mile               | 1.00           | 0.80           | 1.20           |
| Garage Rent per year             | 1,600          | 550            | 1,000          |

|                             |                   |                 |                   |
|-----------------------------|-------------------|-----------------|-------------------|
| Insurance Premium yearly    | 850               | 500             | 1,500             |
| Miles Run per litre         | 6                 | 5               | 4                 |
| Mileage Run during the year | 15,000            | 6,000           | 9,000             |
| Estimated Life of Vehicles  | 1,00,000<br>miles | 75,000<br>miles | 1,20,000<br>miles |

Charge interest at 10% p.a. on the cost of vehicle. The vehicles run 20 miles per hour on an average:

**Solution:**

**Statement of Operating Cost**

| Particulars                       | Vehicle A   | Vehicle B                 | Vehicle C |   |                           |                         |                           |      |      |       |
|-----------------------------------|---|---------------------------|-----------|---|---------------------------|-------------------------|---------------------------|------|------|-------|
| Cost of Vehicle                   | 25,000  | 15,000                    | 50,000    |   |                           |                         |                           |      |      |       |
| <b>Standing/Fixed Expenses:</b>   |   |                           |           |   |                           |                         |                           |      |      |       |
| Road Licence Fees                 | 750   | 750                       | 750       |   |                           |                         |                           |      |      |       |
| Supervision and Salary            | 1,800   | 1200                      | 1500      |   |                           |                         |                           |      |      |       |
| Garage Rent                       | 1,600   | 550                       | 1000      |   |                           |                         |                           |      |      |       |
| Insurance                         | 850   | 500                       | 1500      |   |                           |                         |                           |      |      |       |
| Interest @ 10% of Cost            | 2,500   | 1500                      | 5000      |   |                           |                         |                           |      |      |       |
| Total                             | 7,500   | 4500                      | 9750      |   |                           |                         |                           |      |      |       |
| Mileage per annum (miles)         | 15,000  | 6000                      | 9000      |   |                           |                         |                           |      |      |       |
| Fixed Expenses per mile           | 0.50  | 0.75                      | 1083      |   |                           |                         |                           |      |      |       |
| <b>Running/Variable Expenses:</b> |   |                           |           |   |                           |                         |                           |      |      |       |
| Driver's Wages (₹ 4/20)           | 0.20  | 0.20                      | 0.20      |   |                           |                         |                           |      |      |       |
| Fuel Costs                        | 0.25  | 0.30                      | 0.375     |   |                           |                         |                           |      |      |       |
| Depreciation                      | <table style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">B</td> <td style="text-align: center;">C</td> </tr> <tr> <td style="text-align: center;"><math>\frac{25,000}{1,00,000}</math></td> <td style="text-align: center;"><math>\frac{15,000}{75,000}</math></td> <td style="text-align: center;"><math>\frac{50,000}{1,20,000}</math></td> </tr> </table> | A                         | B         | C | $\frac{25,000}{1,00,000}$ | $\frac{15,000}{75,000}$ | $\frac{50,000}{1,20,000}$ | 0.25 | 0.20 | 0.417 |
| A                                 | B   | C                         |           |   |                           |                         |                           |      |      |       |
| $\frac{25,000}{1,00,000}$         | $\frac{15,000}{75,000}$   | $\frac{50,000}{1,20,000}$ |           |   |                           |                         |                           |      |      |       |
| Tyre Cost/Mile                    | 1.00  | 0.80                      | 1.20      |   |                           |                         |                           |      |      |       |
| Repairs and Maintenance Cost/Mile | 1.50  | 2.00                      | 3.00      |   |                           |                         |                           |      |      |       |
| Operating Cost/Mile               | 3.70  | 4.25                      | 6.275     |   |                           |                         |                           |      |      |       |

**Illustration 9:** Relax Hotel has a capacity of 100 single rooms and 20 double rooms. The average occupancy of both single and doubled rooms is expected to be 80% throughout the year of 365 days. The rent for the doubled room has been fixed at 125% of the rent of the single room. The cost are as under:

- Variable cost : Single rooms ₹ 220 each per day  
Double rooms ₹ 350 each per day
- Fixed cost : Single rooms ₹ 120 each per day  
Double rooms ₹ 250 each per day

Calculate the rent chargeable for single and double rooms per day in such a way that the hotel earns overall profit of 20% on hire charges of rooms.

**Solution:**

$$\text{Single Rooms} = 100 \times 365 \times \frac{80}{100} = 29,200 \text{ room days}$$

$$\text{Doubled Rooms} = 20 \times 365 \times \frac{80}{100} = 5,840 \text{ room days}$$

| (a) | Computation of Total Cost                  | ₹                  |
|-----|--|--------------------|
| A.  | Variable Cost                              |                    |
|     | Single Rooms (29,200 room days × ₹ 220)    | 64,24,000          |
|     | Double Rooms (5,840 room days × ₹ 350)     | 20,44,000          |
|     |  | 84,68,000          |
| B.  | Fixed Cost                                 |                    |
|     | Single Rooms (29,200 room days × ₹ 120)    | 35,04,000          |
|     | Double Rooms (5,840 room days × ₹ 250)     | 14,60,000          |
|     |  | 49,64,000          |
|     | <b>Total Cost (A + B)</b>                  | <b>1,34,32,000</b> |
| C.  | Profit (20% on Revenue, i.e., 25% on Cost) | 33,58,000          |
| D.  | Total revenue                              | 1,67,90,000        |

$$\text{Single Rooms } (29,200 \times 1) = 29,200$$

$$\text{Doubled Room } (5,840 \times 1.25) = 7,300$$

$$\text{Notional single room per day} = 36,500$$

$$\text{Rent per day per single room} = \frac{1,67,90,000}{36,500} = ₹ 460$$

$$\text{Rent per day per double room} = ₹ 460 \times 1.25 = ₹ 575$$

**Illustration 10:** A transport company supplies following details in respect of a truck of 5 tonne capacity which carries goods to and from the city covering a distance of 50 kms each way.

| Particulars                               | ₹        |
|---|----------|
| Cost of Truck                             | 1,80,000 |
| Diesel, Oil, Grease (Per Trip Each Way)   | 30       |
| Repairs and Maintenance (Per Month)       | 1,500    |
| Driver's (Monthly) Wages                  | 1,500    |
| Cleaner's-cum-Attendant's Wages (Monthly) | 750      |
| Insurance (Per Year)                      | 9,000    |
| Road License (Per Year)                   | 3,000    |
| General Supervision Charges (Per Year)    | 6,000    |
| Estimated Life (Years)                    | 10       |

While going to the city, freight is available for a full load of the truck and on its return journey, it can fetch freight only up to 20% of its capacity.

On the assumption that the truck runs on an average 25 days a month, you are required to determine the following:

- Operating cost per tonne km.
- Rate per tone per trip that the company should charge if profit of 100% on cost is to be earned.
- What freight should the company charge if one wants to engage the truck for one day for trip to the city and back?

**Solution:**

### Operating Cost Statement

| Particulars   | Total Cost p.m. 7,500 ton km (₹) | Cost per ton km (₹) |
|---|----------------------------------|---------------------|
| <b>A. Standing Charges:</b>                               |                                  |                     |
| Driver Wages  | 1,500                            | 0.200               |
| Cleaner-cum-Attendant Wages                               | 750                              | 0.100               |
| Insurance $\left(\frac{9,000}{12}\right)$                 | 750                              | 0.100               |
| Road License $\left(\frac{3,000}{12}\right)$              | 250                              | 0.033               |
| General Supervision $\left(\frac{6,000}{12}\right)$       | 500                              | 0.67                |
| Total   | 3,750                            | 0.500               |
| <b>B. Running Charges:</b>                                |                                  |                     |
| Depreciation $\left(\frac{1,80,000}{12 \times 10}\right)$ | 1,500                            | 0.200               |
| Diesel, Oil and Grease (30 × 50 trips)                    | 1,500                            | 0.200               |
| Repairs and Maintenance                                   | 1,500                            | 0.200               |
| Total   | 4,500                            | 0.600               |
| <b>C. Total Cost per ton kms (A + B)</b>                  | <b>8,250</b>                     | <b>1.100</b>        |

**Working Notes:**

- (i) Determination of tonne km per month

$$\text{Trip to city: } 50 \text{ km} \times 5 \text{ tonne capacity} \times 25 \text{ days} = 6,250$$

$$\text{Return: } 50 \text{ km} \times 25 \text{ days} \times 1 \text{ ton} = 1,250$$

$$\underline{\underline{7,500 \text{ km}}}$$

- (ii) Determination of Freight Rate:

$$\text{Cost per tonne} = ₹ 1.10$$

|                                  |   |      |
|----------------------------------|---|------|
| Add: Desired profit 100% of cost | = | 1.10 |
| Freight Rate/ton km              | = | ₹ 2. |

**Illustration 11:** From the following information relating to a hotel, calculate the room rent to be charged to give a profit of 25% on cost excluding interest charged on loan for the year ended 31st March, 2009:

- (a) Salaries of office staff ₹ 50,000 per month.
- (b) Wages of the room attendant: ₹ 20 per day per room. When the room is occupied.
- (c) Lighting, Heating and Power
  - (i) The normal lighting expenses for a room for the full month is ₹ 500, when occupied.
  - (ii) Power is used only on the winter and the charges ₹ 200 for a room, when occupied.
- (d) Repairs to beds and other furniture: ₹ 30,000 per annum.
- (e) Repairs to hotel building: ₹ 50,000 per annum.
- (f) License fees: ₹ 12,400 per annum.
- (g) Sundries: ₹ 10,000 per annum.
- (h) Interior decoration and furnishing: ₹ 1,00,000 per annum.
  - (i) Depreciation @ 5% p.a. is to be charged on building costing ₹ 20,00,000/- and @ 10% on Equipment.
  - (j) Interest to be charged @ 6% p.a. on investment in buildings and equipment amounting ₹ 25,00,000/-.
- (k) There are 200 rooms in the hotel, 80% of the rooms are generally occupied in summer, 60% in winter and 30% in rainy season.

The period of summer, winter and rainy season may be considered to be of 4 months in each case. A month may be assumed of 30 days on an average.

**Solution:**

#### Operating Cost Statement

| Particulars                         | p.a. ₹   |
|-------------------------------------|----------|
| Office Staff Salaries (50,000 × 12) | 6,00,000 |
| Room Attendant Wages (see WN 1)     | 8,16,000 |
| Lighting and Heating (WN 2)         | 6,80,000 |
| Power (WN 3)                        | 96,000   |
| Repairs to Beds and Other Furniture | 30,000   |
| Repairs to Building                 | 50,000   |
| License Fee                         | 12,400   |
| Sundries (10,000 × 12)              | 1,20,000 |
| Interior Decoration and Furnishing  | 1,00,000 |
| Depreciation:                       |          |
| Building @ 5% of 20,00,000          | 1,00,000 |
| Equipment @ 10% of 55,00,000        | 50,000   |
|                                     | 1,50,000 |

|   |           |
|---|-----------|
| Interest on 25,00,000 @ 6%  | 1,50,000  |
| Total Cost  | 28,04,400 |
| Add: Profit 25% on Cost (excluding Interest on loan) 25% of 26,54,400 | 6,63,600  |
| Total Takings   | 34,68,000 |

$$\text{Room rent to be charged per day} = \frac{34,68,000}{40,800} = ₹ 85$$

**Working Notes:**

|                                       | ₹               |
|---------------------------------------|-----------------|
| 1. Room Attendant Wages = 40,800 × 20 | = 8,16,000      |
| 2. Lighting and Heating:              |                 |
| Summer = 500 × 4 months × 200 × 80%   | = 3,20,000      |
| Winter = 500 × 4 months × 200 × 60%   | = 2,40,000      |
| Rainy = 500 × 4 months × 200 × 30%    | = 1,20,000      |
|                                       | <u>6,80,000</u> |
| 3. Power = 200 × 4 months × 200 × 60% | = <u>96,000</u> |

**Rooms Days:**

|   |                |
|---|----------------|
| Summer = 200 × 4 months × 30 days × 80% | = 19,200       |
| Winter = 200 × 4 months × 30 days × 60% | = 14,400       |
| Rainy = 200 × 4 months × 30 days × 30%  | = <u>7,200</u> |
| Total Room Days                         | <u>40,800</u>  |

**Illustration 12:** A person owns a bus that runs between Mumbai and Lonawala and back for 10 days in a month. The distance from Mumbai to Lonawala is 150 kms. The bus completes the trip from Mumbai to Lonawala and return in the same day. The bus goes another 10 days in a month towards Alibagh. The distance from Mumbai to Alibagh is 120 kms. The trip is also completed on the same day. For the rest 4 days of its operation in a month, it runs locally in Mumbai, covering daily distance of 40 kms. Calculate the rate that the person should charge from passenger when he wants to earn the profit of 25% on his takings and also calculate the charge per passenger for both the outstation trips. The other information is given as follows:

|                                | ₹  |
|--------------------------------|--|
| Cost of the Bus                | 6,00,000 (Depreciation @ 20% p.a.;<br>Normal Capacity: 50 persons) |
| Salary: Driver                 | 5,000 per month  |
| Salary: Conductor              | 5,000 per month  |
| Salary: (Part time) Accountant | 2,000 per month  |
| Insurance                      | 7,200 per month  |
| Fuel (Consumed @ 4 kms/litre)  | 35 per litre   |
| R.T.O. Tax                     | 600 per annum  |
| Lubricant Oil                  | 10 per 100 kms   |
| Repairs and Maintenance        | 500 per month  |
| Permit Fee                     | 300 per month  |

Passenger tax is 20% of the net takings. The bus is occupied 90% of its capacity while on Lonawala trip and 80% of its capacity while on Alibagh trip, but is fully occupied in its local journey.

**Solution:**

**Statement of Cost**

| Particulars |  | ₹               |
|-------------|--|-----------------|
| <b>A.</b>   | <b>Fixed Expenses:</b>   | 5,000           |
|             | Driver's Salary  | 5,000           |
|             | Accountant's Salary  | 2,000           |
|             | Depreciation $\left(\frac{6,00,000 \times 20}{100 \times 12}\right)$ | 10,000          |
|             | Insurance $(7200 \div 12)$   | 600             |
|             | RTO Tax $(600 \div 12)$  | 50              |
|             | Repairs and Maintenance  | 500             |
|             | Permit Fee   | 300             |
|             | <b>Total Fixed Cost (A)</b>  | 23,450          |
| <b>B.</b>   | <b>Running Expenses:</b>   |                 |
|             | Fuel: $\frac{35}{4} \times 5,560$                                    | 48,650          |
|             | Lubricating Oil : $5,560 \times \frac{10}{100}$                      | 556             |
|             | <b>Total Variable Cost (B)</b>                                       | 49,206          |
|             | <b>Total Cost (A + B)</b>  | 72,656          |
|             | Add: Profit $\left(33\frac{1}{3}\% \text{ on Cost}\right)$           | 24,218          |
|             | <b>Net Takings</b>   | 96,874          |
|             | Passenger Tax (20%)  | 19,375          |
|             | <b>Total (Gross) Takings</b>   | <b>1,16,249</b> |

Total Effective Passenger km

$$\text{Lonawala Trip} = 10 \times 150 \times 2 \times 50 \times \frac{90}{100} = 1,35,000$$

$$\text{Alibagh Trip} = 10 \times 120 \times 2 \times 50 \times \frac{80}{100} = 96,000$$

$$\text{Local (Mumbai)} = 4 \times 40 \times 50 = 8,000$$

$$\textbf{Total Passenger km} = \underline{\underline{2,39,000}}$$

Total km/Month

$$\text{Lonawala} = 10 \times 150 \times 2 = 3,000$$

$$\text{Alibagh} = 10 \times 120 \times 2 = 2,400$$

$$\text{Local} = 4 \times 40 = 160$$

5,560 km/Months

$$\textbf{Charges per Passenger km} = \frac{1,16,249}{2,39,000}$$

|                  |               |   |              |       |
|------------------|---------------|---|--------------|-------|
|                  |               | = | <b>48.64</b> | Paise |
| Lonawala Charges | = 150 × 48.64 | = | ₹ 73         |       |
| Alibagh Charges  | = 120 × 48.64 | = | ₹ 58         |       |

**Illustration 13:** A hospital is run by a company. For this purpose, it has hired a building at a rent of ₹ 5,000/- per month plus it would bear the repair charges also.

The hospital is having 25 beds and 5 more beds can be accommodated when the need arises.

The staff of the Hospital is as follows:

2 Supervisors, each at salary of ₹ 500/- per month.

4 Nurses, each at a salary of ₹ 300/- per month.

2 Ward Boys, each at a salary ₹ 150/- per month.

Although the hospital is open for patients all the 365 days in a year, records for the year 2009 disclose that only for 120 days in the year, the unit had the full capacity of 25 patients per day and for another 80 days, it had on an average 20 beds only occupied per day. But there were occasions when the beds were full, extra beds were hired at a charges of ₹ 5/- per day and this did not come to more than 5 beds extra above the normal capacity on any one day. The total hire charges for the extra beds incurred for the whole year were ₹ 2,000/-.

The unit engaged expert doctors from outside to attend on the patients and the fees was paid on the basis of the number of patients attended and time spent by them which on an average worked out to ₹ 10,000/- per month in 2009.

The other expenses for the year were as under:

|  |            |
|--|------------|
| Repair   | ₹ 3,600/-  |
| Food supplied to patients                            | ₹ 44,000/- |
| Other services for patients                          | ₹ 12,500/- |
| Laundry charges                                      | ₹ 28,000/- |
| Medicines supplied                                   | ₹ 35,000/- |
| Cot of oxygen, X-ray, etc.                           |            |
| Other than directly borne for treatment of patients  | ₹ 54,000/- |
| General administration charges allocated to hospital | ₹ 49,550/- |

If the hospital recovered an amount of ₹ 100/- per day on an average from each patient, compute the profit per patient day made by the Hospital as per operating cost sheet for the year 2009.

**Solution:**

Number of patient days in 2009

25 beds × 120 days = 3,000

20 beds × 80 days = 1,600

Extra bed days  $\frac{2,000}{5}$  = 400

5,000 Patient days

**Assumptions:**

- (a) Cost of janitor and other services has been considered as variable cost.  
 (b) Cost of oxygen and X-ray is considered as fixed cost.  
 (c) The charges for extra bed is a semi-variable cost. However, it is considered as a variable cost.

**Statement Profit**

| Particulars                                       | ₹        | ₹        |
|---|----------|----------|
| Income (100 × 5000)                               |          | 5,00,000 |
| <i>Less: Variable Costs:</i>                      |          |          |
| Fixed   | 44,000   |          |
| Janitor Services                                  | 12,500   |          |
| Laundry   | 28,000   |          |
| Medicines   | 35,000   |          |
| Doctor's Fee (10,000 × 12)                        | 1,20,000 |          |
| Hire Charges for Extra Bed                        | 2,000    | 2,41,500 |
| Contribution                                      |          | 2,58,500 |
| <i>Less: Fixed Costs:</i>                         |          |          |
| Salaries (2 × ₹ 500 + 4 × ₹ 300 + 2 × ₹ 150) × 12 | 30,000   |          |
| Rent (₹ 5,000 × 12)                               | 60,000   |          |
| Repairs and Maintenance                           | 3,600    |          |
| General Administration                            | 49,550   |          |
| Cost of Oxygen, X-ray, etc.                       | 54,000   | 1,97,150 |
| Profit  |          | 61,350   |

$$\text{Profit per patient day} = \frac{61,350}{5,000} = ₹ 12.27$$

**Illustration 14:** An entrepreneur owns a bus which runs from Mumbai to Pune and back for 25 days in a month. The distance from Mumbai to Pune is 170 kms. The bus completes the trip from Mumbai to Pune and back on the same day. Calculate the fare to be charged to passengers if a profit of  $33\frac{1}{3}\%$  on cost is expected.

The following further information is available:

|   | ₹              |
|---|----------------|
| Cost of Bus                                 | 3,00,000       |
| Salary of Driver per month                  | 1,050          |
| Salary of Conductor per month               | 700            |
| Salary of Part-time Accountant p.m.         | 480            |
| Insurance p.a.                              | 6,720          |
| Diesel Consumption 16 kms per litre costing | ₹ 25 per litre |
| Local Taxes p.a.                            | 1,200          |

|                                 |               |
|---------------------------------|---------------|
| Oil and Lubricants per 100 kms. | 20            |
| Repairs and Maintenance p.a.    | 1,000         |
| Licence Fees p.a.               | 2,840         |
| Normal Seating Capacity         | 50 passengers |
| Depreciation Rate               | 20 % p.a.     |

The bus usually runs full upto 90% of its capacity both ways. Interest is payable on the cost of bus at 10% p.a.

