

Unit-1

MARGINAL COSTING AND ABSORPTION COSTING

Unit Structure :

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- 1.1 Absorption Costing
- 1.2 Limitations of absorption costing
- 1.3 Marginal Costing
- 1.4 Marginal v/s Absorption costing
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1.0 LEARNING OBJECTIVES

After studying this chapter, the student should be able to understand -

- Meaning of absorption costing
- The distinction between marginal costing and absorption costing
- The meaning of the terms- breakeven point, margin of safety, p/v ratio, angle of incidence and cost indifference point.
- How to prepare profit statements based on marginal costing and absorption costing.
- the assumptions underlying CVP analysis
- How to calculate break-even points for multi-product situations.

1.1 ABSORPTION COSTING

Absorption costing is a principle whereby fixed as well as variable costs are allocated to cost units and total overheads are absorbed according to activity level. It is the practice of charging all costs irrespective of fixed and variable and direct and indirect expenses are charged. It is a simple and fundamental method of ascertaining the cost of a product or service. This method is familiar since many companies still follow this approach for pricing decisions. This is the oldest and widely used system. This method is also called as '*cost plus*' costing.

1.2 LIMITATIONS OF ABSORPTION COSTING

Absorption costing suffers from the following limitations.

- In practice this method employs highly arbitrary method of apportionment of overhead. This reduces the practical utility of cost data for control purposes.
- Under absorption costing, fixed cost relating to closing stock is carried forward to the next year. Similarly, fixed cost relating to opening stock is charged to current year instead of previous year. Thus under this method, all the fixed cost is not charged against the revenue of the year in which they are incurred. It is unsound practice.
- Under absorption costing collection and presentation of cost data is not very useful for decision making, because process of assigning product cost a reasonable share of fixed overhead obscures cost volume profit relationship.
- Under absorption costing, behavioral pattern of costs is not highlighted and thus many situations, which can be utilized under marginal costing, are likely to go unnoticed in absorption costing.
- The complaint is sometimes made that absorption costing often deals only with production costs and ignores selling and administration costs.
- The decision maker needs to know the costs that will vary as a result of his decision, and the costs that will remain unchanged. Absorption costing does not provide a convenient basis for making such calculations. Its main purpose is to provide cost information for stock valuation and the measurement of reported profits

1.3 MARGINAL COSTING

The term 'Marginal Cost' is defined as 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. It is a variable cost of one unit of a product or a service i.e. a cost which would be avoided if that unit was not produced or provided.

1.3.1 Definition and Meaning:

Marginal costing is a principle whereby variable costs are charged to cost units and fixed costs attributable to the relevant period is written off in full against the contribution for that period. Marginal Costing is the ascertainment of marginal cost and the

effect on profit of changes in volume or type of output by differentiating between fixed costs and variable cost.

CIMA defines marginal as “the accounting system in which variable cost are charged to the cost units and fixed costs of the period are written off in full against the aggregate contribution.

Marginal Costing is not a distinct method of costing like job costing or process costing. It is a technique which provides presentation of cost data in such a way that true cost volume profit relationship is revealed. Under this technique, it is presumed that costs can be divided in two categories, i.e., fixed cost and variable cost. Fixed cost is charged to contribution of the period in which it is incurred and is considered period cost.

1.3.2 Features of marginal costing:

- a. Costs are divided into two categories, i.e. fixed costs and variable costs.
- b. Fixed cost is considered period cost and remains out of consideration for determination of product cost and value of inventories.
- c. Prices are determined with reference to marginal cost and contribution margin.
- d. Profitability of department and products is determined with reference to their contribution margin.
- e. In presentation of cost data, display of contribution assumes dominant role.
- f. Closing stock is valued on marginal cost

1.3.3 Advantages of Marginal costing

- a. It avoids the complications of over or under absorption of fixed cost by excluding it from cost of production.
- b. The technique provides useful data for managerial decision making.
- c. By not carrying forward fixed cost from period to period, it facilitates cost comparison.
- d. The impact of profit on sales fluctuations are clearly shown under marginal costing.
- e. The technique is flexible in the sense it can be used along with other techniques such as budgetary control and standard costing.
- f. It establishes a clear relationship between cost, sales and volume of put and break even analysis which shows the effect of increasing an decreasing production activity on the profitability of the company.