**Solution:**

Operating Cost Statement to determine the fare of running a bus from Mumbai to Pune per passenger km

**Cost Sheet for Year**

| Particulars   | Total Cost (₹) | (₹)       |
|---|----------------|-----------|
| <b>A. Standing Charges/Fixed:</b>   |                |           |
| Salary of Driver (1,050 × 12)   | 12,600         |           |
| Salary of Conductor (700 × 12)  | 8,400          |           |
| Insurance   | 6,720          |           |
| Salary of Part-time Accountants   | 5,760          |           |
| Local Taxes   | 1,200          |           |
| Licence Fees  | 2,840          |           |
| Interest (10% of 3,00,000)  | 30,000         | 67,520    |
| <b>B. Running Charges/Operating:</b>  |                |           |
| Depreciation (20% of 3,00,000)  | 60,000         |           |
| Lubrication $\frac{(1,02,000 \text{ km} \times ₹ 20)}{100}$   | 20,400         |           |
| Diesel Cost $\frac{(170 \times 2 \times 25 \text{ days} \times 12 \text{ months})}{16} \times ₹ 25$ | 1,59,375       |           |
|   | 1,000          | 2,40,775  |
| <b>C. Total Charges (A + B)</b>   |                | 3,08,295  |
| <b>D. Total Passenger km in a year</b><br>(170 × 2 × 25 day × 12 months × 45 persons)               |                | 45,90,000 |
| <b>E. Cost per passenger km (CD)</b>  |                | 0.067     |
| <b>F. Add: Desired Profit (<math>\frac{1}{3}</math> on cost)</b>                                    |                | 0.022     |
|   |                | 0.089     |
| Fare Charges = 0.089 × 170 km   |                | ₹ 15.130  |

**Illustration 15:** New Ranjeet Hotel has three types of suites for its customers, viz., single room, double room and three respectively. State the rent to be charge for each type of suite on the basis of the following information:

- (a) The number of suites of each type are:
- (i) Single room suites 100
  - (ii) Double room suites 30
  - (iii) Three room suites 20
- (b) The rent of double room suite is to be fixed  $1\frac{1}{2}$  times the single room suite and that of three room suite as twice the single room suite.
- (c) The occupancy of each type of suite is as under:
- |                         | Summer | Winter |
|-------------------------|--------|--------|
| (i) Single room suites  | 90%    | 50%    |
| (ii) Double room suites | 80%    | 20%    |
| (iii) Three room suites | 60%    | 20%    |
- (d) The annual expenses are as follows:
- (i) Staff salaries ₹ 2,20,000
  - (ii) Room attendant's wages when occupied:
 

|                    | Summer | Winter |
|--------------------|--------|--------|
| Single room suites | ₹ 2    | ₹ 3.00 |
| Double room suites | ₹ 3    | ₹ 4.50 |
| Three room suites  | ₹ 4    | ₹ 6.00 |
  - (iii) Lighting, heating and power for full month, when occupied:
 

|                    | Lighting, Heating | Winter |
|--------------------|-------------------|--------|
| Single room suites | ₹ 40              | ₹ 20   |
| Double room suites | ₹ 60              | ₹ 30   |
| Three room suites  | ₹ 80              | ₹ 40   |
  - (iv) Repairs and renovation ₹ 42,000  
 Linen, etc. ₹ 45,000  
 Interior decoration ₹ 50,000  
 Sundries ₹ 31,550
  - (v) Depreciation: Building @ 5% on ₹ 14,00,000  
 Furniture and Fixtures @ 10% on ₹ 1,00,000  
 Air conditioner @ 10% on ₹ 2,00,000
- (e) Summer may be assumed for 7 months and winter for 5 months in a year. A month may be taken as of 30 days.
- (f) Profit including interest on investment @ 25% on cost.

**Solution:****In the Books of New Ranjeet Hotel Operating Cost Statement (per annum)**

| Particulars            | ₹        |
|------------------------|----------|
| Staff Salaries         | 2,20,000 |
| Room Attendant's Wages | 93,150   |

|   |        |                    |
|---|--------|--------------------|
| Lighting, Heating                         |        | 55,400             |
| Power                                     |        | 27,700             |
| Repairs and Renovation                    |        | 42,000             |
| Linen                                     |        | 45,000             |
| Interior Decoration                       |        | 50,000             |
| Sundries                                  |        | 31,550             |
| Depreciation on Building (14,00,000 × 5%) | 70,000 |                    |
| on Furniture (1,00,000 × 10%)             | 10,000 |                    |
| on Air Conditioner (2,00,000 × 10%)       | 20,000 | 1,00,000           |
| <b>Total Cost</b>                         |        | <b>6,64,800</b>    |
| <i>Add: Profit (25% on Cost)</i>          |        | <b>1,66,200</b>    |
| <b>Total Rent to be Charged</b>           |        | <b>8,31,000</b>    |
| <b>Total Single Room Days</b>             |        | <b>41,550 days</b> |

**Working Note:**

$$1. \text{ Rent of one day} = \frac{8,31,000}{41,550} = ₹ 20 \text{ per day}$$

$$\text{Rent for single room suite} = 20 \times 1 = ₹ 20 \text{ per day}$$

$$\text{Rent for double room suite} = 20 \times 1.5 = ₹ 30 \text{ per day}$$

$$\text{Rent for three room suite} = 20 \times 2 = ₹ 4 \text{ per day}$$

**Room days**

(i) Single room suite

$$\text{Summer} = 100 \text{ rooms} \times 90\% \times 30 \text{ days} \times 7 \text{ months} = 18,900$$

$$\text{Winter} = 100 \text{ rooms} \times 50\% \times 30 \text{ days} \times 5 \text{ months} = 7,500$$

$$\text{Total single room days (A)} = 26,400$$

$$\text{Summer} = 30 \text{ rooms} \times 80\% \times 30 \text{ days} \times 7 \text{ months} = 5,040$$

$$\text{Winter} = 30 \text{ rooms} \times 20\% \times 30 \text{ days} \times 5 \text{ months} = 900$$

$$\text{Total double room days} = 5,940$$

$$\therefore \text{Total single room days} = 5,940 \times 1.5 \text{ (B)} = 8,910$$

(ii) Three room suite

$$\text{Summer} = 20 \text{ rooms} \times 60\% \times 30 \text{ days} \times 7 \text{ months} = 2,520$$

$$\text{Winter} = 20 \text{ rooms} \times 20\% \times 30 \text{ days} \times 5 \text{ months} = 600$$

$$\text{Total three room days} = 3,120$$

$$\therefore \text{Total single room days} = 3,120 \times 2 \text{ (C)} = 6,240$$

$$\therefore \text{Total single room days} = \text{(A)} + \text{(B)} + \text{(C)} = 41,550$$

**2. Room attendant's wages**

**Summer**

₹

$$\text{Single room} = 18,900 \times 2 = 37,800$$

$$\text{Double room} = 5,040 \times 3 = 15,120$$

|                                 |   |               |
|---------------------------------|---|---------------|
| Three room = $2,520 \times 4$   | = | 10,080        |
| <b>Winter</b>                   |   |               |
| Single room = $7,500 \times 3$  |   | 22,500        |
| Double room = $900 \times 4.50$ |   | 4,050         |
| Three room = $600 \times 6$     |   | 3,600         |
|                                 |   | <u>93,150</u> |

**3. Lighting, heating**

|   |   |               |
|---|---|---------------|
| Single room = $\frac{26,400}{30} \times 40$ | = | 35,200        |
| Double room = $\frac{5,940}{30} \times 60$  | = | 11,880        |
| Three room = $\frac{3,120}{30} \times 80$   | = | 8,320         |
|   |   | <u>55,400</u> |

**4. Power**

|   |   |               |
|---|---|---------------|
| Single room = $\frac{26,400}{30} \times 20$ | = | 17,600        |
| Double room = $\frac{5,940}{30} \times 30$  | = | 5,940         |
| Three room = $\frac{3,120}{30} \times 40$   | = | 4,160         |
|   |   | <u>27,700</u> |

**Illustration 16:** Elegant Hotel has a capacity of 100 single rooms and 20 double rooms. It has a sports centre with a swimming pool which is also used by persons other than residents of the hotel. The hotel has a shopping arcade at the basement and a specially restaurant at the rooftop. The following information is available:

- (a) Average occupancy: 75% for 365 days of the year.  
 (b) Current costs are:

|             | Variable Cost<br>₹ per day | Fixed Cost<br>₹ per day |
|-------------|----------------------------|-------------------------|
| Single room | 400                        | 200                     |
| Double room | 500                        | 250                     |

- (c) Average sales per day of restaurant ₹ 1,00,000 contribution is at 30% fixed cost ₹ 10,00,000 per annum.  
 (d) The sports centre/swimming pool is likely to be used by 50 non-residents daily. Average contribution per day per non-resident is estimated at ₹ 50 fixed cost is ₹ 5,00,000 per annum.  
 (e) Average contribution per month from the shopping arcade is ₹ 50,000. Fixed cost is ₹ 5,00,000 per annum.

You required to find out:

- (i) Rent changeable for single and double room per day. So that there is a margin of safety, 25% of total cost and that the rent for a double room should be kept at 120% of single room.
- (ii) Evaluate the profitability of restaurant sports centre and shopping arcade separately.

**Solution:**

**(i) In the Books of Elegant Hotel**

Room Days:

- 1. Single room =  $100 \times 75\% \times 365 = 27,375$  Single room days
- 2. Double room =  $20 \times 75\% \times 365 = 5,475 \times 1.2 = 6,570$  Single room days
- 3. Total =  $27,375 + 6,570 = 33,945$  Single room days

**Operating Cost**

|             | Occupancy in a year (WN 1)<br>(1) | Variable Cost Re. 1 day<br>(2) | Fixed Cost Re. 1 day<br>(3) | Total Cost FC + VC<br>$4 = 1 \times 2$ | Total FC<br>$5 = 1 \times 3$ | Total Cost =<br>$6 = 5 + 4$ |
|-------------|-----------------------------------|--------------------------------|-----------------------------|--|------------------------------|-----------------------------|
| Single room | 27,375                            | 400                            | 200                         | 1,09,50,000                            | 54,75,000                    | 1,64,25,000                 |
| Double room | 5,475                             | 500                            | 250                         | 27,37,500                              | 13,68,750                    | 41,06,250                   |
|             |                                   |                                |                             |  | +20% MOS                     | 2,05,31,250                 |
|             |                                   |                                |                             |  | Total Amt.Rec.               | 51,32,812                   |
|             |                                   |                                |                             |  |                              | 2,56,64,062                 |

₹

$$\text{Rent per day on Single Room} \left( \frac{2,56,64,062}{33,945} \right) = 756$$

$$\text{Rent per day on Double Room} (756 \times 1.2) = 907$$

**(ii) Restaurant:**

₹

$$\text{Contribution} (1,00,000 \times 365 \times 30\%) = 1,09,50,000$$

$$\text{Less: Fixed cost} = 10,00,000$$

$$\text{Profit} = 99,50,000$$

**Sports Centre/Swimming Pool**

₹

$$\text{Contribution} (50 \times 365 \times 50) = 9,12,500$$

$$\text{Less: Fixed Cost} = 5,00,000$$

$$\text{Profit} = 4,12,500$$

**Shopping Arcade**

$$\text{Contribution} (50,000 \times 12) = 6,00,000$$

$$\text{Less: Fixed Cost} = 6,00,000$$

$$\text{Profit} = \text{Nil}$$

## Exercise

1. National Roadways has a fleet of 20 trucks. Each truck covers a distance of 300 kms per day and the carrying capacity of the trucks is ten tonnes. On an average, loading available for the trucks is only 90% effective working days in a month are 25, excluding the days of lay-off on account of repairs which are estimated to be 5%. Information about the costs is as follows:
  - (a) Cost of trucks – ₹ 1,60,000
  - (b) Estimated useful life – 5 years.
  - (c) Resale value after 5 years – ₹60,000.
  - (d) Salary to drivers and cleaners – ₹ 1,000 per truck per month.
  - (e) Taxes and insurance – ₹ 2,500 per truck per year.
  - (f) Total expenditure on maintenance and repairs through owned workshop for all trucks – ₹ 24,000 per year.
  - (g) Tyre and tubes and other accessories – ₹ 7,200 per truck per year.
  - (h) Diesel, oil, etc. – ₹ 40 per 100 kms.

Calculate the cost of operating the truck per ton-km.

**[Ans.: ₹ 0.10 per tonne km approximately. Total tonne kms per month: 64,125.]**

2. A chemical factory runs its boiler on furnace oil obtained from Indian Oil and Bharat Petroleum, whose depots are situated at a distance of 12 kms and 8 kms from the factory site. Transportation of furnace oil is made by the company's own tank lorries of 5 tonnes capacity each. Onward trips are made only on full load and the lorries return empty. The filling-in time takes an average 40 minutes for Indian Oil and 30 minutes for Bharat Petroleum. But the emptying time in the factory is only 40 minutes for all. From the records available, it is seen that the average speed of the company's lorries works out to 24 kms per hour. The varying operating charges average 60 paise per km covered and fixed charges given an incidence of ₹ 7.50 per hour of operation.

Calculate the cost per tonne km. for each source.

**[Ans.: Indian Oil: 53 paise. Bharat Petroleum: 58 paise.]**

3. Shankar has been promised a contract to run a tourist car on a 20 kms long route for the Chief Executive of a multinational firm. He buys a car costing ₹ 1,50,000. The annual cost of insurance and taxes are ₹ 4,500 and ₹ 900 respectively. He has to pay ₹ 500 per month for a garage where he keeps the car when it is not in use. The annual repair costs are estimated at ₹ 4,000. The car is estimated to have a life of 10 years at the end of which the scrap value is likely to be ₹ 50,000. He hires a driver who is to be paid ₹ 300 per month plus 10% of the takings as commission. Other incidental expenses are estimated at ₹ 200 per month.

Petrol and oil will cost ₹ 100 per 100 kms. The car will make 4 round trips each day. Assuming a profit of 15% on takings is desired and that the car will be on the road for 25 days on an average per month, what should be charge per round trip?

**[Ans.: ₹ 88.22 per round trip.]**

4. Bus Service Ltd. run the following fleet of buses within the limit of Pune city:  
Carrying Capacity

|          |               |
|----------|---------------|
| 10 Buses | 50 passengers |
| 15 Buses | 40 passengers |

On an average, each bus makes 10 trips a day covering a distance of 8 km in each trip, and 75% of the seats are occupied. The annual records show that 5 buses are generally required to be kept away from road each day for repair.

The following expenses were incurred by the company during March, 1998:

Garage Rent, Rates and Insurance ₹ 2,500; Road and Vehicle Tax ₹ 500; Salary: Chief Operating Manager ₹ 1,500 (3 Assistant Managers ₹ 800 each, 4 Supervisors ₹ 400 each, 25 Drivers ₹ 240 each and 30 Cleaners ₹ 100 each).

Office Staff ₹ 4,000; Consumable Stores ₹ 4,500; Petrol ₹ 24,000; Lubricants ₹ 5,500; Miscellaneous Expenses ₹ 1,800; Repairs ₹ 3,500.

Replacement of tyres and tubes ₹ 1,750; Gas and Electricity ₹ 350.

The Cost Clerk of the company prepared a Cost Sheet using the annual figures for various expense and writing off ₹ 6,500 for depreciation. Show the Cost Sheet in proper form as might have been prepared by the Cost Clerk.

Also advise the Cost Clerk about those expenses which should be included in the Cost Sheet on the basis of annual estimate of those expenses (in place of the actual amount spent during this month in respect of the same) and point out to him how he should arrive at this month's share of each of those expenses.

**[Ans.: Rate per passenger per km: ₹ 0.042. Effective passenger kms: 16,36,800.]**

5. A state owned transport organisation has been in serious financial and operational difficulty due to high prices of spares, rising fuel cost and high wages.

The running operational expenses have been worked out for a single deck bus and are reproduced below:

Total fleet – 500 buses single deck. Average passenger occupying each trip is 40.

List of expenses for one period ended 31st December, 2003:

| Total for 30,000 kms                       | per bus per year (₹) |
|--|----------------------|
| <b>Variable Expenses:</b>                  |                      |
| (a) Fuel diesel oil                        | 10,000               |
| (b) Tyres, tubes and batteries             | 5,000                |
| (c) Lubricants                             | 1,500                |
| (d) Spares parts and accessories           | 4,500                |
| (e) Wages, fringe benefits and bonus       | 28,000               |
| <b>Fixed Expenses:</b>                     |                      |
| (a) Road Tax                               | 1,500                |
| (b) Insurance                              | 2,500                |
| (c) Rent for Night Parking Garage          | 3,000                |
| (d) Maintenance Garage establishments cost | 2,000                |
| Original cost per bus                      | 2,00,000             |
| Depreciation @ 15% straight line basis     |                      |

**Administrative Expenses:**

|   |           |
|---|-----------|
| (a) Administrative establishment cost (including Salaries and PF) | 13,05,000 |
| (b) Staff Welfare Cost  | 57,000    |
| (c) Retiral Gratuity  | 50,000    |
| (d) Rates and Taxes   | 50,000    |
| (e) Travelling and Conveyance                                     | 38,000    |
| (f) Postage, Telephone and Stationery                             | 2,10,000  |
| (g) Audit Fees  | 25,000    |
| (h) Electricity   | 70,000    |
| (i) Interest and Bank Charges                                     | 2,80,000  |
| (j) Miscellaneous   | 40,000    |

Administrative overhead is to be absorbed in the operating cost on the basis of available number of budgeted operating fleet (calculated on the basis of total fleet less 15% breakdown).

You are required to advise management regarding the fare structure on cost plus 10% basis for the following stages of travel, assuming that the fare is charged in proportion to kilometers travelled.

|                     |                 |  |
|---------------------|-----------------|--|
|                     | Minimum Fare on |  |
| 1st stage of travel | 5 km            | } (Rounded<br>off to<br>nearest paise) |
| 2nd stage of travel | 10 km           |  |
| 3rd stage of travel | 15 km           |  |

[Ans.: Operational cost per km: ₹ 3.10.]

6. A city municipality arranges for the removal of its garbage by means of motor vehicle transport. The following vehicles are maintained:

| No. of vehicles | Specification    |
|-----------------|------------------|
| 20              | 5 tonnes lorries |
| 30              | 4 tonnes lorries |
| 50              | 3 tonnes lorries |
| 40              | 2 tonnes lorries |

On an average, each lorry makes six trips a day and in each trip covers an average distance of five kms. Each lorry carries garbage weighing only 60% of its capacity. Taking an annual average, 20% of the lorries are laid up for repairs every day. The conservancy work is carried on daily.

The following are the monthly charges incurred on the conservancy transport:

| Items of Cost   | Monthly Charges |
|---|-----------------|
| Salary of the Superintendent, Motor Vehicles Department | 2,000           |
| Salaries of 3 Transport Foremen                         | 500 each        |
| Wages of Drivers (for 140 Drivers)                      | 150 each        |
| Wages of Mazdoors (Labourers) (for 280 Mazdoors)        | 75 each         |
| Consumable Stores                                       | 16,000          |

|   |        |
|---|--------|
| Petrol  | 60,000 |
| Lubricants  | 15,000 |
| Replacement of Tyres, Tubes and other Parts and Accessories       | 5,000  |
| Garage Rent and Rates (adjusted in the books of the Municipality) | 3,000  |
| Gas and Electric Charges  | 1,000  |
| Miscellaneous Expenses  | 12,000 |

There is a Repairs Workshop attached to the Motor Vehicles Department which also carries out repair for office cars and other vans and vehicles. 50% of the Superintendent's salary is debited to the workshop, and the stipulated charges to be borne by the Conservancy Transport Department for the service of the workshop are ₹ 10,000 a month.

Assuming that month consists of 30 days, calculate the cost per tonne km, for removal of garbage.

**[Ans. Tonnes kms: 1,94,400. Cost per Tonne km: ₹856.]**

7. Public Health Centre runs an Intensive Care Unit. For this purpose, it had hired a building at a rent of ₹ 5,000 p.m. with the understanding that it would bear the repairs and maintenance charges also.

The units consists of 25 beds and 5 more beds can be comfortably accommodated when the occasion demands. The permanent staff attached to the unit are as follows:

2 Supervisors, each at a salary of ₹ 500 per month.

4 Nurses, each at a salary of ₹ 300 per month.

2 Ward Boys, each at a salary of ₹ 150 per month.

Though the unit was open for the patients all the 365 days in a year, scrutiny of accounts in 2003 revealed that only 120 days in a year, the unit had the full capacity of 25 patients per day and for another 80 days, it had on an average 20 beds only occupied per day. But there were occasions when the beds were fill. Extra beds were hired from outside at a charge of ₹ 5 per bed per day. This did not come to more than 5 beds extra above the normal capacity any one day. The total hire charges for the extra beds incurred for the whole year amounted to ₹ 2,000.

The unit engaged expert doctors from outside to attend on the patients and the fees were paid on the basis of the number of patients attended and time spent by them on an average worked out to ₹ 10,000 per month in 2003. The other expenses for the were as under:

|   |               |
|---|---------------|
| Repairs and maintenance (F)   | ₹ 300 p.m.    |
| Food supplied to patients (V)   | ₹ 44,000 p.a. |
| Janitor and other services for them (V)   | ₹ 12,500 p.a. |
| Laundry charges for their bed lines (V)   | ₹ 28,000 p.a. |
| Medicines supplied (V)  | ₹ 35,000 p.a. |
| Cost of oxygen, X-ray, etc. Other than directly borne for treatment of patients (F) | ₹ 54,000 p.a. |
| General administration charges allocated to the unit (F)                            | ₹ 49,550 p.a. |

- (a) If the unit recovered an overall amount of ₹ 100 per day on an average from the each patient, what is the profit per patient day made by the unit in 203?

- (b) The unit wants to work on a budget for 2004 but the number of patients requiring intensive care is a very uncertain factor. Assuming that same revenue and expenses prevail in 2004 in the first instance, work out the number of patient days required by the unit to break even.

**[Ans. Patient days: 5,000. BEP: ₹ 3,81,335 or 3,813 patient days.]**

8. A Guest House is being run in a small hill station with 50 single rooms. The home offers concessional rates during six off-season months in a year. During this period, half of the full room rent is charged. The management's profit margin is targeted at 20% of the room rent. The following are the cost estimated and other details for the year ending 31 March, 2004 (assume a month to be 30 days):

- (a) Occupancy during the season is 80%, while in the off-season is 40% only.