- g. It provides useful data for the management in determination of policies regarding future
- h. te production and sales.
- i. Stock of work in progress and finished goods are valued at marginal cost, which is uniform.

1.3.4 Limitations:

- a. The segregation of semi variable costs often poses a problem
- b. Closing stock of work in progress and finished goods are understated which is not acceptable to tax authorities.
- c. With the change technology and owing to automation of industries, it results in more fixed cost. Marginal costing fails to reflect the exact change because of adoption of new technology.
- d. It does not provide any yardstick to exercise control. So an effective means of control cannot be exercised.
- e. The technique is not suitable under cost plus contract because of technique ignores fixed cost in calculating total cost.
- f. Variable cost per unit remains constant only in the short run but not in the long run.
- g. Cost comparison of two jobs will be difficult. Though marginal costing may be same for both the jobs.
- h. When sales are based on marginal cost or marginal cost with some contribution, it may result in losses or low profit.

1.4 MARGINAL V/S ABSORPTION COSTING

Absorption Costing	Marginal costing
1. All costs are charged to the cost of production	1. Only variable cost is charged to cost of production. Fixed costs are recovered from contribution.
2. Stock of work in-progress and finished goods are valued at full or total cost. Fixed cost is carried over from one period to another period which distorts cost comparison.	2. Stock of work in progress and finished goods are valued at marginal cost. This facilitates cost comparison.

3. The difference between sales and total cost constitute profit.	3. The excess of sales revenue over variable cost is known as contribution when fixed cost is deducted from contribution, it results in profit.
4. The apportionment of fixed costs on an arbitrary basis gives rise to under or over absorption of overheads	4. As only variable costs are charged to products, it does not give rise to over or under absorption of overheads.
5. Costs are classified according to functional basis such as production cost, administration cost, selling and distribution cost.	5. Costs are classified according to variability.

1.5 CONTRIBUTION ANALYSIS

1.5.1 Contribution

Contribution is the excess of selling price over variable costs. It is known as contribution because it contributes towards recovery of the fixed costs and profits. By equation, the concept of contribution can be stated as follows:

$$\text{Contribution} = \text{Sales} - \text{Variable cost}$$

Or

$$\text{Contribution} = F + P$$

1.5.2 Cost Volume profit (CVP) Analysis:

It is an important tool of profit planning. It provides information about the following matters:

- i. The behavior of cost in relation to volume
- ii. Volume of production or sales, where the business will break even
- iii. Sensitivity of profits due to variation in output
- iv. Amount of profit for a projected sales volume
- v. Quantity of production and sales for a target profit level

Cost volume profit analysis may therefore be defined as a managerial tool showing the relationship between various ingredients of profit planning viz, cost selling price and volume of activity, etc

$$\text{Profit -Volume (P/V) Ratio a) = } \frac{\text{Contribution}}{\text{Sales}}$$

$$\text{b) = } \frac{\text{Differences in Profits}}{\text{Differences in sales}}$$

$$\text{i) P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$\text{ii) P/V Ratio} = 100\% - \text{Marginal Cost\%}$$

Profit at a given sales volume

Contribution = Sales x P/V Ratio

Profit = Contribution - Fixed Cost

Profit at a given sales level = (Sales Revenue x P/v Ratio) - Fixed cost.

1.5.3 Breakeven Point:

The point which breaks the total cost and the selling price evenly to show the level of output or sales at which there shall be neither profit nor loss, is regarded as break even point. At this point, the income of the business exactly equals its expenditure. If production is enhanced beyond this level, profit shall accrue to the business, and it is decreased from this level, loss shall be suffered by the business.

$$\text{Breakeven point (in units)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$$

$$\text{Break-even Point (in Rs.)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}} \times \text{Sales}$$

1.5.4 Margin of safety:

Total sales minus the sales at breakeven point is known as the margin of safety

Thus, the formula is:

Margin of Safety = Total Sales - Break even sales

Margin of Safety can also be computed according to the following formula :

$$\text{Margin of safety} = \frac{\text{Net profit}}{\text{P/V Ratio}}$$

Margin of safety can also be expressed as a percentage of sales :

$$= \frac{\text{Margin of Safety}}{\text{Total Sales}} \times 100$$

Check Your Progress:

- 1) Define the following terms.
 - a) Absorption Costing
 - b) Marginal costing
 - c) Contribution
 - d) Break Even Point
 - e) Margin of Safety

- 2) Give Formulas
 - a) Contribution
 - b) Profit Volume Ratio
 - c) Profit at a given sales levels
 - d) Break Even point in units
 - e) Margin of safety.

1.6 SOLVED ILLUSTRATIONS

Illustration-1:

Prepare Income statements under Absorption Costing and under Marginal costing from the following information relating to the year 2001-02:

Opening Stock = 1,000 units valued at Rs. 70,000
including variable cost of Rs. 50 per unit.

Fixed cost = Rs. 1, 20,000

Variable cost = Rs. 60 per unit

Production = 10,000 units

Sales = 7,000 units @ Rs. 100 unit

Stock is valued on the basis of FIFO

Solution:

INCOME STATEMENT (Under Absorption Costing)

		Rs.	Rs.
	Sales (7,000 units @ Rs. 100 per unit)		7,00,000
Less :	Cost of Goods Manufactured :		
	Variable cost (10,000 unit @ Rs. 60 per unit)	6,00,000	
	(Rs. 1,20,000)	1,20,000	
	Fixed cost (10,000 units = Rs. 12 per unit)	7,20,000	
		70,000	
Add :	Value of Opening Stock	7,90,000	
Less :	Value of Closing Stock (4,000 units @ Rs. 72 per unit)	2,88,000	
			5,02,000
	Profit		1,98,000

INCOME STATEMENT (Under Marginal Costing)

		Rs.	Rs.
	Sales		7,00,000
	Variable cost	6,00,000	
Add:	Value of Opening Stock (1,000 units @ Rs. 50 per unit)	50,000	
		6,50,000	
Less :	Value of Closing Stock (4,000 units @ Rs. 60 per unit)	2,40,000	
			4,10,000
	Contribution		2,90,000
Less:	Fixed Cost		1,20,000
	Profit		1,70,000

Illustration- 2

Your Company has a production capacity of 12,500 units and normal capacity utilisation is 80%. Opening inventory of finished goods on 1-1-1999 was 1,000 units. During the year ending 31-12-1999, it produced 11,000 units while it sold only 10,000 units.

Standard variable cost per unit is Rs. 6.50 and standard fixed factory cost per unit is Rs. 1.50. Total fixed selling and administration overhead amounted to Rs. 10,000. The company sells its product at Rs. 10 per unit.

Prepare Income Statements under Absorption Costing and Marginal Costing. Explain the reasons for difference in profit, if any.

Solution:

INCOME STATEMENT (Absorption Costing)

		Rs.	Rs.
	Sales (10,000 units @ Rs. 10)		1,00,000
	Variable factory cost (11,000 units @ Rs. 6.50)	71,500	
	Fixed factory cost (11,000 units @ Rs. 1.50)	16,500	
		88,000	
		8,000	
Add :	Opening stock (1,000 units @ Rs. 8)	96,000	
		16,000	
Less :	Closing stock (2,000 units @ Rs. 8)	80,000	
Less :	Over-absorption (1,000 units @ Rs. 1.50)	1,500	
		78,500	
Add :	Selling and administration overhead	10,000	
	Total cost		88,500
	Profit		11,500

INCOME STATEMENT (Marginal Costing)