- (b) Expenses:

|  |   |          |
|--|---|----------|
| (i) Staff salary (excluding room attendants) | ₹ | 2,75,000 |
| (ii) Repairs to buildings                    | ₹ | 1,30,500 |
| (iii) Laundry and linen                      | ₹ | 40,000   |
| (iv) Interior and tapestry                   | ₹ | 87,500   |
| (v) Sundry expenses                          | ₹ | 95,400   |

- (c) Annual depreciation is to be provided, for building at 5% and on furniture and equipment a 15% , on straight line basis;
- (d) Room attendants are paid ₹ 5 per room day on the basis of occupancy of the rooms in a month.
- (e) Monthly lighting charge are ₹ 120 per room, except in four months of winter when it is ₹ 30 per room and this cost is on the basis of full occupancy for a month.
- (f) Total investments in the house is ₹ 100 lacs of which ₹ 80 lakhs relate to building and balance for furniture and equipments.

You are required to work out the room rent chargeable per day both during the season and the off-season months, on the basis of the foregoing information.

9. Hotel Shreyas has 40 bedrooms with a maximum occupancy of 490 sleeper nights per week. Average occupancy is 60% throughout the year. Meals provided to guests have been costed and the average food cost per person per day is as follows:

|           |   |              |
|-----------|---|--------------|
| Breakfast | ₹ | 3.60         |
| Lunch     | ₹ | 11.00        |
| Dinner    | ₹ | 13.40        |
| Total     | ₹ | <u>28.00</u> |

Direct wages and staff meals per week are as under: Housekeeping ₹ 1,952, Restaurant and Kitchen ₹ 3,430 and General ₹ 1,760.

Direct expenses per annum are ₹ 45,760 for housekeeping and ₹ 52,000 for the restaurant.

Indirect expenses amount to ₹ 3,41,120 which should be apportioned on the basis of floor areas are: Bedrooms: 3,600 sq. M, Restaurants: 1,200 sq. M and Services area: 600 sq. m.

A net profit of 10% each must be made on the restaurant taking and accommodation takings.

You are required to calculate what inclusive terms per person should be charged per day. Show the split between meals and accommodation charges.

**[Ans. Cost per day per person: ₹ 90 (i.e., ₹ 60 for food and ₹ 30 for accommodation.)]**

10. Leela Hotel has three category of accommodation one room suites, two room suites and three room suites.

Following are the details of information pertaining to the operation of the hotel:

- (a) Annual Expenses are as thus:

|                         |   |           |
|-------------------------|---|-----------|
| Staff Salaries          | ₹ | 10,00,000 |
| Repairs and Renovations | ₹ | 1,72,000  |
| Interior Decoration     | ₹ | 4,00,000  |
| Sundries                | ₹ | 1,31,040  |
| Laundry contract cost   | ₹ | 2,00,000  |

**Room Attendant's Salaries:**

₹ 8 per day per single room, ₹ 12 per day per double room and ₹ 16 per day per three room suite occupied in summer.

₹ 12 per day per single room, ₹ 18 per day double room and ₹ 24 per day per three room, suite occupied during winter.

**Lighting:**

₹ 40 for one room suite per month if occupied for full month for both summer and winter.

₹ 60 for two room suite per month and ₹ 80 for three room suite per month. If occupied for full month, for both summer and winter.

- (b) There are 200 one room suites, 60 two suites and 40 three rooms suites in the hotel.  
 (c) Normally, 80% of one room, 60% of two room and 50% of three room suites are occupied in summer. During winter, 50% of one room, 40% of two room and 20% of three room suites are occupied.  
 (d) Summer may be assumed for 8 months and winter for 4 months duration. Normal days in a month may be taken at 30.  
 (e) Profit is 20% so that interest on investment may also be covered in such profits.

The rent of two room suite is to be fixed at  $1\frac{1}{2}$  times of one room suite and that of three room suite at double the one room suite.

You are required to prepare an operating cost statement of Leela Hotel for the year and suggest the rent which should be charged for each type of suite on the basis of above information.

**[Ans. Room rent to be recorded: ₹ 39,60,000, Room Rent for one room: ₹ 50, Two room suite: ₹ 75 and Three room suite: ₹ 100, total room days 67,680]**

$$\text{Cost of Lighting} = \frac{\text{Monthly Charges}}{30 \text{ days}} \times \text{No. of days}$$

**Room Attendants's Salary:**

**One Room ₹ 4,51,200**

**Two Room ₹ 1,55,520**

**Three Room ₹ 99,840**

**Power Charges ₹ 52,800]**

11. Elegant Hotel has a capacity of 100 single rooms and 20 double rooms. It has a sports centre with a swimming pool, which is also used by persons other than residents of the hotel. The hotel has a shopping arcade at the basement and a speciality restaurant at the rooftop.

The following information is available:

- (a) Average occupancy: 75% for 365 days of the year.  
 (b) Current costs are:

|             | Variable Cost<br>₹/per day | Fixed Cost<br>₹/per day |
|-------------|----------------------------|-------------------------|
| Single Room | 400                        | 200                     |
| Double Room | 500                        | 250                     |

- (c) Average sales per day of restaurant ₹ 1,00,000; contribution is at 30%. Fixed cost ₹ 10,00,000.  
 (d) The sports centre/swimming pool is likely to be used by 50 non-residents daily; average contribution per day per non-resident is estimated at ₹ 50; fixed cost is ₹ 5,00,000 per annum.  
 (e) Average contribution per month from the shopping arcade is ₹ 50,000; fixed cost is ₹ 6,00,000 per annum.

You are required to:

- (a) Rent chargeable for single and double room per day, so that there is a margin of safety of 20% on hire of rooms and that the rent for a double room should be kept at 120% of a single room.  
 (b) Evaluate the profitability of restaurant, sports centre and shopping arcade separately.

**[Ans.: Rent per day of single room: ₹ 756. Rent per day of double room: ₹ 907. Profit: Restaurant –₹ 99,50,000. Sports centre –₹ 4,12,500.]**

12. SMC is a public school having five buses each plying in different directions for the transport of its school students. In view of a large number of students availing of the bus service, the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the school. The workload of the students has been so arranged that in the morning, the first trip picks up the senior students and the second trip plying an hour later picks up the junior students. Similarly, in the afternoon, the first trip drops the junior students and an hour later, the second trip takes the senior students home. The distance travelled by each bus one way is 8 kms. The school works 25 days in a month and remains closed for vacation in May, June and December. Bus fee, however, is payable by the students for all the 12 months of the year.

The details of expenses for a year are as under:

|                  |                              |
|------------------|------------------------------|
| Driver's Salary  | : ₹ 450 per month per driver |
| Cleaner's Salary | : ₹ 350 per month            |

|                                       |  |
|---------------------------------------|--|
|                                       | (Salary payable for 12 months)             |
|                                       | (One cleaner employed for all the 5 buses) |
| License Fee, Taxes, etc.              | : ₹ 860 per bus p.a.                       |
| Insurance                             | : ₹ 1,000 per bus p.a.                     |
| Repairs and Maintenance               | : ₹ 3,500 per bus p.a.                     |
| Purchase Price of Bus (Life 12 years) | : ₹ 1,50,000 each                          |
| Scrap Value                           | : ₹ 30,000                                 |
| Diesel Cost                           | : ₹ 2.00 per liter                         |

Each bus gives an average mileage of 4 kms per litre of diesel. Seating capacity of each bus is 50 students. The seating capacity is fully occupied during the whole year.

Students picked up the dropped within a range upto 4 kms of distance from the school are charged half fare and 50% of the students travelling in each trip are in this category.

Ignore interest.

Since the charges are to be based on average cost, you are required to:

- Prepare a statement showing the expenses of operating a single bus and the fleet of five buses for a year.
- Work out the average cost per student per month in respect of:
  - Students coming from a distance of upto 4 kms from the school.
  - Students coming from a distance beyond 4 kms from the school.

[Ans.: (i) ₹ 16. (ii) ₹ 32.]

## Questions for Self-practice

### I. Theory Questions

- What do you mean by operating costing?
  - What is Transport costing? What are its objectives?
- Draw a specimen cost sheet for canteen costing.
- What are the various items of cost of operation of a hospital? Prepare a proforma cost sheet.
- Write short note on:
  - Log Book.
  - Applicability of Operating Costing.
  - Cost Unit.
  - Operating Costing.
- What is operating cost? To what industries is this method of costing applicable?

### II. Short Questions

- What is operating costing?
- Which organisation follow Operating costing?
- What is fixed cost?
- What is running cost?

5. What is maintenance cost?
6. What is the unit of cost for hospitals?
7. What is the unit of cost for canteens?
8. What is the unit of cost for water supply companies?
9. What is the unit of cost for railways?
10. What is the unit of cost for hotels?
11. What is Operating cost sheet?
12. What is Daily Log Report?

## Objective Questions

### I. Fill in the Blanks

1. Operating costing is also known as \_\_\_\_\_ costing.
2. Cost of Service is decided by Cost \_\_\_\_\_.
3. Unit of cost for hospital is \_\_\_\_\_.
4. Unit of cost for goods transport is \_\_\_\_\_.
5. Unit of cost for passenger transport \_\_\_\_\_.
6. Unit of cost for hotels is per \_\_\_\_\_.
7. Unit of cost for water works is \_\_\_\_\_.
8. Rent of premises is \_\_\_\_\_ cost.
9. Cost of petrol is \_\_\_\_\_ cost.
10. Replacement of tyres is \_\_\_\_\_ cost.
11. Unit of cost for tourist company \_\_\_\_\_.
12. Unit of cost for cinema house is \_\_\_\_\_.

[Ans.: 1. service, 2. sheet, 3. per bed, 4. per ton km, 5. per passenger km, 6. per cup of tea, 7. per 1000 litres, 8. fixed, 9. variable, 10. maintenance, 11. per passenger km, 12. per man show.]

### II. True or False

1. Operating costing is called as service costing.
2. Unit of cost for gas companies is per ton.
3. Rent of premises is a variable cost.
4. Overhauling is running cost.
5. Details of journey is shown by daily log sheet.
6. Driver's salary is a variable cost.
7. Cost of petrol is a running cost.
8. Taxes is a fixed cost.
9. Insurance is a fixed cost.
10. Unit of cost for hospital is per visitor.

11. Unit of cost for hotel is per visitor.
12. Trading companies can follow operating costing

[Ans.: True: (1, 5, 7, 8, 9, 11, 12), False: (2, 3, 4, 6, 10).]

### III. Match the Columns

#### Group 'A'

1. Hotel costing
2. Transport
3. Water works
4. Gas companies
5. Cinema house

#### Group 'B'

- (i) Per tonne km
- (ii) Per 1000 litres
- (iii) Per cylinder
- (iv) per man show
- (v) per cup of tea

[Ans.: 1. (v), 2. (i), 3. (ii), 4. (iii), 5. (iv).]

### IV. Multiple Choice Questions

1. Classification of cost as fixed and variable is of special importance in \_\_\_\_\_.
  - (a) Process costing
  - (b) Unit costing.
  - (c) Operating costing
  - (d) None of these
2. Operating costing is applicable to \_\_\_\_\_.
  - (a) Transport companies
  - (b) Electricity companies
  - (c) Cinemas
  - (d) Hospitals
  - (e) All of these
3. Cost of service is ascertained by preparing \_\_\_\_\_.
  - (a) Cost sheet
  - (b) Production A/c
  - (c) Process A/c
  - (d) Job Cost Sheet
4. The unit of cost for hospitals is \_\_\_\_\_.
  - (a) Per bed
  - (b) Per ton
  - (c) Per km
  - (d) Per unit
5. The unit of cost for goods transport companies is \_\_\_\_\_.
  - (a) Per unit
  - (b) Per ton km
  - (c) Per passenger km
  - (d) Per ton
6. The unit of cost for tourist companies is \_\_\_\_\_.
  - (a) Per ton
  - (b) Per tour
  - (c) Per passenger km
  - (d) None of these
7. The unit of cost for hotels is \_\_\_\_\_.
  - (a) Per visitor
  - (b) Per cup of tea
  - (c) Per km
  - (d) Per kg
8. The unit of cost for waterworks is \_\_\_\_\_.
  - (a) Per litre
  - (b) Per kg
  - (c) Per 1000 litres
  - (d) None of these

9. The unit of cost for gas companies is \_\_\_\_\_.
- (a) Per tin (b) Per cylinder  
(c) Per ton (d) Per kg
10. Garage rent is \_\_\_\_\_.
- (a) Fixed cost (b) Variable cost  
(c) Semi-variable cost (d) None of these
11. Cost of petrol is \_\_\_\_\_.
- (a) Fixed cost (b) Running cost  
(c) Semi-variable cost (d) None of these
12. Overhauling is classified as \_\_\_\_\_.
- (a) Fixed cost (b) Semi-fixed cost  
(c) Maintenance cost (d) Marginal cost
13. The object of hotel costing is to find out cost \_\_\_\_\_.
- (a) Per visitor (b) Per room  
(c) Per bed (d) Per table
14. The sheet which shows the details of each journey is a \_\_\_\_\_.
- (a) Daily log sheet (b) Cost sheet  
(c) Statement of account (d) None of these
15. Mumbai Municipal Corporation arranges for removal of garbage by means of vehicle transport; The following vehicles are maintained:

| No. of vehicles | Specifications |
|-----------------|----------------|
| 20              | 5 tonnes       |
| 30              | 4 tonnes       |
| 50              | 3 tonnes       |
| 40              | 2 tonnes       |

On an average, each lorry makes 6 trips a day and covers a distance of 5 km. Each lorry carries 60% of its capacity.

On an average, 20% of the lorries are laid up for repairs. The work is carried out daily. The tonne km will be \_\_\_\_\_.

- (a) 1.94,400 (b) 1.94.000  
(c) 1.00.000 (d) 1,25.000

[Ans.: 1. (c), 2. (e), 3. (a), 4. (a), 5. (b), 6. (c), 7. (b), 8. (c), 9. (b), 10. (a), 11. (b), 12. (c), 13. (a), 14. (a), 15. (a).]





# UNIVERSITY PROBLEMS AND SOLUTIONS

Q.1. A transport company supplies the following details in respect of a truck of 5 tonne capacity which carries goods to and from the city covering a distance of 50 kms. each way.

|   | ₹        |
|---|----------|
| Cost of truck                           | 1,80,000 |
| Diesel, oil, grease (per trip each way) | 30       |
| Repairs and maintenance (per month)     | 1,500    |
| Driver's (monthly) wages                | 1,500    |
| Cleaner-cum-attendant's wages (monthly) | 750      |
| Insurance (per year)                    | 9,000    |
| Road license (per year)                 | 3,000    |
| General Supervision charges (per year)  | 6,000    |
| Estimated life (years)                  | 10       |

While going to the city, freight is available for a full load of the truck and on its return journey it can fetch freight only up to 20 per cent of its capacity.

On the assumption that the trucks runs on an average 25 days a month, you are required to determine the following:

- (i) operating cost per tonne-km,
- (ii) rate per tone per trip that the company should charge if profit of 50 per cent on cost is to be earned, and
- (iii) what freight should the company charge if one wants to engage the truck for one day for a trip to the city and back?

**Solution:**

### Operating Cash Statement

| particulars                            | Total Cost P.m.<br>7500 Ton Km (₹) | Cash per Ton kms<br>(₹) |
|--|------------------------------------|-------------------------|
| (A) Standing charges:                  |                                    |                         |
| Driver wages                           | 1,500                              | 0.20                    |
| Cleaner-cum-Attendant wages            | 750                                | 0.10                    |
| Insurance (9000 ÷ 12)                  | 750                                | 0.10                    |
| Road license (3000 ÷ 12)               | 250                                | 0.033                   |
| General Supervision (6000 ÷ 12)        | 500                                | 0.067                   |
| Total                                  | 3,750                              | 0.500                   |
| (B) Running charges:                   |                                    |                         |
| (-) Depreciation (1,80,000 ÷ (12×10))  | 1,500                              | 0.200                   |
| (-) Diesel, oil, grease (30× 50 trips) | 1,500                              | 0.200                   |

|                                  |       |       |
|----------------------------------|-------|-------|
| i.e. 2 trips per day for 25 days | 1,500 | 0.200 |
| Repairs and Maintenance          | 1,500 | 0.200 |
| Total                            | 4,500 | 0.600 |
| (C) Total cost per ton kms       | 8,250 | 1.100 |

**Working notes:**

- (i) Determination of tonne- KM per month.

$$\text{Trip to City : } 50 \text{ KM} \times 5 \text{ ton capacity} \times 25 \text{ days} = 6,250$$

$$\text{Return : } 50 \text{ KM} \times 25 \text{ days} \times 1 \text{ ton} = \underline{1,250}$$

$$7,500 \text{ KM}$$

- (ii) Determination of Freight Rate

$$\text{Cost per tonne} = ₹ 1.10$$

$$\text{Add: Desired profit (100%) of cash} = \underline{1.10}$$

$$\text{Freight Rate/ ton KM} = ₹ 2.20$$

Q.2. Following relevant data of a firm is given

| Particulars                         | Activity Levels (tons) |               |               |               |
|-------------------------------------|------------------------|---------------|---------------|---------------|
|                                     | 50,000 tons            | 60,000 tons   | 70,000 tons   | 80,000 tons   |
| Variable Cost (₹ in thousands)      | 5,000                  | 6,000         | 7,000         | 8,000         |
| Semi-variable cost (₹ in thousands) | 1,500                  | 1,600         | 1,650         | 1,700         |
| Fixed cost (₹ in thousands)         | 2,500                  | 2,500         | 2,500         | 3,000         |
| Total Cost (₹ in thousands)         | <b>9,000</b>           | <b>10,100</b> | <b>10,100</b> | <b>12,700</b> |

The fixed costs follow step-grap pattern as is clear from the above and the semi-variable costs change at uniform rate between the above given activity levels. Given that the firm operates at 55,000 tons level at present.

- (A) Calculate the additional/incremental costs if it manufactures additional (a) 10,000 tons (b) 15,000 tons and
- (B) Advise whether the firm should accept 'any one' of the following additional (special) export market offers and if Yes, 'which one' should it accept:
- (i) for 10,000 tons at a selling price of ₹ 125/- per ton.
- (ii) for 15,000 tons at a selling price of ₹ 150/- per ton.

**Solution:**

Pressure level = 55,000 tons

(I) Calculation of Additional / Incremental Cost

| Particulars                     | 10,000 tons<br>(₹ in '000) | 15,000 tons<br>(₹ in '000) |
|---------------------------------|----------------------------|----------------------------|
| Variable Cost                   | 1,000                      | 1,500                      |
| Semi-variable cost              | 75*                        | 100                        |
| Fixed cost                      | –                          | 500                        |
| Additional/Incremental cost (A) | 1,075                      | 2,100                      |
| 2. Incremental Revenue:         | (₹ in 000)                 | (₹ in 000)                 |
| (B) (i)                         | 1,250                      | 2,250 (ii)                 |
| Incremental profit (B– A)       | 175                        | 150                        |

**Advice:** Since the firm is getting an incremental profit of ₹ 175 (000) and ₹ 150 (000) in additional activity of 10,000 tons and 15,000 tons respectively. Hence, lower level offer should be accepted.

Q.3. A manufacturing company uses the following standard mix of their compound in one batch of 100 kgs. of its production time:

50 kgs of material X at the standard price of ₹ 2.

30 kgs of material Y at the standard price of ₹ 3.

20 kgs of material Z at the standard price of ₹ 4.

The Actual mix for a batch of 120 kgs was as follows:

60 kgs of material X at the price of ₹ 3.

40 kgs of material Y at the price of ₹ 2.5.

10 kgs of material Z at the price of ₹ 3.

Calculate the different materials variances.

**Solution:**

**Manufacturing Co.**

| Products | Standard |      |        | Actual |      |        |
|----------|----------|------|--------|--------|------|--------|
|          | Kg.      | Rate | Amount | Kg.    | Rate | Amount |
| X        | 50       | 2    | 100    | 60     | 3    | 180    |
| Y        | 30       | 3    | 90     | 40     | 2.5  | 100    |
| Z        | 20       | 4    | 80     | 10     | 3    | 30     |
|          | 100      |      | 270    | 110    |      | 310    |
| Loss     | —        |      | —      | 10     |      | —      |
|          | 100      |      | 270    | 120    |      | 310    |

$$\begin{aligned}
 (1) \text{ Material Cost Variance} &= \text{Std. Cost} - \text{Actual Cost} \\
 &= 270 - 310 \\
 &= 40 \text{ (A)}
 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ Material Price Variance (MPV)} \\
 &= \text{Actual Quantity (SP} - \text{AP)} \\
 \text{X: } 60 (2-3) &= 60 \text{ (A)} \\
 \text{Y: } 40 (3-2.5) &= 20 \text{ (F)} \\
 \text{Z: } 10 (4-3) &= \underline{10 \text{ (F)}} \\
 &= \underline{30 \text{ (A)}}
 \end{aligned}$$

$$\begin{aligned}
 (3) \text{ Material Usage Variance:} \\
 &\text{SP (SQ} - \text{AQ)} \\
 \text{X: } 2 (50 - 60) &= 20 \text{ (A)} \\
 \text{Y: } 40 (30 - 40) &= 30 \text{ (A)} \\
 \text{Z: } 10 (20 - 10) &= \underline{40 \text{ (F)}} \\
 &= \underline{10 \text{ (A)}}
 \end{aligned}$$

$$\begin{aligned}
 \text{MCV} &= \text{MPV} + \text{MUV} \\
 &= 30 \text{ (A)} + 10 \text{ (A)} \\
 &= 40 \text{ (A)}
 \end{aligned}$$

Revised Standard Quantity

$$X = \frac{50}{100} \times 110 = 55$$

$$Y = \frac{30}{100} \times 110 = 33$$

$$Z = \frac{20}{100} \times 110 = 22$$

(4) Material Mix Variance

$$= (\text{Revised Quantity} - \text{Actual Quantity}) \times \text{SP}$$

$$X = (55 - 60) \times 2 = 10 \text{ (A)}$$

$$Y = (33 - 40) \times 3 = 10 \text{ (A)}$$

$$Z = (22 - 10) \times 4 = \underline{48 \text{ (F)}}$$

$$17 \text{ (F)}$$

(5) Material yield Variance

$$= (\text{Revised Quantity} - \text{Std. Quantity}) \times \text{SP}$$

$$X = (55 - 50) \times 2 = 10 \text{ (A)}$$

$$Y = (33 - 30) \times 3 = 9 \text{ (A)}$$

$$Z = (22 - 20) \times 4 = \underline{8 \text{ (F)}}$$

$$27 \text{ (F)}$$

Final Recalculation:

$$\text{MCV} = \text{MPV} + \text{MMV} + \text{MYV}$$

$$= 30 \text{ (A)} + 17 \text{ (F)} + 27 \text{ (A)}$$

$$\text{MCV} = 40 \text{ (A)}$$

Q.4. The following information relates to the productive activities of Delta Ltd. for 3 months ending on 31st March 2008:

| <b>Particulars</b>                                | <b>₹</b>        |
|---|-----------------|
| <b>Variables Expenses: (at 50% capacity)</b>      |                 |
| — Materials                                       | 6,00,000        |
| — Labour  | 6,40,000        |
| — Salesmen's Commission                           | <u>95,000</u>   |
|   | 13,35,000       |
| <b>Semi-variable Expenses : (at 50% capacity)</b> |                 |
| — Plant maintance                                 | 62,500          |
| — Indirect Labour                                 | 2,47,500        |
| — Salesmen's salaries                             | 72,500          |
| — Sundry  | <u>65,000</u>   |
|   | 4,47,500        |
| <b>Fixed Expenses:</b>                            |                 |
| — Managements salaries                            | 2,10,000        |
| — Rent and taxes                                  | 1,40,000        |
| — Depreciation of Machinery                       | 1,75,000        |
| — Sundry office Expenses                          | <u>2,22,500</u> |
|   | <u>7,47,500</u> |

It is further noted that semi-variable expenses remain constant between 40% and 70% capacity, increase by 10% of the above figures between 70% and 85% capacity and increased by 15% of the above figures between 85% and 100% capacity.