		Rs.	Rs.
	Sales (10,000 units @ Rs. 10)		1,00,000
	Variable cost (11,000 units @ Rs. 6.50)	71,500	
Add :	Opening Stock (1,000 units @ Rs. 6.50)	6,500	
		78,000	
Less :	Closing Stock (2,000 units @ Rs. 6.50)	13,000	
	Variable cost of Manufacture		65,000
	Contribution		35,000
Less :	Fixed cost – Factory (10,000 x Rs. 1.50)	15,000	
	Selling and Administration	10,000	
			25,000
	Profit		10,000

The difference in profits Rs. 1,500 (i.e. Rs. 11,500– Rs. 10,000) as arrived at under absorption costing and marginal costing is due to the element of fixed factory cost included in the valuation of opening stock and closing stock as shown below:

	Opening Stock	Closing Stock
	Rs.	Rs.
Absorption Costing	8,000	16,000
Marginal Costing	<u>6,500</u>	<u>13,000</u>
	<u>1,500</u>	<u>3,000</u>
Net Difference = Rs. 3,000 – Rs. 1,500		Rs. <u>1,500</u>

Illustration 3 :

If the Budgeted output is 80,000 units, Fixed cost is Rs. 4,00,000, Selling price per unit is Rs. 20 and variable cost per unit is Rs. 10, find out BEP sales, BEP in units, P/V ratio and indicate the margin of safety.

Solution :

	Rs. Per Unit
Selling Price	20
Less : Variable Cost	10
Contribution	10
P/V Ratio	$= \frac{\text{Contribution}}{\text{Sales}} = \frac{10}{20} = 0.5$
Break Even Sales (Rs.)	$= \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$
	$= \frac{\text{Rs. 4,00,000}}{0.5}$
	$= \text{Rs. 8,00,000}$
	$= \frac{\text{Fixed Cost}}{\text{Contribution Per Unit}}$
	$= \frac{\text{Rs. 4,00,000}}{\text{Rs. 10}}$
	$= 40,000 \text{ Units}$

Margin of Safety Sales	= Budgeted Output– Break Even Sales
Margin of Safety (Units)	= 80,000 – 40,000 = 40,000 Units
Margin of Safety Sales (Rs.)	= Margin of Safety Units x Selling Price Unit
	= 40,000 x 10
	= Rs. 4,00,000

Illustration- 4 :

(a) From the following information calculate :

(a) Break – Even Point.

(b) P/V Ration

- (c) Profit
- (d) Profit at 75% capacity,
- (e) Profit at 100% capacity
- (1) Budgeted Sales Rs. 2,00,000 (80% capacity)
 - (2) Direct Materials 30% of Sales.
 - (3) Direct labor 20% on sales.
 - (4) Variable Overheads (Factory) 10% on sales.
 - (5) Variable Overheads (Administration) 15% of sales.
 - (6) Fixed Cost Rs. 30,000

Solution :

		Activity Level	
Particulars	75% Rs.	80% Rs.	100% Rs.
Sales	1,87,5000	2,00,000	2,50,000
Less : Variable Cost :			
Direct Material (30%)	56,250	60,000	75,000
Direct Labour (20%)	37,500	40,000	50,000
Factory Overheads (10%)	18,750	20,000	25,000
Administration Overheads (15%)	28,125	30,000	37,500
Total Variable Expenses	1,40,625	1,50,000	1,87,500
Contribution	46,875	50,000	62,500
Less : Fixed Cost	30,000	30,000	30,000
(3) Profit	16,875	20,000	32,500
(1) BEP <u>Fixed Cost</u>	30,000	30,000	30,000
(in Rs.) P/V Ratio	0.25	0.25	0.25
	1,20,000	1,20,000	1,20,000
Contribution	46,875	50,000	62,500
(2) P/V Ratio Sales	1,87,500	2,00,000	2,50,000
	= 0.25	= 0.25	= 0.25

Illustration -5 :

Company X and Company Y, both under the same management, makes and sells the same type of product. This budgeted Profit and Loss Accounts for January – June, 2005, are as under :

	Company 'X'		Company 'Y'	
Particulars	Rs.	Rs.	Rs.	Rs.
Sales		6,00,000		6,00,000
Less : Variable Cost	4,80,000		4,00,000	
Fixed Cost	60,000	5,40,000	1,40,000	5,40,000
Profit		60,000		60,000

You are required to :

- Calculate the Break-Even Point for each company.
- Calculate the sales volume at which each of the two companies with profit of Rs. 20,000.
- Calculate margin of Safety for both the companies.

Marginal Cost Sheet

Particulars	X	Y
Sales	6,00,000	6,00,000
Less : Variable Cost	4,80,000	4,00,000
Contribution	1,20,000	2,00,000
Less : Fixed Cost	60,000	1,40,000
Profit	60,000	60,000

$$(1) \text{ P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}}$$

$$\begin{array}{r} \text{X} \\ \frac{1,20,000}{6,00,000} \\ = 0.2 \end{array}$$

$$\begin{array}{r} \text{Y} \\ \frac{2,00,000}{6,00,000} \\ = 0.33 \end{array}$$

$$(2) \text{ BEP (Rs.)} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$$

$$\begin{array}{r} \text{X} \\ \frac{60,000}{0.2} \\ = \text{Rs. } 3,00,000 \end{array}$$

$$\begin{array}{r} \text{Y} \\ \frac{1,40,000}{0.33} \\ = \text{Rs. } 4,20,000 \end{array}$$

$$(3) \text{ Sales required to earn a desired profit} = \frac{\text{Fixed cost} + \text{Target Profit}}{\text{P / V Ratio}}$$

$$\begin{array}{cc} \text{X} & \text{Y} \\ \frac{60,000 + 20,000}{0.2} & \frac{1,40,000 + 20,000}{0.33} \\ = \text{Rs. 4,00,000} & = \text{Rs. 4,80,000} \end{array}$$

$$(4) \text{ MOS (Rs.)} = \frac{\text{Profit}}{\text{P / V Ratio}}$$

$$\begin{array}{cc} \text{X} & \text{Y} \\ \frac{60,000}{0.2} & \frac{60,000}{0.33} \\ = \text{Rs. 3,00,000} & = \text{Rs. 1,80,000} \end{array}$$

Illustration- 6.

- (a) X Ltd. has earned contribution of Rs. 2,00,000 and net profit of Rs. 1,50,000 on sales of Rs. 8,00,000. What is its margin of safety?
- (b) If margin of safety is Rs. 2,40,000 (40% of sales) and P/V Ratio is 30% of AB Ltd., calculate its
- (i) Break even sales and (ii) Amount of profit on sales of Rs. 9,00,000.
- (c) A company sells its product at Rs. 15 per unit. In a period, if it produces and sells 8,000 units, it incurs a loss of Rs. 5 per unit. If the volume is raised to 20,000 units, it earns a profit of Rs. 4 per unit. Calculate break-even point both in terms of rupees as well as in units.
- (d) A company earned a profit of Rs. 30,000 during the year 1994-95. If the marginal cost and selling price of a product are Rs. 8 and Rs. 10 per unit respectively, find out the amount of 'Margin of Safety'.
- (e) The profit volume (P/V) ration of B B & Co. dealing in precision instruments is 50% and the margin of safety is 40%.
You are required to work out the break-even point and the net profit if the sale volume is Rs. 50 lakhs.
- (f) Comment on the economic soundness of the following firms :

	Firm A	Firm B
Current Sales Volume	3,00,000	3,00,000
Break Even Sales Volume	2,00,000	2,00,000
Margin of Safety	1,00,000	1,00,000
Fixed Cost	1,00,000	60,000

(g) A company has a P/V Ratio of 40 per cent. By what percentage must sales be increased to offset :

- (i) 10 per cent reduction in selling price and
- (ii) 20 per cent reduction in selling price