Fixed expenses remain constant whatever the level of activity may be. Sales at 60% capacity are ₹ 25,50,000, at 80% capacity are ₹ 34,00,000 and at 100% capacity are ₹ 42,50,000.

Assuming that all items produced are sold, you are required to prepare a flexible budget at 60%, 80% and 100% capacity.

**Solution:**

**In the Books of Delta Ltd.  
Flexible Budget for 3 months ending 31.03.2008**

| Capacity                   | 60%              | 80%              | 100%             |
|----------------------------|------------------|------------------|------------------|
| A. Fixed Expenses:         |                  |                  |                  |
| Management Salaries        | 2,10,000         | 2,10,000         | 2,10,000         |
| Rent and Taxes             | 1,40,000         | 1,40,000         | 1,40,000         |
| Depreciation on Machinery  | 1,75,000         | 1,75,000         | 1,75,000         |
| Sundry office Exp.         | 2,22,500         | 2,22,500         | 2,22,500         |
| <b>Total (A)</b>           | <b>7,47,500</b>  | <b>7,47,500</b>  | <b>7,47,500</b>  |
| B. Semi-variable Expenses: |                  |                  |                  |
| Plant Maintenance          | 62,500           | 68,750           | 71,875           |
| Indirect Labour            | 2,47,500         | 2,72,250         | 2,84,625         |
| Salesmen Salaries          | 72,500           | 79,750           | 83,375           |
| Sundry                     | 65,000           | 71,500           | 74,750           |
| <b>Total (B)</b>           | <b>4,47,500</b>  | <b>4,92,950</b>  | <b>5,14,625</b>  |
| C. Variable Expenses:      |                  |                  |                  |
| Materials                  | 7,20,000         | 9,60,000         | 12,00,000        |
| Labour                     | 7,68,000         | 10,24,000        | 12,80,000        |
| Salesman Commission        | 1,14,000         | 1,52,000         | 1,90,000         |
| <b>Total (C)</b>           | <b>16,02,000</b> | <b>21,36,000</b> | <b>26,70,000</b> |
| D. Total Exp. (A+B+C)      | 27,97,000        | 33,75,750        | 39,32,125        |
| E. Sales                   | 25,50,000        | 34,00,000        | 42,50,000        |
| F. Profit/Loss             | (2,47,000)       | 24,250           | 3,17,875         |

Q.5. (b) You are given the following information for the next year:

| Particulars                   | ₹        |
|-------------------------------|----------|
| Sales (10,000 units)          | 1,20,000 |
| Variables Cost (10,000 units) | 48,000   |
| Fixed Cost                    | 60,000   |

1. Find out the P.V. ratio and Break-even point.
2. Evaluate the effect of following on P.V. ratio and Break-even point.
  - (a) 10% decrease in variable cost
  - (b) 10% decrease in Fixed cost
  - (c) 10% increase in physical sales volume
  - (d) 5% increase in selling price.

**Solution:**

Calculation of PV ratio and BEP

Contribution = Sales – Variable Cost

$$72 = 1,20,000 - 48,000$$

| Case | PV Ratio  | B.E.P.  |
|------|---|---|
|      |   | $\frac{FC}{P/V \text{ Ratio}}$                                    |
| (1)  | Existing $\frac{72,000}{1,20,000} \times 100 = 60\%$  | $\frac{60,000}{60\%} = 1,00,000$                                  |
| (2)  | (a) 10% decrease in variable cost contribution<br>$= 1,20,000 - [48,000 - 10\%]$<br>$= 76,800$<br>$\frac{76,800}{1,20,000} \times 100 = 64\%$   | 60,000<br>64%<br>= 93,750   |
|      | (b) 10% decrease in $\frac{\text{Fixed Cost}}{\text{No change}} = 60\%$   | FC = 60,000 – 6,000<br>= 54,000<br>$\frac{54,000}{60\%} = 90,000$ |
|      | (c) 10% increase in sale volume<br>New sale = 1,20,000 × 10% of 1,20,000<br>$= 1,32,000$<br>$C = 1,32,000 - 48,000 = 84,000$<br>$\frac{84,000}{1,32,000} \times 100 = 63.63\%$  | $\frac{60,000}{63.63\%}$<br>= 94,295                              |
|      | (d) 5% increase in selling price<br>$SP/unit = \frac{1,20,000}{10,000} = 12$<br>5% increase $\frac{0.60}{12.60}$<br>Revised S. P. $\frac{12.60}{12.60}$<br>Contribution = 12.60 – 4.80<br>$= 7.80$<br>$\frac{7.80}{12.60} \times 100 = 61.90\%$ | $\frac{60,000}{61.90\%}$<br>= 96,930                              |

Q.6. Write short notes on (any four):-

- (a) Inter-link of Budgetary control and variance analysis;
- (b) Utility of Standard Costing;
- (c) Different types of budgets useful for a typical business enterprise;
- (d) Implications of the angle of incidence;
- (e) Special features of Operating costing;
- (f) Importance of marginal costing in decision making function.

**Solution:**

**(a) Inter-link of Budgetary Control and Variance Analysis**

The word 'budget' is derived from the French term "Budget" which denotes a leather pouch in which funds are appropriated for meeting anticipated expenses. A budget is quantitative expression of plan of action. It is a plan of the target to be achieved within a specified period. It is final and approved forecast. When the forecasts are approved by the management as a tentative plan for the future they become budget.

Budgetary Control is a means of control in which the actual state of affairs is compared with that planned for so that appropriate action may be taken with regard to any deviations before it is too late.

According to the Institute of Cost & Management Accountants England "Budgetary Control is the establishment of budget relating to the responsibilities of the executives to the requirements of a policy and the continuous comparison of actual with the budgeted results either to secure by individual action, the objective of the policy or to provide the basis for its revision."

Thus Budgetary Control Involves: (a) Establishment of budget, (b) Continuous Comparisons of the actual with the budgeted performance to fix responsibility of persons for failure to achieve the targets, and (c) Revision of the budgets in the light of changed circumstances.

There are two steps in the process of budgetary control — Preparation of budget and implementation of the budget programme. Each sectional manager prepares budget for his section and submit the same to the sectional managers who prepares a consolidated budget for the department. The different budgets from different departments are consolidated and into the master budget by a budget committee under the chairmanship of an executive powerful enough to ensure prompt action and co-operation.

**Preliminaries Required for Adoption of a System of Budgetary Control:**

- 1. Budget Centres:** Budget Centre is a section of an organisation of a undertaking for the purpose of budgetary control. Budget centres or departments should be established for each of which budget will be set with the help of the head of the department concerned.
- 2. Accounting Records:** A prerequisite to the establishment of budgetary control system is that accounting system should be able to record and analyse accounting information.
- 3. Organisation Chart:** Organisation Chart defines the functions and responsibilities of each members of the management and ensure that each one knows his position in the organisation and his relationship to other members.
- 4. Budget Committee:** A budget Committee Consists of several members of the top management group. This committee will set the general guideline that the

organisation is to follow and co-ordinate the separate budgets prepared by various organisational units.

5. **Budget Manual:** Budget manual is a document which sets out the responsibilities of the persons engaged in the organisation. It is usually in printed form and an index is provided so that information can be quickly located.
6. **Fixation of Budget Period:** Budget period is the period for which the budget is prepared and employed. There is no right period for every budget. It may vary between short term and long term. Long term budgeting may be considerably affected by the unforeseen conditions.
7. **Key Factors:** Key factor is the factor the extent of whose influence must be assessed in order to ensure that functional budgets are reasonably capable of fulfilment. Key factor is also known as "limiting" or "governing" or "principal budget" factors. Sale is the most often the key factor in an industry.

**Variance Analysis:** There is no uniformity of opinion as to the proper disposition of variances. Some cost accountants argue that variances of all types should be transferred to Costing Profit and Loss A/c. A second group of cost accountants are of opinion that the variances at the end of the year should be properly distributed over closing stock and cost of sales, so that both these items are shown at actual cost in financial statements. Although these two methods are easy to apply and may be used for practical purposes, the variances are not disposed of in accordance with the best accounting practice. According to the strict principles of cost accounting each variance should be carefully analysed so that causes of the same be ascertained. Then each variance should be disposed of in accordance with the underlying reasons for its existence. All variances which are the result of controllable operation should be transferred to Costing Profit and Loss A/c. On the other hand, these variances which are the result of uncontrollable conditions like changes in material prices, wage rate changes, etc. should be apportioned to inventories and cost of goods sold on some equitable basis.

**(b) Utility of Standard Costing**

Standard costing is defined as the preparation and use of standard costs, their comparison with actual costs and the measurement and analysis of variances to their causes and points of incidence. Standard cost a predetermined cost is calculated from the management's standard of efficient operation and the relevant necessary expenditure. Standard costing play an important role in cost control and cost reduction.

1. **As a Measuring Yardstick of Performance:** Standard costing system establishes yardsticks against which the efficiency or inefficiency of actual performance are measured. Standard may be set in respect of the prices and quantity of materials, labour time and wage rates, production etc. These standards are used to measure the performance e.g. standards quantity of material specified for a particular job can be taken as a basis (standard) to control the actual usage of material. By calculating variance analysis the management can study the reason for deviation.
2. **As a Basis of Inventory Valuation:** Under standard costing valuation of inventory become simple. The valuation of inventory is made at standard costs and any difference between the actual costs and standards may be transferred to variance account. Thus, standard costing enables to maintain uniform pricing of raw material, work in progress and finished goods.

3. **As an Aid in Preparing Earning Budget:** Estimation of standard cost for each and every element of cost helps the management in estimating the earning too. Under the system of standard costing the output is valued at costs and the estimated earnings are also based on standard selling price of output is valued at costs and the estimated earnings to be realised during a given period can be calculated on the basis of difference between the standard costs and standard selling price. This is useful in preparation of earning subject.
4. **As a Guide in Fixing Selling Price:** Standard costing is very useful to the management in formulation of pricing policy for the products. The normal procedure is to add a certain margin of profit to the standard costs of the product. However, depending upon the marketing conditions this margin may vary from time to time. Normally the market price is influenced by the forces of demand and supply. Pricing policies may be formulated in advance before production starts. This helps in prompt decision making.

(c) **Different Types of Budgets Useful for a Typical Business Enterprise**

A functional budget is one which relates to any of the function or activities of an organisation. The function determine the scope of activities of various departments. Each department has to prepare its own budget. Functional budget is "a Budget of income or expenditure appropriate to, or the responsibility of a particular function (CIMA). All the functional budgets are summarised into what is known as "master budget. These functional budgets are thus subsidiary budgets of the "master budget".

There are several types of functional budgets depending upon the structure of organisation and need of control in each case. However, generally the following types of budgets are prepared:

- (i) **Sales Budget:** This budget is prepared by sales manager. Preparation of sales budget is the most difficult job since it is very difficult to estimate future demands of a product. This is probably the most important budget as all other budgets depend on the sales budget.
- (ii) **Production Budget:** The budget is prepared by production manager. It shows the quantity of products to be manufactured.
- (iii) **Production Cost Budget:** This budget is also known as manufacturing budget. It is the quantity of goods to be manufactured expressed in terms of cost.  
This budget consists of three subsidiary budgets:
  - (a) Materials budget
  - (b) Labour cost budget
  - (c) Manufacturing overhead budgets.
- (iv) **Purchase Budget:** This budget lays down the quantity of materials to be purchased from month to month to ensure smooth production.
- (v) **Cash Budget:** This represents the cash receipt and cash payments and estimated cash balance for each month of the period for which budget is prepared. Cash budget is a device for controlling and coordinating the financial side of a business.
- (vi) **Capital Expenditure Budget:** It shows the planned outlay on fixed assets to be acquired during the budget period. Every care must be taken before preparing this budget.
- (vii) **Selling and Distribution Cost Budget:** This budget is a forecast of selling and distribution expenses for the company's products during the budget period. This

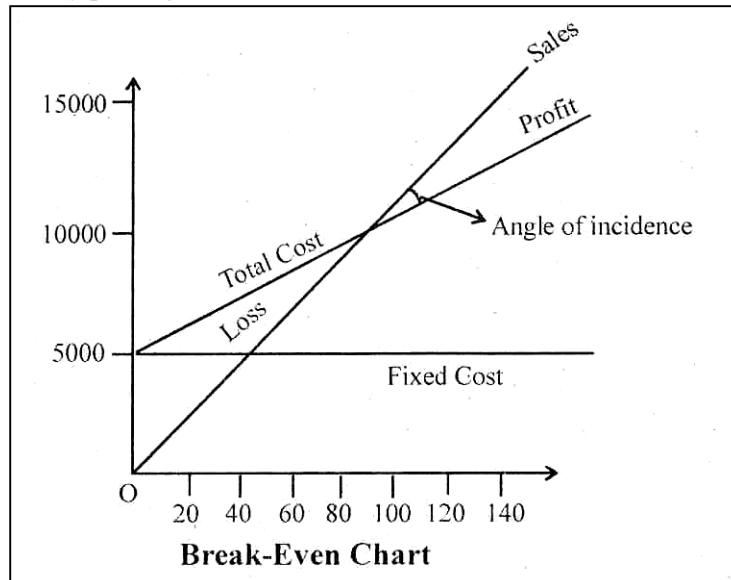
budget is closely connected with sales budget as selling and distribution expenses will be in proportion to sales.

- (viii) **Research and Development Cost Budget:** Research cost means the cost of searching for a new or improved products, new applications of materials, or new or improved method.

Development cost is the cost of the process which begins with the implementation of the decision to produce a new or improved product or to employ a new or improved method.

(d) **Implications of the Angle of Incidence**

It is formed by the intersection of sales line and total cost line at the Break Even Point. It shows the rate at which the organisation is earning profit once the BEP is reached. This angle provides useful information about the rate at which profits are being made. The larger the angle the higher the rate of profit and vice-versa. The angle of incidence can be studied in conjunction with margin of safety. A large angle of incidence together with a high margin of safety indicates an extremely favourable situation. This can be shown by plotting a Break-Even Chart.



(e) **Special Features of Operating Costing**

Operating costing is defined as "the cost of specific services or functions e.g. canteen, maintenance, personnel. These may be referred as service centres, departments or functions. (ICMA Terminology). Service or operating costs are, therefore, the costs of providing and operating a service. The method is usually applied to transportation services, viz., and road, rail, air and waterways, gas, steam, etc. and professional services like accounting or solicitor's firms, management consultants, courier service, etc. Thus, the method applies to activities that provide a service rather than producing goods. Again, the method may be used for both services to outside customers as well as internal use. In a manufacturing unit, certain sections may provide ancillary services to production department, such as canteen, maintenance, personnel as mentioned in the above definition.

In this method, operating costs are collected periodically and the operating cost is divided by the quantity of services rendered during the period to arrive at the cost per unit. The main characteristic feature of service organisations are as follows:

- (a) Labour - intensive
- (b) More Expense - oriented
- (c) Major inputs and output cannot be stored.
- (d) Use of composite cost-units is more common than single cost unit.

This method of costing is different from that used in costing manufactured products, and the difference lies accumulated under various headings suitable for control purpose and decision-making, and are usually grouped under fixed cost or standing charges and variable costs. The format of presentation of cost data depends on the nature of industry and need of management.

**(f) Importance of Marginal Costing in Decision Making Function**

In marginal costing, it is presumed that variable costs are related to output and Fixed costs are related to the period. Fixed costs are charged off to the P&L A/c.

Marginal costing necessitates the analysis of costs into fixed and variable. These types of costs behave differently with changes in the volume of output. The variable cost varies directly in proportion to change in the volume of output, which means that variable cost per unit remains constant regardless of the levels of output. Fixed costs, on the other hand, remain fixed at the same level regardless of changes in the volume of output, and vary per unit inversely with the change in total with time rather than with the level of output. For this reason fixed costs are also known as time or period costs because they accrue with the passage of time irrespective of the volume of output. Fixed cost is also called by other names like standby cost, constant cost, capacity cost, etc. Variable costs are also known as product costs as these are related to volume of output. Variable cost is also termed as direct cost, marginal cost, activity cost, volume cost, or out-of pocket cost. Semi-variable cost is one which is partly fixed and partly variable. The fixed part of this cost is segregated and merged into the variable cost.

Marginal costing is basically concerned with the determination of product cost which consists of the total costs less the fixed costs i.e. direct materials, direct labour, direct expenses and variable overhead. Thus, marginal cost is the variable cost (which forms part of product cost) and does not include fixed cost. Fixed costs are not included in the cost of production because the former bear relation to certain period of time and also vary per unit of production.

The technique of marginal costing is a valuable aid to management for decision making in many key areas such as the following:

- (a) The price at which a product should be sold.
- (b) Determination of volume of output.
- (c) Utilisation of surplus capacity.
- (d) Submission of tenders and quotations.
- (e) Acceptance of special order e.g. export order.
- (f) Make or buy a component.
- (g) Economic feasibility of major (capital) projects.
- (h) Replacement of a machinery.
- (i) Determining optimum product or sales mix.

- (u) Operate the plant or shut it down, etc.  
 (k) Suspension or permanent closing down of a business.

Q.7. The following particulars are taken from the records of the company engaged in manufacturing two products, A and B, from a certain material:

| Particulars                 | Product A (per unit) | Product B (per unit) |
|-----------------------------|----------------------|----------------------|
| Sales                       | 2,500                | 5,000                |
| Material cost (₹ 50 per kg) | 500                  | 1,250                |
| Direct labour (30 per hour) | 750                  | 1,500                |
| Variable overheads          | 250                  | 500                  |

Total fixed overheads: ₹ 10,00,000

- (a) Comment on the profitability of each product when:  
 (i) Total sales in value is limited.  
 (ii) Raw materials is in short supply.  
 (iii) Production capacity (labour) is the limiting factor.  
 (b) When total availability of raw materials is 20,000 kg and maximum sales potential of each product is 1,000 units, find the product mix to yield maximum profits.