Solution :

$$(a) \quad P/V \text{ Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\text{Rs. } 2,00,000}{\text{Rs. } 8,00,000} \times 100 = 25\%$$

$$\text{Margin of Safety} = \frac{\text{Profit}}{P/V \text{ Ratio}} = \frac{\text{Rs. } 1,50,000}{25\%} = \text{Rs. } 6,00,000$$

$$(b) \quad \text{Margin of Safety} = \frac{\text{Profit}}{P/V \text{ Ratio}}$$

$$\text{or Profit} = \text{Margin of Safety} \times P/V \text{ Ratio} = \text{Rs. } 2,40,000 \times 30\% = \text{Rs. } 72,000$$

$$\frac{\text{Margin of Safety}}{40\%} = \frac{\text{Rs. } 2,40,000}{40\%} = \text{Rs. } 6,00,000$$

$$\text{Contribution} = \text{Sales} \times P/V \text{ Ratio} = \text{Rs. } 6,00,000 \times 30\% = \text{Rs. } 1,80,000$$

$$\text{Fixed cost} = \text{Contribution} - \text{Profit} = \text{Rs. } 1,80,000 - \text{Rs. } 72,000 = \text{Rs. } 1,08,000$$

$$(i) \text{ Break Even Sales} = \frac{\text{Fixed Cost}}{P/V \text{ Ratio}} = \frac{\text{Rs. } 1,08,000}{30\%} = \text{Rs. } 3,60,000$$

$$(ii) \text{ Profit} = (\text{Sales} \times P/V \text{ Ratio}) - \text{Fixed Cost} = (\text{Rs. } 9,00,000 \times 30\%) - \text{Rs. } 1,08,000 = \text{Rs. } 2,70,000 - \text{Rs. } 1,08,000 = \text{Rs. } 1,62,000$$

(c) Average cost at 8,000 units volume

$$= \text{Selling price per unit} - \text{loss component per unit} = \text{Rs. } 15 - \text{Rs. } 5$$

$$= \text{Rs. } 10 \text{ Average cost at } 20,000 \text{ units volume} = \text{Rs. } 15$$

$$- \text{Rs. } 4 = \text{Rs. } 11 \text{ Total cost at } 8,000 \text{ units volume} = \text{Rs. } 8,000 \times \text{Rs. } 11 = \text{Rs. } 88,000$$

$$\text{Total cost at } 20,000 \text{ units volume} = \text{Rs. } 15 \times 20,000 = \text{Rs. } 3,00,000$$

$$\text{Total cost at } 8,000 \text{ units volume} = \text{Rs. } 11 \times 8,000 = \text{Rs. } 88,000$$

Variable cost per unit $\frac{\text{Change in total cost}}{\text{Change in volume of production}} = \frac{\text{Rs. 60,000}}{12,000} = \text{Rs. 5}$

Fixed cost = Total cost – Variable cost = Rs. 1,60,000 – Rs. 40,000
= Rs. 1,20,000

P/V Ratio $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\text{Rs. 10}}{\text{Rs. 15}} \times 100 = 66 \frac{2}{3} \%$

Break Even Point (Rupees) $\frac{\text{Fixed cost}}{\text{P/V Ratio}} = \frac{\text{Rs. 1,20,000}}{66 \frac{2}{3} \%} = \text{Rs. 1,80,000}$

Break Even Point (in units) $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{Rs. 1,20,000}}{\text{Rs. 10}} = 12,000 \text{ units}$

Alternative Solution :

We know the following relationship :

Sales =	TC + P/L	:	Sales = TC + P/L
Rs. 15 =	x + Rs. (5)	:	Rs. 15 = x + Rs. 4
Rs. 20 =	x	:	Rs. 11 = x

TC = 8,000 x Rs. 20 per unit = 1,60,000;
TC = 20,000 x Rs. 11 per unit = Rs. 2,20,000

Variable Cost per unit $\frac{\text{Difference in cost}}{\text{Difference in Activity}} = \frac{\text{Rs. 60,000}}{12,000 \text{ units}} = \text{Rs. 5 per unit}$

TC = Fixed Cost + VC per unit x Activity
Rs. 1,60,000 = x + Rs. 5 x 8,000
Rs. 1,20,000 = x

B.E.P. (unit) $\frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{\text{Rs. 1,20,000}}{(\text{Rs. 15} - \text{Rs. 5})} = 12,000 \text{ units}$

B.E.P. (Sales Rs.) = Fixed Cost x $\frac{\text{S}}{\text{C}}$ Per unit $\frac{15}{10}$
= Rs. 1,80,000

(d) Selling price	Rs. 10
Less : Marginal cost	8
Contribution	2

P/V Ratio $\frac{\text{Rs. 2}}{\text{Rs. 10}} \times 100 = 20\%$
Margin of Safety $\frac{\text{Profit}}{\text{P/V Ratio}} = \frac{\text{Rs. 30,000}}{20\%} = \text{Rs. 1,50,000}$

(e)	Calculation of Sales at Break-even point	
	Sales	Rs. 50,00,000
	Less : Margin of Safety 40% (i.e. $50,00,000 \times \frac{40}{100}$)	20,00,000

Sales at Break Even Point = 30,00,000

P/V Ratio 50%

Therefore, Contribution or fixed Expenses at B.E.P.

(50% of Rs. 30,00,000) = Rs. 15,00,000

Calculation of Net Profit at Sales Volume of Rs.50,00,000

Contribution on Rs. 50,00,000 Sales

(Sales x P/V Ratio i.e. $Rs. 50,00,000 \times \frac{50}{100}$) = Rs.25,00,000

Less : Fixed Expenses	=15,00,000
Profit	=10,00,000

(f)	Firm A	Firm B
Break Even Sales	2,00,000	2,00,000
Fixed cost or Contribution	1,00,00	60,000
(At B.E.P. contribution is Equal to Fixed Cost)	50%	30%

	$\frac{\text{Contribution}}{\text{Sales}} \times 100 =$	$\frac{1,00,000}{2,00,000} \times 100$	$\frac{60,000}{2,00,000}$
P/V Ratio =			

	Rs.	Rs.
Current Sales Volume	<u>3,00,000</u>	<u>3,00,000</u>
Contribution on Current Sales Volume	1,50,000	90,000
(i.e. Sales x P/V Ratio)	(3,00,000 x 50%)	(3,00,000 x 30%)
Less : Fixed cost	1,00,000	60,000
Profit	50,000	30,000

Comment : Firm A is more sound as compared to Firm B because it gives excess profit of Rs. 20,000 (i.e. Rs. 50,000 – Rs. 30,000). It is because of higher P/V ratio of 50%. Higher the P/V ratio, better it is. Firm A will start earning profit @ 50% on sales after B.E.P. whereas firm B will earn profit @ 30% on sales in excess of break even sales.

(g) Suppose selling price per unit is Re. 1 and units sold are 100.

	Present Position	After reduction of 10% in selling price	After reduction of 20% in selling price
	Rs.	Rs.	Rs.
Sales	100	90	80
Less : Variable cost	60	60	60
Contribution	40	30	20
Total sales in order to offset decrease in selling price		-	
<u>Sales x Present Contribution</u>	<u>90</u>	<u>80</u>	
New Contribution	30 x 40	20 x 40	
% Increase in Sales	= Rs. 120 20%	= Rs. 160 60%	

Illustration- 7 :

A company has annual fixed costs of Rs. 14,00,000. In 2001 sales amounted to Rs. 60,00,000 as compared with Rs. 45,00,000 in 2000 and profit in 2001 was Rs. 4,20,000 higher than in 2000 :

- At what level of sales does the company break-even?
- Determine profit or loss on a present sales volume of Rs. 80,00,000.
- If there is reduction in selling price in 2002 by 10% and the company desires to earn the same profit as in 2001, what would be the required sales volume?

Solution :

$$\frac{\text{Change in profit}}{\text{Change in sales} \times 100} = \frac{\text{Rs. 4,20,000}}{\text{Rs. 15,00,000} \times 100} = 28\%$$

$$(i) \text{ Break Even Point} = \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{\text{Rs. 14,00,000}}{28} \times 100$$

$$= \text{Rs. 50,00,000}$$

$$(ii) \text{ Profit} = (\text{Sales} \times \text{P/V ratio}) - \text{Fixed cost}$$

$$(\text{Rs. 80,00,000} \times 28\%) - \text{Rs. 14,00,000}$$

$$= \text{Rs. 8,40,000}$$

(iii) Contribution in 2001 = 28% x Rs. 60,00,000 = Rs. 16,80,000

This has to be maintained.