**Solution:**

**Statement of Evaluation product A & B**

| Particulars         | Product A |       | Product B |       |
|---------------------|-----------|-------|-----------|-------|
|                     | ₹         | ₹     | ₹         | ₹     |
| Sales               |           | 2,500 |           | 5,000 |
| (-) Variable Costs: |           |       |           |       |
| Materials Cost      | 500       |       | 1,250     |       |
| Direct labour       | 750       |       | 1,500     |       |
| Variable overhead   | 250       | 1,500 | 500       | 3,250 |
| Contribution/unit   |           | 1,000 |           | 1,750 |

- |   | Product A                          | Product B                          |
|---|------------------------------------|------------------------------------|
| 1. P/V ratio = $\frac{C}{S} \times 100$ | $= \frac{1,000}{2,500} \times 100$ | $= \frac{1,750}{5,000} \times 100$ |
|   | = 40%                              | = 35%                              |
| 2. Material (Kg)/Unit                   | $= \frac{500}{50}$                 | $= \frac{1,250}{50}$               |
|   | = 10 kg                            | = 25 kg                            |
| 3. Contribution/kg of material          | $= \frac{1,000}{10}$               | $= \frac{1,750}{25}$               |
|   | = ₹ 100                            | = ₹ 70                             |

|                            |                                 |                                   |
|----------------------------|---------------------------------|-----------------------------------|
| 4. Labour Hrs./Unit        | $= \frac{750}{30}$<br>= 25 hrs. | $= \frac{1,500}{30}$<br>= 50 Hrs. |
| 5. Contribution/Labour Hr. | $= \frac{1,000}{25}$<br>= ₹ 40  | $= \frac{1,750}{50}$<br>= ₹ 35    |

- (a) (i) Comment of the profitability of each product when total sales value is limited:  
Product A has a higher P/V ratio than Product B, hence product A is more profitable.
- (ii) Comment on profitability of each product when raw material is in short supply:-  
Product A has a higher contribution per kg raw materials than product B. Hence product A is more profitable.
- (iii) Comment on the profitability of each product when production capacity (labour) is the limiting factor:  
Product A has a higher contribution per labour Hours than Product B. Hence product A is more profitable.
- (b) When raw materials and sales quantity both are limiting factors:

**Statement of product Mix to yield maximum profits**  
**(Availability of Raw Materials is limited to 20000 kg)**

| Products                   | Product A                       | Product B                     |
|----------------------------|---------------------------------|-------------------------------|
| Units to be made           | 1000                            | 400                           |
| Raw material consumption   | 10,000<br>(1,000 units × 10 kg) | 10,000<br>(400 units × 25 kg) |
| Contribution per Unit      | ₹ 1000                          | ₹ 1,750                       |
| Total Contribution         | ₹ 10,00,000                     | ₹ 7,00,000                    |
| Total contribution (A + B) | ₹ 17,00,000                     |                               |
| (-) fixed Cost             | ₹ 10,00,000                     |                               |
| Profit                     | 7,00,000                        |                               |

- Q.8. Mr. Hakim runs a Tempo service in the town and has three vehicles. He furnishes you the following data and wants you to compute the cost per running mile:

|                                  | Vehicle A<br>₹ | Vehicle B<br>₹ | Vehicle C<br>₹ |
|----------------------------------|----------------|----------------|----------------|
| Cost of vehicle                  | 25,000         | 15,000         | 50,000         |
| Road License fee per year        | 750            | 750            | 750            |
| Supervision salary (yearly)      | 1,800          | 1,200          | 1,500          |
| Driver's wage per hour           | 4              | 4              | 4              |
| Cost of fuel per litre           | 1.50           | 1.50           | 1.50           |
| Repairs and Maintenance per mile | 1.50           | 2.00           | 3.00           |

|                             |                   |                 |                   |
|-----------------------------|-------------------|-----------------|-------------------|
| Tyre cost per mile          | 1.00              | 0.80            | 1.20              |
| Garage rent per year        | 1,600             | 550             | 1,000             |
| Insurance Premium yearly    | 850               | 500             | 1,500             |
| Miles run per litre         | 6                 | 5               | 4                 |
| Mileage run during the year | 15,000            | 6,000           | 9,000             |
| Estimated life of vehicles  | 1,00,000<br>miles | 75,000<br>miles | 1,20,000<br>miles |

Charge interest at 10% p.a. on the cost of vehicle. The vehicles run 20 miles per hour on an average.

**Solution:**

**Mr. Hakim Tempo Service**

**Operating cost Statement for the period ending.....**

| Particulars                       | Vehicle A     | Vehicle B     | Vehicle C     |
|-----------------------------------|---------------|---------------|---------------|
| Cost                              | 25,000        | 15,000        | 50,000        |
| <b>Standing/ fixed Expenses:</b>  |               |               |               |
| Road license fees                 | 750           | 750           | 750           |
| Supervision and salary            | 1800          | 1200          | 1500          |
| Garage Rent                       | 1600          | 550           | 1000          |
| Insurance                         | 850           | 500           | 1500          |
| Interest @ 10% of cost            | 2500          | 1500          | 5000          |
| Total                             | 7500          | 4500          | 9750          |
| Mileage per annum (miles)         | 15000         | 6000          | 9000          |
| Fixed exp. Per mile               | 0.50          | 0.75          | 1.083         |
| <b>Running/variable Expenses:</b> |               |               |               |
| Driver's Wage (₹ 4 ÷ 20)          | 0.20          | 0.20          | 0.20          |
| Fuel Costs                        | 0.25          | 0.30          | 0.375         |
| Depreciation                      | 0.25          | 0.20          | 0.417         |
|                                   | A             | B             | C             |
|                                   | <u>25,000</u> | <u>15,000</u> | <u>50,000</u> |
|                                   | 1,00,000      | 75,000        | 1,20,000      |
| Tyre Cost/mile                    | 1.00          | 0.80          | 1.20          |
| Repairs and Maintenance Cost/mile | 1.50          | 2.00          | 3.00          |
| Operating Cost/ mile              | 3.70          | 4.25          | 6.275         |

Q.9. In a factory the standard mix consists of 60 kgs of X and 40 kgs of Y. The standard loss of production is 30%. The standard price of X is ₹ 5 per kg. and of Y ₹ 10 per kg.

The actual mixture and yield were as follows;

X :- 80 kgs at ₹ 4.50 per kg. Y :- 70 kgs at ₹ 8 per kg. Actual yield :- 115 kgs.

Calculate:

- (a) Material Cost Variance  
 (b) Material Price Variance  
 (c) Material Revised Usage Variance  
 (d) Material Mix Variance, and  
 (e) Material Yield Variance.

**Solution:**

| Materials | Standard |      |       | Actual |      |       | Std. Cost of Actual Mix |      |       |
|-----------|----------|------|-------|--------|------|-------|-------------------------|------|-------|
|           | Kg       | Rate | Total | Kg     | Rate | Total | Kg                      | Rate | Total |
| X         | 90       | 5    | 450   | 80     | 4.50 | 360   | 80                      | 5    | 400   |
| Y         | 60       | 10   | 600   | 70     | 8.00 | 560   | 70                      | 10   | 700   |
|           | 150      |      | 1050  | 150    |      | 920   |                         |      | 1100  |
| Loss      | 45       |      |       | 35     |      | –     |                         |      |       |
| Output    | 105      |      |       | 115    |      | 920   |                         |      | 1100  |

$$\text{Std. Rate of Std. Mix} = \frac{1050}{150} = ₹ 7 \text{ kg}$$

$$\text{Std. Rate of Actual Mix} = \frac{1100}{150} = 7.33$$

$$\text{Std. Cost of Std. Mix in terms of Actual yield} = \frac{1050}{150} \times 115 = 1150$$

**Computation of Variances:****(a) Material Cost Variance**

$$= \text{Actual Cost of Actual Mix} - \text{Std. Cost of Std. Mix in terms of actual mix}$$

$$= 920 - 1150 = 230 \text{ (F)}$$

**(b) Materials price variance = AQ (SR – AR)**

$$X = 80 (5 - 4.50) = 40 \text{ (F)}$$

$$Y = 70 (10 - 8.00) = 140 \text{ (F)}$$

$$180 \text{ (F)}$$

**(c) Material revised Usage Variance**

$$= \text{Actual Quantity} \times \text{Std. Rate of Actual Mix} = 1100$$

$$(-) \text{ Std. Cost of Std. Mix in terms of Actual yield} = \underline{1150}$$

$$50 \text{ (F)}$$

**(d) Material Mix Variance =**

$$\text{Actual Quantity} \times \text{Std. Rate of Actual Mix} = 1100$$

$$(-) \text{ Actual Quantity} \times \text{Std. Rate of Std. Mix} = \underline{1050}$$

$$50 \text{ (A)}$$

**(e) Material Yield Variance =**

$$\text{Actual Quantity} \times \text{Std. Rate of Std. Mix} = 1050$$

$$(-) \text{ Std. Cost of Std. Mix in terms of Actual yield} = \underline{1150}$$

$$100 \text{ (F)}$$

**Reconciliation:**

$$\begin{aligned}
 \text{MCV} &= \text{MPV} + \text{MMV} + \text{MYV} \\
 &= 180 (\text{F}) + 50 (\text{A}) + 100 (\text{F}) \\
 &= 230 (\text{F})
 \end{aligned}$$

Q.10. The Jaydeep Co. Ltd., has completed most of the functional budgets and it is now time to prepare the cash budget. An analysis of the various budgets concerned reveals the requirement.

**Requirements for Cash Budgets**

|          | Sales  | Materials | Wages  | Production | Admin Exp. | Selling Exp. | Distribution Exp. | Research and Development Exp. |
|----------|--------|-----------|--------|------------|------------|--------------|-------------------|-------------------------------|
|          | ₹      | ₹         | ₹      | ₹          | ₹          | ₹            | ₹                 | ₹                             |
| Oct. 08  | 80,000 | 40,000    | 10,000 | 8,400      | 3,400      | 5,000        | 3,000             | 1,000                         |
| Nov.08   | 60,000 | 30,000    | 9,000  | 8,000      | 3300       | 4,500        | 2,500             | 1,000                         |
| Dec. 08  | 40,000 | 20,000    | 8,000  | 7,500      | 3,500      | 4,000        | 2,000             | 1,000                         |
| Jan. 09  | 50,000 | 40,000    | 9,000  | 8,000      | 3,700      | 4,400        | 2,400             | 1,200                         |
| Feb. 09  | 60,000 | 50,000    | 10,000 | 8,500      | 3,900      | 4,800        | 2,600             | 1,200                         |
| March 09 | 80,000 | 60,000    | 11,000 | 9,000      | 3,600      | 5,200        | 2,900             | 1,200                         |
| April 09 | 70,000 | 50,000    | 9,000  | 8,000      | 3,500      | 5,000        | 2,600             | 1,500                         |
| May 09   | 60,000 | 30,000    | 8,000  | 7,500      | 3,700      | 4,800        | 2,500             | 1,500                         |
| June 09  | 50,000 | 40,000    | 9,000  | 8,000      | 3,900      | 4,500        | 2,400             | 1,500                         |

Period of Credit allowed by creditors - 2 months

Period of Credit allowed to debtors - 3 months

Lag in Payment of overheads - 1 month

Lag in Payment of wages 1/8 month

The cash balance on 1st January, 2009 is expected to be ₹ 1,00,000.

Further :

- Plant and Machinery to be installed in April, 2009 at a cost of ₹ 50,000 will be paid by monthly installments of ₹ 10,000 as from 1st May, 2009. Extensions to the Research and Development Department at a cost of ₹ 10,000 will be completed on 1st January, 2009 payment to be made on 1st February, 2009.
- A sales commission of 10% on sales is to be paid within the month following actual credit sales.
- Cash sales of ₹ 5,000 per month are expected; no commission is payable on them.
- The company has a hire purchase agreement under which ₹ 5,000 a month is being paid for plant purchased before this budget period. The said payment will continue throughout this budget period.
- Preference share dividends of 8% on capital of ₹ 2 million are to be paid on 1st April, 2009.
- Tax of ₹ 1,00,000 is due on 1st April, 2009.
- Dividends from investments, amounting to ₹ 70,000 are expected on 1st May, 2009.

- (h) Three calls of Re. 0.25 each on 2,00,000 ordinary shares are due on 1st January 09, 1st March 09 and 1st June '09.

Prepare cash Budget for 6 months from January '09 to June '09.

**Solution:**

**Jaydeep Co. Ltd.**

**Cash Budget (Jan 2009 to June 2009)**

| Particulars                          | Jan 09   | Feb 09   | Mar 09   | Apr 09    | May 09     | June 09  |
|--------------------------------------|----------|----------|----------|-----------|------------|----------|
| A. Opening Bal.                      | 1,00,000 | 1,69,125 | 1,64,550 | 1,76,675  | (1,22,475) | (98,200) |
| B. Receipts:                         |          |          |          |           |            |          |
| Cash Sales                           | 5,000    | 5,000    | 5,000    | 5,000     | 5,000      | 5,000    |
| Receipt from Debtor                  | 8,000    | 60,000   | 40,000   | 50,000    | 60,000     | 80,000   |
| Dividend from Investment             | —        | —        | —        | —         | 70,000     | —        |
| Calls on shares                      | 50,000   | —        | 50,000   | —         | —          | 50,000   |
| Total receipts (B)                   | 1,35,000 | 65,000   | 95,000   | 55,000    | 1,35,000   | 1,35,000 |
| Total (A+B)                          | 2,35,000 | 2,34,125 | 2,59,550 | 2,31,675  | 12,525     | 36,800   |
| C. Payments:                         |          |          |          |           |            |          |
| Materials                            | 30,000   | 20,000   | 40,000   | 50,000    | 60,000     | 50,000   |
| Labour                               | 8,875    | 9,875    | 10,875   | 9,250     | 8,125      | 8,875    |
| Production overhead                  | 7,500    | 8,000    | 8,500    | 9,000     | 8,000      | 7,500    |
| Admin. Overhead                      | 3,500    | 3,700    | 3,900    | 3,600     | 3,500      | 3,700    |
| Selling Overhead                     | 4,000    | 4,400    | 4,800    | 5,200     | 5,000      | 4,800    |
| Distribution Overhead                | 2,000    | 2,400    | 2,600    | 2,900     | 2,600      | 2,500    |
| R & D Overhead                       | 1,000    | 1,200    | 1,200    | 1,200     | 1,500      | 1,500    |
| Plant and Machinery                  | —        | —        | —        | —         | 10,000     | 10,000   |
| Extension to R & D                   | —        | 10,000   | —        | —         | —          | —        |
| Hire purchase payment                | 5,000    | 5,000    | 5,000    | 5,000     | 5,000      | 5,000    |
| Sales Commission                     | 4,000    | 5,000    | 6,000    | 8,000     | 7,000      | 6,000    |
| Preference Dividend (8%)             | —        | —        | —        | 1,60,000  | —          | —        |
| Tax                                  | —        | —        | —        | 1,00,000  | —          | —        |
| Total (C)                            | 65,875   | 69,575   | 82,875   | (354,150) | 1,10,725   | 99,875   |
| Cash available (A + B - C)           | 1,69,125 | 1,64,550 | 1,76,675 | 1,22,475  | (98,200)   | 63,075   |
| Loans/overdraft<br>(Closing balance) |          |          |          |           |            |          |

- Q.11. A State Transport Corporation has been in serious financial and operational difficulty due to high prices of spares, rising fuel cost and high wages.

The running operational expenses have been worked out for a single-deck bus and are reproduced below:-

Total fleet-500 buses single-deck

Average Passengers occupying each trip: 40

List of expenses for one year period ended 31.12.2008:

**Variable Expenses:** Total for 30,000 km. per bus per year.

|                                     | ₹      |
|-------------------------------------|--------|
| (i) Fuel diesel oil                 | 10,000 |
| (ii) Tyres, tube and batteries      | 5,000  |
| (iii) Lubricants                    | 1,500  |
| (iv) Spare parts and accessories    | 4,500  |
| (v) Wages, fringe benefit and bonus | 28,000 |

**Fixed Expenses:**

|  |          |
|--|----------|
| (i) Road Tax                               | 1,500    |
| (ii) Insurance                             | 2,500    |
| (iii) Rent for night parking garage        | 3,000    |
| (iv) Maintenance garage establishment cost | 2,000    |
| (v) Original cost per bus                  | 2,00,000 |

Depreciation @ 15% p.a. on straight line basis

**Administrative Expenses :**

**Total per year**

|  | ₹         |
|--|-----------|
| (a) Administrative establishment cost<br>(including Salaries and P.F.) | 13,05,000 |
| (b) Staff welfare cost   | 57,000    |
| (c) Retirement gratuity  | 50,000    |
| (d) Rates and taxes  | 50,000    |
| (e) Travelling and conveyance  | 38,000    |
| (f) Postage, telephone and stationery                                  | 2,10,000  |
| (g) Audit fee  | 25,000    |
| (h) Electricity  | 70,000    |
| (i) Interest and bank charges  | 2,80,000  |
| (j) Miscellaneous  | 40,000    |

Administrative overhead is to be absorbed in the operating cost on the basis of available number of budgeted operatable fleet (calculated on the basis of total fleet less 15% breakdown).

You are required to advise management regarding the fare structure on cost plus 10% basis for the following stages of travel, assuming that: the fare is charged in proportion to kilometres travelled.

Minimum fare on :-

|                     |                                       |
|---------------------|---------------------------------------|
| 1st stage of travel | 5 km.                                 |
| 2nd stage of travel | 10 km. (Rounded off to nearest paise) |
| 3rd stage of travel | 15km.                                 |

**Solution:**

**State Transport Corporation**  
**Operational Expenses for the period ended 31.12.2008**

|  | 30,000 Km. run per Bus per annum<br>₹ | Rate per km.<br>₹ |
|--|---------------------------------------|-------------------|
| <b>Variable Expenses:</b>                              |                                       |                   |
| Fuel and diesel  | 10,000                                | 0.30              |
| Tyres, Tubes and Batteries                             | 5,000                                 | 0.17              |
| Lubricants   | 1,500                                 | 0.05              |
| Spare parts and accessories                            | 4,500                                 | 0.15              |
| Wages, Fringe benefit and bonus                        | 28,000                                | 0.93              |
| <b>(1)</b>   | <b>49,000</b>                         | <b>1.60</b>       |
| <b>Fixed Expenses :</b>                                |                                       |                   |
| Road Tax   | 1,500                                 | 0.05              |
| Insurance  | 2,500                                 | 0.08              |
| Night parking Garage rent                              | 3,000                                 | 0.10              |
| Maintenance garage establishment cost                  | 2,000                                 | 0.07              |
| Depreciation on ₹ 2,00,000 @ 15%                       | 30,000                                | 1.00              |
| <b>(2)</b>   | <b>39,000</b>                         | <b>1.30</b>       |
| <b>Administrative Expenses:</b>                        |                                       |                   |
| Administrative establishment cost                      | 13,05,000                             |                   |
| Staff welfare cost                                     | 57,000                                |                   |
| Retirement gratuity                                    | 50,000                                |                   |
| Rates and Taxes  | 50,000                                |                   |
| Travelling and Conveyance                              | 38,000                                |                   |
| Postage, telephone and stationery                      | 2,10,000                              |                   |
| Audit fee  | 25,000                                |                   |
| Electricity  | 70,000                                |                   |
| Interest and Bank charges                              | 2,80,000                              |                   |
| Miscellaneous  | 40,000                                |                   |
|  | 21,25,000                             |                   |
| Total No. of Buses                                     | 500                                   |                   |
| Less Breakdown   | 75                                    |                   |
|  | 425                                   |                   |
| Adm. Exp. Per Bus = $\frac{21,25,000}{425}$ <b>(3)</b> | <b>5,000</b>                          | <b>0.17</b>       |
| Total Operation cost/bus = (1- 2 + 3)                  | 93,000                                | 3.10              |

|                           |   |                       |
|---------------------------|---|-----------------------|
| Average Passenger per Bus | = | 40                    |
| Cost per Passenger per Km | = | $\frac{3.10}{40}$     |
|                           | = | 7.75 paise            |
| Cost per km               | = | 7.750 Paise           |
| Margin                    | = | $\frac{0.775}{8.525}$ |
| Fare per KM               | = | 8.525 Paise           |

The fare structure will be as follows

|           |                      |   |         |   |           |
|-----------|----------------------|---|---------|---|-----------|
| Stage I   | 5 KM × 8,525 Paise   | = | 42.625  | = | 43 Paise  |
| Stage II  | 10 KM × 8.525 Paise  | = | 85.25   | = | 85 Paise  |
| Stage III | 15 K.M × 8.255 Paise | = | 127.875 | = | 128 Paise |

Q.12. V.N. Ltd. operates on a standard cost system to produce an article mixing two raw materials and following are the standards:-

40% of Material A at ₹ 4 per kg., 60% of Material B at ₹ 3 per kg.

A standard loss of 15% is expected in production.

The following actual cost data is given for March, 2010 (Production: 1700 kg of finished product):-

|             | Stock on 1.3.2010      | Stock on 31.3.2010 | Purchase for March, 2010 |       |
|-------------|------------------------|--------------------|--------------------------|-------|
|             |                        |                    | Kgs.                     | ₹     |
| Materials A | 35 Kgs. (no. Variance) | 5 kgs.             | 800                      | 3,400 |
| Materials B | 40 Kgs. (no. Variance) | 50 kgs.            | 1,200                    | 3,000 |

Calculate the following variances in respect of the purchase during the month that are consumed :-

- Material Price Variance
- Material Mix Variance
- Material Yield Variance
- Material Cost Variance
- Material Usage Variance.

**Solution:**

| Types of Materials | Standard |      |        | Actual |      |          |
|--------------------|----------|------|--------|--------|------|----------|
|                    | Qty      | Rate | Amount | Qty    | Rate | Amount   |
| A                  | 800      | 4    | 3,200  | 354    | 4.00 | 140.00   |
|                    |          |      |        | 795    | 4.25 | 3,378.75 |
| B                  | 1200     | 3    | 3,600  | 40     | 3.00 | 120.00   |
|                    |          |      |        | 1150   | 2.50 | 2,875.00 |
| Total              | 2000     |      | 6,800  | 2020   |      | 6,513.75 |
| Less Std. Loss 15% | 300      |      |        | 320    |      |          |
|                    | 1700     |      | 6,800  | 1700   |      | 6,513.75 |

**(a) Materials Price Variances (MPV):**

**Material A:** Since the actual price and standard price of 35 kg of Raw materials are the same, there will be no price variance in respect of this quantity. Price variance will be in respect of only 795 Kg as shown below:

$$AQ (SR - AR)$$

$$795 (4 - 4.25) = 198.75 (A)$$

**Material B:** Similarly, in respect of Material B, Price variance will be in respect of 1150 Kg only as shown below:

$$1150 (3 - 2.5) = 575 (F)$$

$$\text{Total MPV} = 198.75 (A) + 575 (F) = 376.25 (F)$$

**(b) Material Usage Variance (MUV) = SR (SQ - AQ)**

$$A = 4 (800 - 830) = 120 (A)$$

$$B = 3 (1200 - 1190) = \frac{30 (F)}{90 (A)}$$

**(c) Material Yield Variance**

= Std. Cost per Unit (Std. Output for Actual Mix - Actual output)

$$= 4 \left( \frac{1700}{2000} \times 2020 - 1700 \right)$$

$$= 4 \times (1717 - 1700)$$

$$= 4 \times 17 = 68 (A)$$

**(d) Material Mix (MMV)**

= Std. Rate (Revise std. Qty. - Actual Quantity)

Revise Std. Qty.

$$A = \frac{2020}{2000} \times 800 = 808$$

$$B = \frac{2020}{2000} \times 1200 = 1212$$

$$A = 4 \times (808 - 839) = 88 (A)$$

$$B = (1212 - 1190) \times 3 = \frac{66 (F)}{22 (A)}$$

**(e) Material Cost Variance (MCV)**

= Std. Cost for Actual output - Actual cost

$$= 6800 - 6513.75$$

$$= 286.25 (F)$$

**Verification:**

$$\text{MCV} = \text{MUV} + \text{MPV}$$

$$= 90(A) + 376.25 (F) = 286.25 (F)$$

$$\text{MUV} = \text{MMV} + \text{MYV}$$

$$= 22(A) + 68(A) = 90A$$

**Working Notes:**

1. The Std. Loss being 15% it means to produce 1700 Kg. of article, std. Quantity of material required is

$$\frac{100}{85} \times 1700 \text{ Kg.} = 20000 \text{ Kg.}$$

$$A = 40\% \text{ of } 2000 = 800$$

$$B = 60\% \text{ of } 2000 = 1200$$

$$2. \text{ Std. Cost per unit} = \frac{\text{Total Std. Cost}}{\text{Std. output}} = \frac{6800}{1700} = ₹ 4/\text{unit}$$

Q.13. The following are the estimated sales of a company for eight months ending 30. 11.2008

| Months    |      | Estimated Sales (Units) |
|-----------|------|-------------------------|
| April     | 2008 | 12,000                  |
| May       | 2008 | 13,000                  |
| June      | 2008 | 9,000                   |
| July      | 2008 | 8,000                   |
| August    | 2008 | 10,000                  |
| September | 2008 | 12,000                  |
| October   | 2008 | 14,000                  |
| November  | 2008 | 12,000                  |

As a matter of policy, the company maintains the closing balance of finished goods and raw materials as follows :-

**Stock Items****Closing balance of a month**

Finished goods 50% of the estimated sales for the next month

Raw Materials Estimated consumption for the next month.

Each unit of production requires 2 kg. of raw material costing ₹ 5 per kg.

Prepare Production Budget (in units) and Raw Material Purchase Budget (in units and cost) of the company for the half year ending 30th September, 2008.

**Production Budget (in Units)****For the half year ending 30th Sept 2008**

| Month | Sales in Units | Closing Bal. 50% of estimated sales for next month | Opening bal. | Production (2 + 3 - 4) |
|-------|----------------|--|--------------|------------------------|
| April | 12,000         | 6,500  | 6,000        | 12,500                 |
| May   | 13,000         | 4,500  | 6,500        | 11,000                 |
| June  | 9,000          | 4,000  | 4,500        | 8,500                  |
| July  | 8,000          | 5,000  | 4,000        | 9,000                  |
| Aug.  | 10,000         | 6,000  | 5,000        | 11,000                 |
| Sept. | 12,000         | 7,000  | 6,000        | 13,000                 |
|       | 64,000         |  |              | 65,000                 |

**Purchase Budget (in Cost and Units)**  
**For the half year ending 30th Sept. 2008**

| Month | Production in Units | Consumption Kg. ₹ 2/- per unit | Closing Balance | Opening Balance | Purchase in Kg. | Rate | Amount   |
|-------|---------------------|--------------------------------|-----------------|-----------------|-----------------|------|----------|
| April | 12,500              | 25,000                         | 22,000          | 25,000          | 22,000          | 5    | 1,10,000 |
| May   | 11,000              | 22,000                         | 17,000          | 22,000          | 17,000          | 5    | 85,000   |
| June  | 8,500               | 17,000                         | 18,000          | 17,000          | 18,000          | 5    | 90,000   |
| July  | 9,000               | 18,000                         | 22,000          | 18,000          | 22,000          | 5    | 1,10,000 |
| Aug   | 11,000              | 22,000                         | 26,000          | 22,000          | 26,000          | 5    | 1,30,000 |
| Sept. | 13,000              | 26,000                         | 26,000          | 26,000          | 26,000          | 5    | 1,30,000 |
|       | 65,000              | 1,30,000                       |                 | 1,30,000        |                 |      | 6,55,000 |

Q.14. X Ltd. furnishes you the following particulars:-

Product X requires 20 hours per unit

Standard rate per hour is ₹ 2

Units produced: 4,000

Hours taken 76,000 (including 200 hours for power failure) at ₹ 2.10 per hour.

Calculate :-

- (i) Direct Labour Cost Variances
- (ii) Direct Labour Rate Variances
- (iii) Direct Labour Efficiency Variances
- (iv) Direct Labour Idle Time Variances

**Solution:**

$$\begin{aligned}
 \text{(i) Labour Cost Variance (LCV)} &= (\text{SCL} - \text{ACL}) \\
 &= (4,000 \times 2 \times 20 - 76,000 \times 2.10) \\
 &= 1,60,000 - 1,59,000 = 400 \text{ (F)} \\
 \text{(ii) Labour Rate Variance} &= \text{Actual Hours (SR - AR)} \\
 &= 76000 (2 - 2.10) = 7600 \text{ (A)} \\
 \text{(iii) Labour Efficiency Variance} &= \text{SR (SH - AH)} \\
 &= 2 (80,000 - 75,800) \\
 &= 8400 \text{ (F)} \\
 \text{(iv) Labour Idle Time Variance} &= \text{Idle time} \times \text{Std. Rate} \\
 &= 200 \times 2 = 400 \text{ (F)}
 \end{aligned}$$

**Verification:**

$$\begin{aligned}
 \text{LCV} &= \text{LRV} + \text{LEV} + \text{LITV} \\
 400 \text{ (F)} &= 7600 \text{ (A)} + 8400 \text{ (F)} + 400 \text{ (A)}
 \end{aligned}$$

Q.15. From the following data of a concern, find out the Fixed Costs, P/V ratio and Break-even Sales :-

|                  | Sales (₹) | Profit (₹) |
|------------------|-----------|------------|
| First half-year  | 14,433    | 385        |
| Second half-year | 18,203    | 1,139      |

Also calculate:

- (i) Profit or Loss at sales of ₹ 12,000.
- (ii) Sales required to earn a profit of ₹ 2,000.
- (iii) Margin of safety at sales of ₹ 24,000.

**Solution:**

| Particulars | First half | Second half | Difference |
|-------------|------------|-------------|------------|
| Sale (₹)    | 14,433     | 18,203      | 3,770      |
| Profit (₹)  | 385        | 1,139       | 754        |
| Total Cost  | 14,048     | 17,064      | 3,016      |

$$\begin{aligned}
 \text{(i) P/V Ratio} &= \frac{\text{Change in profit}}{\text{Change in Sales}} \times 100 \\
 &= \frac{754}{3,770} \times 100 = 20\% \\
 \text{(ii) Fixed Cost} &= \text{Sales} - \text{VC} - \text{Profit} \\
 2,502 &= 14,433 - 11,546 - 385 \\
 \text{(iii) BES} &= \frac{\text{FC}}{\text{P/V Ratio}} \\
 &= \frac{2,502}{20\%} = 12,510
 \end{aligned}$$

Further Calculation:

$$\begin{aligned}
 \text{(i) Profit or loss at sales of ₹ 12,000} \\
 \text{Sales} &= \frac{\text{F} + \text{P}}{\text{P/V Ratio}} \\
 12,000 &= \frac{2,502 + \text{P}}{20\%} \\
 2,400 &= 2,502 - \text{P} \\
 \text{or profit/Loss} &= 2,400 - 2,502 \\
 \text{Loss} &= (102) \\
 \text{(ii) Sale required to earn a profit of ₹ 2,000} \\
 \text{Sales} &= \frac{\text{F} + \text{P}}{\text{P/V Ratio}} \\
 &= \frac{2,502 + 2,000}{20\%} \\
 &= \frac{4,502}{20\%} = ₹ 22,510 \\
 \text{(iii) MoS at a sale of ₹ 24,000} \\
 \text{MoS} &= \text{Actual Sales} - \text{BE Sales} \\
 &= 24,000 - 12,510 \\
 &= 11,490
 \end{aligned}$$

Or

$$= \frac{11,490}{24,000} \times 100$$

$$= 47,875\% \text{ of sale.}$$

Q.16. The following formation is available in respect of a firm. Balance Sheet as on 1st August, 2009 :-

| Liabilities       | ₹             | Assets             |        | ₹             |
|-------------------|---------------|--------------------|--------|---------------|
| Accrued wages     | 600           | Cash               |        | 5,100         |
| Capital           | 59,200        | Account Receivable |        | 14,700        |
| Other Liabilities | 2,000         | Inventory          |        | 26,000        |
|                   |               | Fixed Assets       | 20,000 |               |
|                   |               | Less: Depreciation | 4,000  | 16,000        |
|                   | <b>61,800</b> |                    |        | <b>61,800</b> |

Further:

- (a) (i) Sales are 40 per cent against cash, 60 per cent on credit.  
(ii) Of the credit sales, 75 per cent are collected in the first month following sales and 25 per cent in the second month following sales.  
(iii) All inventory purchases are paid for during the month in which they are made.  
(iv) A basic inventory of ₹ 10,000 (cost) is constantly maintained, and the firm follows a policy of purchasing enough additional inventory each month to cover 1-25 times the following month's sales. Its gross pro margin is 20 per cent on sale.  
(v) A minimum cash balance of ₹ 2,000 is to be maintained by firm.  
(vi) "Accrued wages"; and "other current liabilities" have remained unchanged.

(b) Past Sales:

|            | ₹ | ₹      |
|------------|---|--------|
| June, 2009 |   | 18,000 |
| July, 2009 |   | 20,000 |

(c) Sales Budget:

|                 | ₹      |                | ₹      |
|-----------------|--------|----------------|--------|
| August, 2009    | 20,000 | November, 2009 | 40,000 |
| September, 2009 | 26,000 | December, 2009 | 50,000 |
|                 |        | January, 2010  | 18,000 |
|                 |        | February, 2010 | 16,000 |

(d) Past Sales

(i) Wages and Salaries

|           | ₹     |                | ₹     |
|-----------|-------|----------------|-------|
| August    | 1,400 | November, 2009 | 2,000 |
| September | 1,600 | December, 2009 | 3,000 |
| October   | 1,600 | January, 2010  | 1,400 |

- (ii) Rent: ₹ 400 per month  
 (iii) Depreciation ₹ 150 per month  
 (iv) Other expenses 1 per cent of sales.

You are required to work out the Cash Budget for the months August, 2009 to January, 2010 also indicating the necessary borrowings.

**Solution:****Cash Budget (Aug 2009 to Jan 2010)**

| Particulars   | Aug.<br>₹ | Sep.<br>₹ | Oct.<br>₹ | Nov.<br>₹ | Dec.<br>₹ | Jan.<br>₹ |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| (A) Cash Inflow:  |           |           |           |           |           |           |
| (i) Cash Sales  | 8,000     | 10,400    | 9,600     | 16,000    | 20,000    | 7,200     |
| (ii) Collection from Debtors<br>(2 <sup>nd</sup> month of sales)  | 9,000     | 9,000     | 11,700    | 10,800    | 10,800    | 22,500    |
| (iii) Collection from Debtors<br>(3 <sup>rd</sup> month of sales) | 2,700     | 3,000     | 3,000     | 3,900     | 3,900     | 6,000     |
| Total (A)   | 19,700    | 22,400    | 24,300    | 30,700    | 41,900    | 35,700    |
| (B) Cash Outflow:   |           |           |           |           |           |           |
| (i) Wages and Salaries  | 1,400     | 1,600     | 1,600     | 2,000     | 3,000     | 1,400     |
| (ii) Rent   | 400       | 400       | 400       | 400       | 400       | 400       |
| (iii) Other Exp.  | 200       | 260       | 240       | 400       | 500       | 180       |
| (iv) Payment for Purchases  | 26,000    | 24,000    | 40,000    | 50,000    | 18,000    | 16,000    |
| Total (B)   | 28,000    | 26,260    | 42,240    | 52,800    | 21,900    | 17,980    |
| Net Cash  |           |           |           |           |           |           |
| Receipt (A– B)  | (8,300)   | (3,860)   | (17,940)  | (22,100)  | 20,000    | 17,720    |
| Cash at start of month  | 5,100     | 2,000     | 2,000     | 2,000     | 2,000     | 2,000     |
| Less: Desired level of cash                                       | (2,000)   | (2,000)   | (2,000)   | (2,000)   | (2,000)   | (2,000)   |
| Borrowing (Cum).  | (5,200)   | (9,060)   | (27,000)  | (49,100)  | (29,100)  | (11,380)  |

Q.17. Mr. X, a contractor, is to procure vehicles for transport of materials from his godown to the work site. He has to make a choice between trucks the one hand and tractors with trailers on the other. The following details are furnished by him :-

- (a) The distance between godown and work site is 4 km. and a bridge is lying on the route on which vehicles carrying over 6 tonnes are prohibited.
- (b) In Order to complete the work in time 60 tonnes of materials shall have to be moved to the work site per day of 8 hours.
- (c) The costs of the truck, tractor and trailer are respectively ₹ 70,000, ₹ 48,000 and ₹ 18,000.
- (d) Salary for a driver is estimated at ₹ 300 per month.
- (e) Maintenance charges are estimated as under:
- Truck ₹ 240 per month  
 Tractor 200 per month  
 Trailer 60 per month

- (f) Depreciation allowable is 20% p.a. in each case.  
 (g) On an average the truck will run 20 km. per gallon of diesel and the tractor 12 km.  
 (h) One gallon of diesel will cost ₹ 6.

You are required to work out the cost per tonne under both 'Truck'

**Solution:**

**Operating cost Statement Showing cost per tonne Carried**

|                               | Trucks<br>₹ | Tractors with<br>Trailers |
|-------------------------------|-------------|---------------------------|
| <b>Wages</b>                  |             |                           |
| Driver's Salaries:            |             |                           |
| Truck 300 × 3                 | 900         |                           |
| Tractors 300 × 2              |             | 600                       |
| <b>Other Expenses :</b>       |             |                           |
| Depreciation (WN 2)           | 3,500       | 2,800                     |
| Diesel (WN 3)                 | 864         | 1,400                     |
| Maintenance Charges (WN 4)    | 720         | 640                       |
| (i) Total Costs               | 5,984       | 5,480                     |
| (ii) Tonnes transported       | 1,800       | 2,160                     |
| (iii) Cost per tonne = (i/ii) | ₹ 3.32      | ₹ 2.54                    |

The above cost statement shows that tractors with trailers will prove to be cheaper. However, for long distance trucks may prove to be cheaper because of their ability to make a large number of trips.

**Notes:**

**1. Tonnes Transported:**

Truck : 5 tonnes × 4 trips × 3 trucks × 30 days = 1800 tonnes

Tractors : 6 tonnes × 6 trips × 2 tractors × 30 days = 2160 tonnes

**2. Depreciation:**

Trucks: Capital value: 3 trucks × 70,000 = ₹ 2,10,000

$$\text{Dep. Per month @ 20\% p.a.} = \frac{2,10,000 \times 20\%}{12}$$

$$= ₹ 3,500$$

Trailers : Capital value : 2 tractors × 48,000 = ₹ 96,000

4 trailers × 18,000 = ₹ 72,000

₹ 1,68,000

$$\text{Dep. Per month @ 20\% p.c.} = \frac{1,68,000 \times 20\%}{12} = ₹ 2,800$$

**3. Cost of Diesel:**

Trucks: 3 trucks × 4 trip × 4km × 2 × 30 days = 2,880 km

$$\text{Cost of Diesel} = 2,880 \times \frac{6}{12} = ₹ 864$$

Trailer: 2 tractors  $\times$  6 trips  $\times$  4 km  $\times$  2  $\times$  30 days = 2,880 km

4. Maintenance Changes:

|                                    |   |            |
|------------------------------------|---|------------|
| Trucks : 3 trucks $\times$ ₹ 240   | = | ₹ 720      |
| Trailers : 2 trailers $\times$ 200 | = | 400        |
| 4 trailer $\times$ 60              | = | <u>240</u> |
|                                    | = | <u>640</u> |

Trucks may carry a load of 5 tonnes. Allowing sufficient time for loading and unloading it may be presumed that each truck will be in a position to make 4 trips a day. Thus, it can carry in a day a quantity of 20 tonnes (5 tonnes  $\times$  4). Since the quantity of materials carried to the work site is 60 tonnes per day, a minimum 00 trucks will be required. Tractors with a trailer can safely be presumed to carry 6 tonnes. Thus, it can be presumed it can easily make 6 trips per day. Hence, with one tractor it will be possible to carry 36 tonnes per day of 8 hours. In order to move a minimum of 60 tonnes, 2 tractors will be required to keep them continuously plying 4 trailers are presumed to be necessary.

Q.18. A company manufacturing a particular product the standard direct materials cost of which is ₹ 10 per unit. The following information is obtained from the costing records:-

(a) **Standard Mix:**

| Material    | Quantity<br>(Units) | Rate<br>(₹) | Amount<br>(₹) |
|-------------|---------------------|-------------|---------------|
| A           | 70                  | 10          | 700           |
| B           | 30                  | 5           | 150           |
|             | 100                 |             | 850           |
| Loss: (15%) | 15                  |             | —             |
|             | <b>85</b>           |             | <b>850</b>    |

(b) **Actual results for June, 2008:**

| Material    | Quantity<br>(Units) | Rate<br>(₹) | Amount<br>(₹) |
|-------------|---------------------|-------------|---------------|
| A           | 400                 | 11          | 4,400         |
| B           | 200                 | 6           | 1,200         |
|             | 600                 |             | 5,600         |
| Loss: (10%) | 60                  |             | —             |
|             | <b>540</b>          |             | <b>5,600</b>  |

Compute:

- (i) Total Material Cost Variance;
- (ii) Material Price Variance;
- (iii) Material Mix Variance;
- (iv) Material Yield Variance;
- (v) Material Usage Variance;

**Solution:****Calculation of Variances :****(i) Total Material Cost Variance :**

$$\begin{aligned} &\text{Std. Cost for Actual output} - \text{Actual cost} \\ &= 540 \times 10 - 5,600 = 200 \text{ (A)} \end{aligned}$$

**(ii) Material Price Variance :**

$$\begin{aligned} &\text{AQ (SR} - \text{AR)} \\ \text{A} &= 400 (10 - 11) &= & 400 \text{ (A)} \\ \text{B} &= 200 (5 - 0) &= & \underline{200 \text{ (A)}} \\ &&& 600 \text{ (A)} \end{aligned}$$

**(iii) Material Mix Variance (MMV) :**

$$\begin{aligned} &\text{SR (Revised Std. Quantity} - \text{Actual Quantity)} \\ \text{A: } &10 (420 - 400) &= & 200 \text{ (F)} \\ \text{B: } &5 (180 - 200) &= & \underline{100 \text{ (A)}} \\ &\text{Total} && 100 \text{ (F)} \end{aligned}$$

**(iv) Material Yield Variance (MYV):**

$$\begin{aligned} &\text{Std. Cost per unit (Std. output for Actual mix} - \text{Actual output)} \\ &10 (510 - 540) &= & 300 \text{ (F)} \end{aligned}$$

**(v) Material Usage Variance :**

$$\begin{aligned} &\text{SR (SQ} - \text{AQ)} \\ \text{A} &= 10 \left( \frac{7,560}{17} - 400 \right) &= & 447 \text{ (F)} \\ \text{B} &= 5 \left( \frac{3,240}{17} - 200 \right) &= & \underline{147 \text{ (A)}} \\ &\text{Total} &= & 400 \text{ (F)} \end{aligned}$$

**Verification:**

$$\begin{aligned} \text{MCV} &= \text{MPV} + \text{MUV} \\ &= 600 \text{ (A)} + 400 \text{ (F)} &= & 200 \text{ (A)} \end{aligned}$$

$$\begin{aligned} \text{MUV} &= \text{MMV} + \text{MYV} \\ &= 100 \text{ (F)} + 300 \text{ (F)} &= & 400 \text{ (F)} \end{aligned}$$

**Working Notes:****1. Std. quantity for Actual Output**

$$= \frac{\text{Std. Quantity}}{\text{Std. Output}} \times \text{Actual output}$$

$$\text{Material A: } \frac{70}{85} \times 540 = \frac{7,560}{17} \text{ Units}$$

$$\text{B: } \frac{30}{85} \times 540 = \frac{3,240}{17} \text{ Units}$$

**2. Revised Std. Quantity**

$$= \frac{\text{Std. Quantity}}{\text{Std. Output}} \times \text{Actual Mix}$$

$$\text{Material A: } \frac{70}{100} \times 600 = 420 \text{ Units}$$

$$\text{B: } \frac{30}{100} \times 600 = 180 \text{ Units}$$

**3. Std. Output for Actual Mix**

$$= \frac{\text{Std. Output}}{\text{Std. Mix}} \times \text{Actual Mix}$$

$$= \frac{85}{100} \times 600 = 510 \text{ Units}$$

Q.19. Write short note of the following:

Difference between 'Fixed' and 'Flexible' budget

**Solution:**

**Difference between 'Fixed' and 'Flexible' budget:** A budget may be flexible or fixed depending upon its capacity to change according to change in the level of activity. The main differences between Flexible Budget and Fixed Budget are as follows:

| Fixed Budget  | Flexible' Budget   |
|---|--|
| 1. Definition: It is a Budget desired to remain unchanged irrespective of the level of activity actually attained.  | It is a Budget, which by recognising the difference between fixed, semi-variable and variable costs is designed to change in relation to level of activity attained. |
| 2. Rigidity: It does not change with actual volume of activity achieved. Thus it is known as a Rigid or Inflexible budget.  | It can be re-casted on the basis of activity level to be achieved. Thus it is not rigid.   |
| 3. Level of Activity: It operates on one level of activity and under one set of conditions. It assumed that there will be no change in the prevailing conditions, which is unrealistic. | In consists of various budgets for different levels of activity.   |
| 4. Effects of Variance Analysis: Variance Analysis does not give useful information as all costs (fixed variable and semi-variable) are related to only one level of activity.          | Variance Analysis provides useful information as each cost is analysed according to its behaviour.   |
| 5. Use of Decision Making: If the budgeted and actual activity levels differ significantly, then aspects like cost ascertainment and price fixation do not give a correct picture       | It facilitates the ascertainment of cost, fixation of selling price and submission of quotations.  |
| 6. Performance Evaluation: Comparison of actual performance with budgeted targets will be meaningless, especially when there is a difference between two activity levels.               | It provides a meaningful basis of comparison of the actual performance with the budgeted targets.  |

Q.20. One 30<sup>th</sup> September, 2009 following was the Balance Sheet of VID Pvt. Ltd.

| Liabilities          | ₹             | Assets             |        | ₹             |
|----------------------|---------------|--------------------|--------|---------------|
| Equity shares (₹ 10) |               | Equipment (cost)   | 2,000  |               |
| Fully paid           | 20,000        | Less: Depreciation | 5,000  | 15,000        |
| Reserves and Surplus | 10,000        | Stock              | 20,000 |               |
| Creditors            | 40,000        | Debtors            | 15,000 |               |
| Proposed dividend    | 15,000        | Bank               | 35,000 |               |
|                      | <b>85,000</b> |                    |        | <b>85,000</b> |

The company is developing a system of forward planning and on 1st October, 2009 it submits the following information:-

|                          | Credit Sales<br>(₹) | Cash Sales<br>(₹) | Credit Purchase<br>(₹) |
|--------------------------|---------------------|-------------------|------------------------|
| September 2009 (actual)  | 15,000              | 14,000            | 40,000                 |
| October 2009 (budgeted)  | 18,000              | 5,000             | 23,000                 |
| November 2009 (budgeted) | 20,000              | 6,000             | 27,000                 |
| December 2009 (budgeted) | 25,000              | 8,000             | 26,000                 |

On 1st October, 2009 the equipment will be replaced at a cost of ₹ 30,000, ₹ 14,000 will be allowed in exchange for the old equipment and a net payment of ₹ 16,000 will be made. Depreciation is to be provided at the rate of 10% per annum.

The proposed dividend will be paid in December 2009.

The following expenses will be paid :-

Wages ₹ 3,000 per month.

Administration ₹ 15,000 per month.

Rent ₹ 3,600 (for the year to 30th September, 2010) to be paid in October, 2009. You are required to prepare a cash budget for the months of October, November and December, 2009.

**Solution:**

**Cash budget for the period Oct. to Dec. 2009**

| Particulars          | Oct.<br>₹     | Nov.<br>₹     | Dec.<br>₹     |
|----------------------|---------------|---------------|---------------|
| <b>Inflows :</b>     |               |               |               |
| Receipt from Debtors | 15,000        | 18,000        | 20,000        |
| Cash Sale            | 5,000         | 6,000         | 8,000         |
| Total inflow (A)     | <b>20,000</b> | <b>24,000</b> | <b>28,000</b> |
| <b>Outflows :</b>    |               |               |               |
| Creditors            | 40,000        | 23,000        | 23,000        |
| Dividend             | —             | —             | 15,000        |
| New Equipment (net)  | 16,000        | —             | —             |
| Wages                | 3,000         | 3,000         | 3,000         |
| Admin. Exp.          | 1,500         | 1,500         | 1,500         |

|                   |         |               |               |               |
|-------------------|---------|---------------|---------------|---------------|
| Rent              |         | 3,600         | –             | –             |
| Total outflow :   | (B)     | <b>64,100</b> | <b>27,500</b> | <b>46,500</b> |
| Surplus/Deficit   | (A – B) | (44,100)      | 3,500         | 18,500        |
| (+) Op. Cash/Bank |         | 35,000        | (9,100)       | (12,600)      |
| Closing Cash Bank |         | (9,100)       | (12,600)      | (31,100)      |

- Q.21. Pramod Automobiles has been distributing goods to its prominent customer situated at a place 40 kms. away from its own place using a single truck. The truck has been purchased at a cost of ₹ 7,50,000 (excluding tyres), and has a capacity of carrying 10 tonnes of load of goods. It makes the journey twice a day carrying its full load on the outward journey whereas it returns empty. The truck operates five days in a week.

The following is the relevant data for a month equated to a 4-weekly period.

₹

|                           |  |
|---------------------------|--|
| Insurance                 | 9,000 per annum                            |
| Licence, Road tax         | 4,000 per annum                            |
| Garage rent               | 1,500 per week                             |
| Repairs and maintenance   | 500 per week                               |
| Tyres and tubes           | 20,000 (Life: 25,000 kms.)                 |
| Other Overheads allocated | 60,000                                     |
| Driver's remuneration     | 800 per week                               |
| Oil                       | 300 per week                               |
| Petrol                    | 25 per litre (consumed @ 8 kms, per litre) |

The effective life of the vehicle is worth running 80,000 kms. at the end of which the vehicle will have scrap value of ₹ 25,000. You are required to submit a statement showing the total cost for a month and decide the fare to be charged per tonne km. that allows 20% profit on fares.

**Solution:**

**Pramod Automobiles**  
**Operating Cash Statements (4 weeks)**

| Particulars                         | ₹             |
|-------------------------------------|---------------|
| Oil (300 × 4)                       | 1,200         |
| Driver's wages (800 × 4)            | 3,200         |
| Repairs (500 × 4)                   | 2,000         |
| Garage Rent (1,500 × 4)             | 6,000         |
| License cost (4,000 ÷ 12)           | 333           |
| Other overheads (6000 ÷ 12)         | 5,000         |
| Insurance (900 ÷ 12)                | 750           |
| <b>Total (A)</b>                    | <b>18,483</b> |
| Variance/Running Cost:              |               |
| Petrol (40 km × 2 × 2) = 160 km/day |               |
| (160 km × 5 days × 4 weeks × 25/8)  | 10,000        |

|   |               |
|---|---------------|
| Depreciation on lorry                   |               |
| (160 km × 5 days × 4 weeks = 3,200 km)  | 29,000        |
| (7,50,000 × 25,000) × 3200 km/80,000 km |               |
| Depreciation tyres                      |               |
| (20,000 × 3200 km/25,000 km)            | 2,560         |
| <b>Total (B)</b>                        | <b>41,560</b> |
| <b>Total Cost (A+ B)</b>                | <b>60,043</b> |

$$\begin{aligned} \text{Vehicle Cost per Km} &= 60,043/3200 = 18.76 \text{ per km.} \\ \text{Tonne km} &= 40\text{km} \times 10 \text{ tons} \times 2 \text{ trips} \times 5 \text{ days} \times 4 \text{ weeks} \\ &= 16,000 \text{ tonne km} \\ \text{Kms} &= 40 \times 2 \text{ trip} \times 2 \times 5 \times 4 = 3,200 \text{ km} \\ \text{Vehicle cost per tonne kms} &= \frac{60,043}{16,000} = 3.75 \text{ per tone km} \\ \text{Adherent profit} &= 25\% (20\% \text{ fare}) = 0.94 \\ &= 3.75 + 0.94 = ₹ 4.69 \text{ per tone km.} \end{aligned}$$

Q.22. From the following particulars, you are required to calculate:

- (i) PN ratio
- (ii) B.E.P. for sales
- (iii) Margin of safety
- (iv) Profit when sales are ₹ 2,00,000/-
- (v) Sales required to earn net profit of ₹ 40,000/-

| Year | Sales (₹) | Profit (₹) | Units  |
|------|-----------|------------|--------|
| I    | 2,40,000  | 18,000     | 24,000 |
| II   | 2,80,000  | 26,000     | 28,000 |

**Solution:**

|        | Year<br>I | Year<br>I | Difference |
|--------|-----------|-----------|------------|
| Sales  | 2,40,000  | 2,80,000  | 40,000     |
| Profit | 18,000    | 26,000    | 8,000      |

$$\begin{aligned} \text{(i) P/L ratio} &= \frac{\text{Change in profit during 2 years}}{\text{change in sales during the period}} \times 100 \\ &= \frac{8,000}{40,000} \times 100 = 20\% \\ \text{(ii) B.G.P. (Sales)} &= \frac{\text{F. Cost}}{\text{P/L ratio}} \\ \text{Fixed cost} &= \text{Contribution} - \text{profit} \\ &= 2,40,000 \times 20\% - 18,000 \\ &= 48,000 - 18,000 = 30,000 \end{aligned}$$

$$\text{B.G.P.} = \frac{30,000}{20\%} = ₹ 1,50,000$$

$$\text{B.G.P. (Unit)} = \frac{1,50,000}{10} = 15,000 \text{ Units}$$

(iii) Margin of Safety : A – BES

$$\text{1st year : } 24,000 - 15,000 = 9,000 \text{ units}$$

$$\text{2nd year : } 28,000 - 15,000 = 13,000 \text{ units}$$

(iv) Profits = ? When sales = 2,00,000

$$\text{Sales} = \frac{F+P}{P/V \text{ ratio}}$$

$$\text{Sales} = \frac{30,000 + P}{20\%}$$

$$\text{Or } P = 40,000 - 30,000 = ₹ 10,000$$

(v) Sales = ? When Profit = 40,000

$$\text{Required Contribution} = F + P$$

$$= 30,000 + 40,000 = 70,000$$

$$\text{Sales} = \frac{70,000}{20\%} = ₹ 3,50,000$$

Q.23. The standard cost of certain chemical mixture is as follows:

| Material | Cost per tonne (₹) |   |
|----------|--------------------|---|
| I (40%)  | 20                 | A standard loss of 10% is expected in production. |
| II (60%) | 30                 |   |

For a period, the actual consumption data was as follows:

| Material        | Cost per tonne (₹) |   |
|-----------------|--------------------|---|
| I (180 tonnes)  | 18                 | The actual weight produced was 364 tonnes |
| II (220 tonnes) | 34                 |   |

Calculate all the Material variances.

**Solution:**

#### Calculation of Material Variances

**Basic Calculations:**

₹

M1: Actual cost of Material used:

|   |                 |   |        |
|---|-----------------|---|--------|
| A | 180 tonnes × 18 | = |        |
| B | 200 tonnes × 34 | = | 10,720 |

M2: Standard cost of Material used:

|   |          |   |                     |
|---|----------|---|---------------------|
| A | 180 × 2  | = | 3,600               |
| B | 220 × 30 | = | <u>6,600</u> 10,200 |

M3: Std. Cost material, if cost had been used in std. Proportions:

$$\begin{aligned} \text{Material A} &= \frac{\text{Std. Qty. of material A in kg.} \times \text{Weight in}}{\text{Weight of Std. 5 Actual mix}} \times \text{SR of A} \\ &= \frac{40}{100} \times 400 \text{ kg} \times 20 = 3,200 \quad \dots\dots\dots(i) \end{aligned}$$

Std. Quality of Material B in

$$\text{Material B} = \frac{60}{100} \times 400 \text{ kg} \times 30 = 7,200 \quad \dots\dots\dots(ii)$$

$$\begin{aligned} \text{M3} &= (i) + (ii) \\ &= 3,200 + 7,200 \\ &= ₹ 10,400 \end{aligned}$$

Std. Cost of output

Let us find out the Std. Cost, when input is 100kg.

| Std. Mix              | SR | SC           |
|-----------------------|----|--------------|
| 40 kg                 | 20 | 800          |
| <u>60 kg</u>          | 30 | <u>1,800</u> |
| 100 kg                |    | 2,600        |
| Less 15% <u>10 kg</u> |    | <u>—</u>     |
| 90 kg                 |    | 2,600        |

$$\begin{aligned} \text{Std. Cost of Actual output of 364 kg} &= \frac{2,600}{90} \times 364 \\ &= 10,516 \end{aligned}$$

**Computation of Variances:**

$$\begin{aligned} \text{(a) Material price variance} &= M1 - M2 \\ &= 1,072 - 10,200 = 520 \text{ (A)} \\ \text{(b) Material usage variance} &= M2 - M4 \\ &= 10,200 - 10,516 = 316 \text{ (A)} \\ \text{(c) Material mix variance} &= M2 - M3 \\ &= 10,200 - 10,400 = 200 \text{ (F)} \\ \text{(d) Material yield variance} &= M3 - M4 \\ &= 10,400 - 10,516 = 116 \text{ (F)} \\ \text{(e) Material cost variance} &= M1 - M4 \\ &= 10,720 - 10,516 = 204 \text{ (A)} \end{aligned}$$

**OR**

$$\begin{aligned} \text{MCV} &= \text{MPV} + \text{MWV} \\ &= 520 \text{ (A)} + 316 \text{ (F)} \\ &= 204 \text{ (A)} \end{aligned}$$

**OR**

$$\begin{aligned} \text{MPV} + \text{MUV} + \text{MYU} \\ &= 520 \text{ (A)} + 200 \text{ (F)} + 116 \text{ (F)} \\ &= 204 \text{ (A)} \end{aligned}$$

Q.24. From the information set out below, prepare a monthly cash budget the period January to June, 2010 for A Ltd.:-

- Prices and costs are assumed to remain unchanged during the period.
- Credit sales affected are 75% of the total Sales each month.
- The company's collection of credit sales is made as follows:- 60% - One month after sale; 30% - Second month after sale; 5% -Third month after sale.
- The sales forecast is as below :-

| Month          | Sales [₹ '000] | Month       | Sales [₹ '000] |
|----------------|----------------|-------------|----------------|
| October, 2009  | 120            | March, 2010 | 80             |
| November, 2009 | 140            | April, 2010 | 120            |
| December, 2009 | 160            | May, 2010   | 100            |
| January, 2010  | 60             | June, 2010  | 80             |
| February, 2010 | 80             | July, 2010  | 140            |

- The company maintains a gross profit margin of 20%.
- The probable sales of each month are purchased and settled in the preceding month.
- The salaries and wages to be paid are as follows :-

| 2010     | ₹      |
|----------|--------|
| January  | 12,000 |
| February | 16,000 |
| March    | 20,000 |
| April    | 20,000 |
| May      | 16,000 |
| June     | 14,000 |

- Interest on 12% convertible debentures of ₹ 1,00,000/- is due for payment of 31st March, 2010 and 30th June, 2010.
- The company has to pay ₹ 1,00,000 as a tax on income of year 1998, but is disputed. However, it is decided that 20% of the disputed amount will be paid in April, 2010.
- The company intends to import a machine at a capital cost of ₹ 8,000/- which along with the import duty of 50% will be payable in June, 2010.
- The company has a cash balance of ₹ 40,000/- on 31st December, 2009. Annual rent of the company amounts to ₹ 9,600 payable monthly.

**Solution:**

**Cash Budget for the period Jan 2010 to June 2010**

|                             | Jan.            | Feb.          | Mar.          | April         | May             | June          |
|-----------------------------|-----------------|---------------|---------------|---------------|-----------------|---------------|
| <b>Inflows</b>              | 15,000          | 20,000        | 20,000        | 30,000        | 25,000          | 20,000        |
| Cash sales                  |                 |               |               |               |                 |               |
| Receipts from Debtor (WN-1) | 1,08,000        | 68,250        | 55,500        | 56,250        | 75,000          | 7,500         |
| <b>Total (A)</b>            | <b>1,23,000</b> | <b>88,250</b> | <b>75,500</b> | <b>86,250</b> | <b>1,00,000</b> | <b>95,000</b> |

|                                      |               |               |                 |                 |               |                 |  |
|--------------------------------------|---------------|---------------|-----------------|-----------------|---------------|-----------------|--|
| <b>Outflows</b>                      |               |               |                 |                 |               |                 |  |
| Purchase<br>(80% of sale)            | 64,000        | 64,000        | 96,000          | 80,000          | 64,000        | 1,12,000        |  |
| Salaries and Wages                   | 12,000        | 16,000        | 20,000          | 20,000          | 16,000        | 14,000          |  |
| Int. on deb.<br>(10000 @ 12% × 3/12) | –             | –             | 3,000           | –               | –             | 3,000           |  |
| Tax for the year 2010                | –             | –             | –               | 20,000          | –             | –               |  |
| Imports of machines Rent             | –             | –             | –               | –               | –             | 12,000          |  |
| Rent                                 | 800           | 800           | 800             | 800             | 800           | 800             |  |
| <b>Total (B)</b>                     | <b>76,800</b> | <b>80,800</b> | <b>1,19,800</b> | <b>1,20,800</b> | <b>80,800</b> | <b>1,41,800</b> |  |
| <b>Surplus/deficit (A– B)</b>        | 46,200        | 7,450         | (-) 44,300      | (-) 34,550      | 19,200        | (-) 46,800      |  |
| <b>(+) Op. Cash Bal.</b>             | 40,000        | 86,200        | 93,650          | 49,350          | 14,800        | 34,000          |  |
| Cl. Cash Bal.                        | 36,200        | 93,650        | 49,350          | 14,800          | 34,000        | (-) 12,800      |  |

**Working Notes:-**

Rec. Pyts in resp of sales and purchase.

|                                       | Nov.   | Dec.     | Jan.            | Feb.          | Mar.          | Apr.            | May             | June          |
|---------------------------------------|--------|----------|-----------------|---------------|---------------|-----------------|-----------------|---------------|
| Credit sales                          | 10,500 | 1,20,000 | 45,000          | 60,000        | 60,000        | 90,000          | 75,000          | 60,000        |
| Cash sales                            |        |          | 15,000          | 20,000        | 20,000        | 30,000          | 25,000          | 20,000        |
| <b>Total sales</b>                    |        |          | <b>60,000</b>   | <b>80,000</b> | <b>80,000</b> | <b>1,20,000</b> | <b>1,00,000</b> | <b>80,000</b> |
| <b>Receipts</b>                       |        |          |                 |               |               |                 |                 |               |
| 60% in next month                     | 54,000 | 63,500   | 72,000          | 27,000        | 36,000        | 36,000          | 54,000          | 45,000        |
| 30% in the 2 <sup>nd</sup> month      |        | 27,000   | 31,500          | 36,000        | 13,500        | 18,000          | 18,000          | 27,000        |
| 5% in the 3 <sup>rd</sup> month       |        |          | 4,500           | 5,250         | 6,000         | 2,250           | 3,000           | 3,000         |
|                                       |        |          | <b>1,08,000</b> | <b>68,250</b> | <b>55,500</b> | <b>56,250</b>   | <b>75,000</b>   | <b>25,000</b> |
| I + II                                |        |          | <b>1,23,000</b> | <b>88,250</b> | <b>75,500</b> | <b>86,250</b>   | <b>1,00,000</b> | <b>95,000</b> |
| Purchase<br>80% of I of<br>Next month |        |          | 64,000          | 64,000        | 96,000        | 80,000          | 64,000          | 1,12,000      |

Q.25. The standard material cost to produce one ton (1,000 kgs.) of chemical "X" is :-

300 kg of material A @ ₹ 10 per kg.

400 kg of material B @ ₹ 5 per kg.

500 kg of material C @ ₹ 6 per kg.

During the month of December 2010, 100 tons of mixture "X" were produced from the usage of :-

35 tons of materials A at a cost of ₹ 9,000 per ton

42 tons of material B at a cost of ₹ 6,000 per ton

53 tons of material C at a cost of ₹ 7,000 per ton

You are required to calculate:-

- Material Cost Variance
- Material Price Variance
- Material Usage Variance
- Material Mix Variance

**Solution:**

**Chemical 'X'**

| Standard     |                 |             |                 | Actual       |                 |             |                 |
|--------------|-----------------|-------------|-----------------|--------------|-----------------|-------------|-----------------|
| Material     | Qty.<br>(Kg.)   | Rate<br>(₹) | Amt<br>(₹)      | Material     | Qty.<br>(Kg.)   | Rate<br>(₹) | Amt<br>(₹)      |
| A            | 30,000          | 10          | 3,00,000        | A            | 35,000          | 9           | 3,15,000        |
| B            | 40,000          | 5           | 2,00,000        | B            | 42,000          | 6           | 2,52,000        |
| C            | 50,000          | 6           | 3,00,000        | C            | 53,000          | 7           | 3,71,000        |
| <b>Total</b> | <b>1,20,000</b> | <b>-</b>    | <b>8,00,000</b> | <b>Total</b> | <b>1,30,000</b> |             | <b>9,38,000</b> |

**(A) Material Cost Variance**

= Standard cost for actual output – actual cost

= 8,00,000 – 9,38,000 = ₹ 1,38,000 (A)

**(B) Material Price Variance**

= Actual Quantity (standard rate - actual rate)

Material A = 35,000 (10-9) = ₹ 35,000 (F)

Material B = 42,000 (5-6) = ₹ 42,000 (A)

Material C = 53,000 (6-7) = ₹ 53,000 (A)

**Total = ₹ 60,000 (A)**

**(C) Material Usage Variance: (standard quantity for actual)**

Material = (30,000 - 35,000) × 10 = 50,000

Material = (40,000 - 42,000) × 5 = 10,000

Material = (50,000 - 53,000) × 6 = 18,000

**Total = 78,000**

**(D) Material Mix Variance:**

(Revised standard quantity - actual quantity) × standard rate

Material = (32,000 – 35,000) × 10 = ₹ 25,000 (A)

Material = (1,30,000/3 - 42,000) × 5 = ₹ 6,667 (F)

Material = (16,250/3-53,000) × 6 = ₹ 7,000 (F)

**Total = ₹ 11,333 (A)**

**Working Note:**

$$\text{Revised Std. Qty.} = \frac{\text{Total actual weight of mix} \times \text{Std. Qty.}}{\text{Total actual weight of mix}}$$

| Material (A)                        | Material (B)                        | Material (C)                        |
|-------------------------------------|-------------------------------------|-------------------------------------|
| 32,500 kg.                          | 4,333 kg.                           | 54,167 kg.                          |
| $(1,30,000/1,20,000 \times 30,000)$ | $(1,30,000/1,20,000 \times 40,000)$ | $(1,30,000/1,20,000 \times 50,000)$ |

Q.26. From the following information, you are asked to compute

- (i) Break-even point in value and volume
- (ii) PN ratio
- (iii) Margin of safety, both in absolute and percentage terms

|  | ₹         |
|--|-----------|
| Sales value                              | 20,00,000 |
| Material cost                            | 4,00,000  |
| Labour cost                              | 5,00,000  |
| Variable manufacturing expenses          | 1,00,000  |
| Variable selling & distribution expenses | 2,00,000  |
| Repairs and maintenance (Fixed).         | 90,000    |
| Depreciation, rates and taxes            | 30,000    |

General and administrative expenses:

|   | ₹             |
|---|---------------|
| <b>Salary</b>                                       |               |
| Factory supervisor                                  | 12,000        |
| Office manager                                      | 18,000        |
| Other office employees                              | <u>60,000</u> |
|   | <u>90,000</u> |
| Salesmen's Commission                               | 5% of sales   |
| (not included in selling and distribution expenses) |               |
| Selling price per unit                              | 100/-         |
| Fixed selling Distribution Overheads                | 1,90,000      |

**Solution:**

Total No. of units sold = ₹ 20,00,000 / ₹ 1000 = 20,000 Units

Selling Price per unit = ₹ 100

| Variable Cost              | ₹                |
|----------------------------|------------------|
| Material Cost              | 4,00,000         |
| Labour Cost                | 5,00,000         |
| Mfg. Cost                  | 1,00,000         |
| Selling and Discounts Cost | <u>2,00,000</u>  |
|                            | <u>12,00,000</u> |

Variable Cost per unit = ₹ 12,00,000/20,000 unit = ₹ 60 p.m.

Also, salesman's commission per unit = ₹ 5

Total receivable cost per unit = 60 + 5 = ₹ 65/-

Selling price per unit – Variable cost per unit

Contribution per unit = 100 – 65 = 35

- (i) Break-even point
- Units            Contribution

|       |   |   |
|-------|---|---|
| 1     | 35  | BEP is terms of sale value = 14,000 units |
| ?     | 49,000  | = units $\times$ 100 = 14,00,000          |
| (ii)  | P/V ratio = contribution/Sales $\times$ 100 = 35/100 $\times$ 100 = 35% |   |
| (iii) | Margin of safety  | = Actual Sales – BEP Sales                |
|       |   | = 20,000 units – 14,000 units             |
|       |   | = 6,000 units                             |
|       | 6,000 $\times$ 100  | = ₹ 6,00,000                              |
|       | (Alt = 20,00,000 less / 40,0000   | = ₹ 6,00,000)                             |
| (iv)  | Margin of safety ratio  | = M/s. Sales/ Sales $\times$ 100          |
|       |   | = 6,000/20,000 $\times$ 100 = 30%         |

Q.27. The expenses budgeted for production of 10,000 units in a factory are furnished below:-

|                                   | Per Unit (₹) |
|-----------------------------------|--------------|
| Materials                         | 70           |
| Labour                            | 25           |
| Variable overheads                | 20           |
| Fixed overheads                   | 10           |
| Variable overheads (Direct)       | 5            |
| Selling Expenses (10% Fixed)      | 13           |
| Distribution expenses (20% Fixed) | 7            |
| Administrative expenses (Fixed)   | 5            |
| Total cost of sale per unit       | 155          |

Prepare a budget for production of 8,000 units (with total and per unit details).

**Solution:**

#### Flexible Budget

| Variable cost           | 8000 units | ₹ Per unit       |
|-------------------------|------------|------------------|
| Material                | 5,60,000   | 70               |
| Labour                  | 2,00,000   | 25               |
| Var. 0 + 1              | 1,60,000   | 20               |
| Var. 0 + 1 (Direct)     | 40,000     | 5                |
| Selling Exp. (90%)      | 93,600     | 11.7 (13 – 1.30) |
| Distribution Exp. (80%) | 44,800     | 5.6 (7 – 1.40)   |
| A                       | 10,98,400  | 137.3            |

| Fixed cost                        |                  |               |
|-----------------------------------|------------------|---------------|
| Fixed overheads (10000 u @ 10%-)  | 100000           | 12.5          |
| Selling Exp. (10% 10000 u @ 1.30) | 13000            | 1.63          |
| Dist. Exp. (10000 u @ 14/-)       | 14000            | 1.73          |
| Admin. 0/+1 (10000 u @ 50/-)      | 50000            | 6.25          |
| Total Fixed Cost (B)              | 177000           | 22.13         |
| <b>Total Cost A + B</b>           | <b>12,75,400</b> | <b>159.43</b> |

Q.28. A Factory is currently working at 50% capacity and produces 30,000 units and also sold each at ₹ 225 per unit. Prepare a Flexible Budget and estimate the profit of the company when it works to 75% and 90% capacity. Assume that all units produced are sold at the same selling price per unit as shown above.

Following information is provided to you:-

**(i) Variable Expenses:**

|                |               |
|----------------|---------------|
| Materials      | ₹ 60 per unit |
| Labours        | ₹ 40 per unit |
| Other Expenses | ₹ 15 per unit |

**(ii) Semi-variable Expenses: (at 50% capacity)**

|                                 |            |
|---------------------------------|------------|
| Indirect Labour                 | ₹ 1,50,000 |
| Indirect Materials              | ₹ 2,10,000 |
| General Administrative Expenses | ₹ 2,70,000 |
| Repairs and Maintenance         | ₹ 1,20,000 |
| Salesmen Salaries               | ₹ 1,80,000 |

**(iii) Fixed Expenses:**

|   |            |
|---|------------|
| Office and Management Salaries          | ₹ 5,40,000 |
| Office and Factory Rent and Taxes       | ₹ 6,00,000 |
| Sundry Administrative Expenses          | ₹ 7,20,000 |
| Depreciation on Machinery and Furniture | ₹ 4,50,000 |

**(iv)** Semi-variable expenses remain constant up to 60% of capacity, increasing by 10% between 60% and 80% capacity and by 20% between 80% and 100% capacity.

**(v)** Rate per unit of variable expenses remains same.

**Solution:**

**Flexible Budget**

|                                   | 30,000 units<br>50% | 45,000 units<br>75% | 54,000 units<br>90% |
|-----------------------------------|---------------------|---------------------|---------------------|
| (i) Variable Expenses             | ₹                   | ₹                   | ₹                   |
| Materials                         | 18,00,000           | 27,00,000           | 32,40,000           |
| Labours                           | 12,00,000           | 18,00,000           | 21,60,000           |
| Other Expenses                    | 4,50,000            | 6,75,000            | 8,10,000            |
| (ii) Semi-variable Expenses       |                     |                     |                     |
| Indirect labour                   | 1,50,000            | 1,65,000            | 1,80,000            |
| Indirect materials                | 2,10,000            | 2,31,000            | 2,52,000            |
| General administrative expo       | 2,70,000            | 2,97,000            | 3,24,000            |
| Repairs and Maintenance           | 1,20,000            | 1,32,000            | 1,44,000            |
| Salesman salaries                 | 1,80,000            | 1,98,000            | 2,16,000            |
| (iii) Fixed Expenses              |                     |                     |                     |
| Office and Management salaries    | 5,40,000            | 5,40,000            | 5,40,000            |
| Office and Factory rent and taxes | 6,00,000            | 6,00,000            | 6,00,000            |

|                                 |                     |                   |                  |
|---------------------------------|---------------------|-------------------|------------------|
| Sundry Administrative expenses  | 7,20,000            | 7,20,000          | 7,20,000         |
| Dep. on machinery and furniture | 4,50,000            | 4,50,000          | 4,50,000         |
| <b>Total Cost</b>               | <b>66,90,000</b>    | <b>85,08,000</b>  | <b>96,36,000</b> |
|                                 | ₹<br>(30,000 × 225) | ₹<br>45,000 × 225 | ₹<br>54000x225   |
| Sales                           | 67,50,000           | 1,01,25,000       | 1,21,50,000      |
| Less total cost                 | 66,90,000           | 85,08,000         | 96,36,000        |
| <b>Profit :</b>                 | <b>60,000</b>       | <b>16,17,000</b>  | <b>25,14,000</b> |

Q.29. A gang of workers normally consists of 30 men, 15 women and 10 boys. They are paid at standard rates per hour as, Man ₹ 80.00 woman ₹ 60.00 and Boy ₹ 40. In a normal working of a week of 40 hours. The gang is expected to produce 2000 units of output.

During the week ended 31st December, 2011, the gang consisted of 40 men, 10 women and 05 boys. The actual wages paid per hour were Man ₹ 70.00, woman ₹ 65.00 and Boy ₹ 30.00. Actual units produced by the gang 1600 units.

Calculate:-

- (i) Labour Cost Variance
- (ii) Labour Rate Variance
- (iii) Labour Efficiency variance
- (iv) Labour Mix Variance
- (v) Labour Yield Variance

**Solution:**

**(i) Labour Cost Variance**

(Std. Rate × Std. time for actual output) – (Actual Rate × Actual time)

|       |   |                             |   |                     |
|-------|---|-----------------------------|---|---------------------|
| Men   | = | (80 × 960) – (70 × 1600)    | = | ₹ 35,200 (A)        |
|       |   | = (76800 – 1,12,000)        |   |                     |
| Women | = | (60 × 480) – (65 × 400)     | = | ₹ 2,800 (F)         |
|       |   | = (28,800 – 26,000)         |   |                     |
| Boys  | = | (40 × 320) – (30 × 200)     | = | ₹ 6,800 (F)         |
|       |   | = (12,800 – 6000)           |   |                     |
|       |   | <b>Labour Cost Variance</b> | = | <b>₹ 25,600 (A)</b> |

**(ii) Labour Rate Variance: Actual time (SR – AR)**

|       |   |                             |   |                     |
|-------|---|-----------------------------|---|---------------------|
| Men   | = | 1600 (80 – 70)              | = | ₹ 16,000 (F)        |
| Women | = | 400 (60 – 65)               | = | ₹ 2,000 (A)         |
| Boys  | = | 200 (40 – 30)               | = | ₹ 2,000 (F)         |
|       |   | <b>Labour Rate Variance</b> | = | <b>₹ 16,000 (F)</b> |

**(iii) Labour Efficiency Variance:**

|       |   |  |   |              |
|-------|---|--|---|--------------|
|       | = | Std. price (Std. time for actual output - actual time) |   |              |
| Men   | = | 80 {960 – 1600}  |   |              |
|       |   | = 80(640)  | = | ₹ 51,200 (A) |
| Women | = | 60 (480 – 400)   |   |              |
|       |   | = 60 (80)  | = | ₹ 4,800 (F)  |

$$\begin{aligned} \text{Boys} &= 40 (320 - 200) \\ &= 40 (120) &= \text{₹ } 4,800 \text{ (F)} \\ \text{Labour Efficiency Variance} &= \text{₹ } 41,600 \text{ (A)} \end{aligned}$$

**(iv) Labour Mix Variance:**

$$\begin{aligned} &= \text{Std. Rate (Std. Time - Actual time worked)} \\ &= 80 (1200 - 1600) \\ &= 80(400) &= \text{₹ } 32,000 \text{ (A)} \\ \text{Women} &= 60 (600 - 400) \\ &= 60 (200) &= \text{₹ } 12,000 \text{ (F)} \\ \text{Boys} &= 40 (400 - 200) \\ &= 40( 200) &= \text{₹ } 8,000 \text{ (F)} \\ \text{Labour Mix Variance} &= \text{₹ } 12,000 \text{ (A)} \end{aligned}$$

**(v) Labour Yield Variance:**

$$\begin{aligned} &= \text{Std. Labour cost per unit of output} \times (\text{Std. Output for Actual time} - \text{Actual output}) \\ &= 4 (2000 - 1600) \\ &= 74 (400) &= \text{₹ } 29,600 \text{ (F)} \end{aligned}$$

**Working Notes:****1. Actual time:**

$$\begin{aligned} \text{Men} &= 40 \times 40 &= 1600 \\ \text{Women} &= 10 \times 40 &= 400 \\ \text{Boys} &= 05 \times 40 &= 200 \\ &&= \underline{2200 \text{ hrs}} \end{aligned}$$

**2. Std. Time for actual output:**

$$\begin{aligned} \text{Men} &= \frac{1600}{2000} \times (30 \times 40) &= 960 \text{ hrs.} \\ \text{Women} &= \frac{1600}{2000} \times (15 \times 40) &= 480 \text{ hrs.} \\ \text{Boy} &= \frac{1600}{2000} \times (10 \times 40) &= 320 \text{ hrs.} \end{aligned}$$

**3. Std. Time:**

$$\begin{aligned} \text{Men} &= 30 \times 40 &= 1200 \text{ hrs.} \\ \text{Women} &= 15 \times 40 &= 600 \text{ hrs.} \\ \text{Boys} &= 10 \times 40 &= 400 \text{ hrs.} \end{aligned}$$

**4. Std. Labour cost permit of output:**

Std. Output given = 2000 units

Std. Cost given

$$\begin{aligned} \text{Men} &= 30 \times 40 \times 80 &= 96000 \\ \text{Women} &= 15 \times 40 \times 60 &= 36000 \\ \text{Boys} &= 10 \times 40 \times 40 &= 16000 \\ &&= \underline{1,48,000} \end{aligned}$$

So, labour cost permit of output

$$= \frac{1,48,000}{2000} = ₹ 74/-$$

Std. Output for actual time worked for 2200 hours of total.

Std. Output = 2000 units

for 1760 hrs. of actual time worked

$$= 2000 \times \frac{1,760}{2,200} = 1600 \text{ units}$$

Q.30. A company manufactures a single product with a capacity of 2,50,000 units per annum. The summarised profitability statement for the year ended 31<sup>st</sup> March, 2012 is as under:

| Particulars                            |          | ₹        | ₹               |
|--|----------|----------|-----------------|
| Sales (1,50,000 units @ 20 ₹ Per unit) |          |          | 30,00,000       |
| Cost of sales:                         |          |          |                 |
| Direct Materials                       |          | 6,00,000 |                 |
| Direct Labour                          |          | 4,50,000 |                 |
| Production Overheads:                  | Variable | 1,50,000 |                 |
|  | Fixed    | 4,00,000 |                 |
| Administrative Overheads Fixed         |          | 3,00,000 |                 |
| Selling and Distribution Overheads     | Variable | 3,00,000 |                 |
|  | Fixed    | 2,00,000 | 24,00,000       |
| <b>Profit</b>                          |          |          | <b>6,00,000</b> |

- (a) You are required to calculate:
- PN Ratio
  - Break Even Sales
- (b) You are also required to evaluate the following options :-
- What will the amount of sales required to earn target profit of 20% on sales, in the packing is improved at an additional cost of ₹ 2 per unit?
  - If an expenditure of ₹ 4,00,000 is made on advertising, the sales would increase from the present level of 1,50,000 units to 2,00,000 units at a selling price of ₹ 21 per unit. Will that expenditure be justified?
  - If selling price is reduced by ₹ 2 per unit, there will be 100% capacity utilisation. Will the reduction in selling price be justified?

**Solution:**

|                     |                 |                  |
|---------------------|-----------------|------------------|
| Sales               |                 | 30,00,000        |
| Less: Variable cost |                 |                  |
| Direct materials    | 6,00,000        |                  |
| Direct labour       | 4,50,000        |                  |
| Variable cost       | <u>4,50,000</u> | <u>15,00,000</u> |
| Contributions       |                 | <u>15,00,000</u> |

**(a) (i) P/V Ratio**

$$\begin{aligned}
 &= \frac{\text{Contribution}}{\text{Sales}} \times 100 \\
 &= \frac{15,00,000}{30,00,000} \times 100 \\
 &= 50\%
 \end{aligned}$$

**(ii) Break Even Sales**

$$\begin{aligned}
 &= \frac{\text{Fixed cost}}{\text{P/V Ratio}} \\
 \text{Fixed cost} &= 4,00,000 + 3,00,000 + 2,00,000 \\
 &= 9,00,000 \\
 &= \frac{9,00,000}{50\%} \\
 &= 18,000
 \end{aligned}$$

**(b) (i) Contribution = Fixed cost + Derived profit**

$$\begin{aligned}
 \text{Additional cost} &= 1,50,000 \times 2 &= 3,00,000 \\
 \text{Fixed cost} &= 9,00,000 + 3,00,000 &= 12,00,000 \\
 \text{Contribution} &= 12,00,000 + 6,00,000 &= 18,00,000 \\
 \text{No. of units} &= \frac{18,00,000}{10} \\
 &= 1,80,000 \text{ units}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Sales (2,00,000} \times 21) &= 42,00,000 \\
 \text{Less: variable cost (15,00,000} + 4,00,000) &= 19,00,000 \\
 \text{Contribution} &= \underline{\underline{23,00,000}}
 \end{aligned}$$

$$\begin{aligned}
 \text{P/V ratio} &= \frac{25,00,000}{42,00,000} \times 100 \\
 &= 54.76\%
 \end{aligned}$$

B. E. P. sales

$$\begin{aligned}
 &= \frac{\text{Fixed cost}}{\text{P/V Ratio}} \\
 &= \frac{9,00,000}{54.76\%} \\
 &= ₹ 16435.35
 \end{aligned}$$

Expenditure is justified because P/V Ratio is more as compared to former sales.

**(iii) Selling price is reduced by ₹ 2/-**

$$\begin{aligned}
 \text{New S.P.} &= 20 - 2 ₹ 18/- \\
 \text{Sales (1,50,000} \times 18) &= 27,00,000 \\
 \text{Less: Variable cost} &= 15,00,000 \\
 \text{Contribution} &= \underline{\underline{12,00,000}}
 \end{aligned}$$

$$\begin{aligned}
 \text{P/V ratio} &= \frac{\text{Contribution}}{\text{Sales}} \times 100 \\
 &= \frac{12,00,000}{27,00,000} \times 100 \\
 &= 44.44\% \\
 \text{B.E.P. (sale)} &= \frac{\text{Fixed cost}}{\text{P/V Ratio}} \\
 &= \frac{9,00,000}{44.44\%} \\
 &= 20252/-
 \end{aligned}$$

Note: Although P/V Ratio is reduced, B.E.P. (sale) has increased and hence it is justified.

- Q.31. Star Transport Company has a fleet of 30 buses. 20 buses with carrying capacity of 50 passengers each and 10 buses with carrying capacity of 40 passengers each. Each bus makes four trips per day covering a distance of 10 kms. in each trip. On an average 80% of the seats are occupied in each trip and 5 buses are under repairs every day.

The total cost incurred as under :-

|                             |   |          |                |
|-----------------------------|---|----------|----------------|
| Salary of 30 Drivers        | ₹ | 3,000    | each per month |
| Salary of 30 Cleaners       | ₹ | 1,000    | each per month |
| Diesel Expenses             | ₹ | 4,15,000 | per month      |
| Oil, Grease etc.            | ₹ | 5,600    | per month      |
| Tyres, Tubes etc.           | ₹ | 2,500    | per month      |
| Repairs                     | ₹ | 30,000   | per annum      |
| Garage Rent                 | ₹ | 42,000   | per annum      |
| Road Licenses               | ₹ | 21,000   | per annum      |
| Taxes                       | ₹ | 5,400    | per half year  |
| Interest                    | ₹ | 27,000   | per annum      |
| Salary of Operating Manager | ₹ | 5,100    | per Month      |
| Office Overheads            | ₹ | 10,800   | per annum      |

Assuming that the company operates its fleet 30 days a month, you are required to :-

- Prepare operating cost statement for a month.
- Ascertain Operating cost per Passenger-km
- Determine the fare per passenger-km to yield a profit of 50% on fare.

**Solution:**

|                                      | ₹         | ₹ |
|--------------------------------------|-----------|---|
| <b>A. Fixed/Standing Charges:</b>    |           |   |
| Road licence                         | 21,000    |   |
| Taxes (5400 × 2)                     | 10,800    |   |
| Interest                             | 27,000    |   |
| Wages of 30 Drivers (30 × 3000 × 12) | 10,80,000 |   |

|  |           |                  |
|--|-----------|------------------|
| Wages of 30 cleaners (30× 1000 × 12)         | 3,60,000  |                  |
| Salary of operating manager (5100 × 12)      | 61,200    |                  |
| General Supervisor charges (office overhead) | 10,800    |                  |
| Garage Rent                                  | 42,000    | 16,12,800        |
| <b>B. Running or Operating Charges:</b>      |           |                  |
| Diesel (4,15,000 × 12)                       | 49,80,000 |                  |
| Oil, grease etc. (5600 × 12)                 | 67,200    |                  |
| Tyres, Tubes etc. (2500 × 12)                | 30,000    |                  |
| Repairs                                      | 30,000    | 51,07,200        |
| Total Operation Cost                         |           | <b>67,20,000</b> |

**(a) Effective Passenger km**

$$\begin{aligned}
 &= (20 \times 50) + (10 \times 40) \\
 &= 1000 + 400 \\
 &= 1400 \text{ effective passenger} \\
 &= 1400 \times 4 \text{ trips} \times 10 \text{ kms} \times \frac{80}{100} \times \frac{25}{30} \times 365 \\
 &= 1,36,26,666 \text{ passenger kms.}
 \end{aligned}$$

**(b) Cost per passenger km**

$$\begin{aligned}
 &= \frac{67,20,000}{1,36,26,666} \\
 &= ₹ 0.49315
 \end{aligned}$$

**(c) Fare rate per passenger km**

$$\begin{aligned}
 &= \frac{0.49315}{1} \times \frac{100}{50} \\
 &= ₹ 0.9863
 \end{aligned}$$