In 2002, the sales volume and contribution consequent upon 10% reduction in price are :

	Rs.
Sales (Rs. 60,00,000 – 10%)	54,00,000
Contribution (Rs. 16,80,000 – 10% of Rs. 60,00,000)	Rs. 10,80,000
	<u>Rs. 10,80,000</u>
P/V ratio	Rs. 54,00,000 x 100 = 20%

$$\text{Required Sales Volume} = \frac{\text{Contribution}}{\text{P/V Ratio}} = \frac{\text{Rs. 16,80,000}}{20\%}$$

$$= \text{Rs. 8,40,000}$$

1.7 EXERCISE

1.7.1 Simple Questions

1. Define cost-volume-analysis.
2. State any four objectives of cost volume profit analysis.
3. State any four assumptions of cost volume profit analysis.
4. State any four limitations of cost volume profit analysis.
5. What is Contribution ? How is it different from profit ?
6. Give Marginal Costing Equation.
7. Give three ways by which P/V Ratio can be improved.
8. What is Margin of Safety? How can it be improved?
9. Why are P/V Ratio and Marginal of Safety calculated?
10. Distinguish BE charts from P/V charts.
11. Write a note on Cash Break-even chart.

1.7.2 Objective questions

From the following choose the most appropriate answer:

- i) Contribution margin is also known as
 - a) Variable cost
 - b) Gross Profit
 - c) Net Income
- ii) Period cost means
 - a) Variable cost
 - b) Fixed cost
 - c) Prime cost
- iii) The break even point is the point at which:
 - a) There is no profit no loss
 - b) Contribution margin is equal to total fixed cost:
 - c) Total revenue is equal to total cost:
 - d) All of the above

- iv) Production cost under marginal costing include
- (a) Prime cost only
 - (b) Prime cost and variable overhead
 - (c) Price cost and fixed overhead
 - (d) Price cost, variable overhead and fixed overhead
- v) One of the primary difference between marginal costing and absorption costing is regarding the treatment of :
- (a) Direct material
 - (b) Variable overhead
 - (c) Fixed overhead
 - (d) Overhead costs
- vi) Period costs are :
- (a) Variable costs
 - (b) Fixed cost
 - (c) Prime cost
 - (d) Overhead cost
- vii) Absorption costing differs from marginal costing in the
- (a) Fact that standard costs can be used with absorption costing but not with marginal costing.
 - (b) Amount of fixed costs that will be incurred
 - (c) Kind of activities for which each can be use
 - (d) Amount of costs assigned to individual units of products.
- viii) To obtain the break-even point in rupee sales value, total fixed costs are divided by :
- (a) Variable cost per unit
 - (b) Contribution margin per unit
 - (c) Fixed cost per unit
 - (d) Profit / volume ration.
- ix) The break-even point is the point at which
- (a) There is no profit no loss
 - (b) Contribution margin is equal to total fixed cost,
 - (c) Total revenue is equal to total cost
 - (d) All of the above.
- x) Margin of safety is referred to as :
- (a) Excess of actual sales over fixed expenses
 - (b) Excess of actual sales over variable expenses
 - (c) Excess of actual sales over break-even sales
 - (d) Excess of budgeted sales over fixed costs.

Answer : i (b), ii(a), iii (a), iv (b), v(c), vi (c), vii (d), viii(d), ix (d), x(c).

1.7.3 Essay type questions:

- 1) What do you mean by differential costs and incremental revenue?
- 2) State the managerial decision which can be taken with the help of Differential cost Analysis?
- 3) Explain the importance of the marginal cost technique in managerial decision making.
- 4) In the context of cost volume profit analysis, what is meant any limiting factor? Discuss its utility.
- 5) Explain briefly the circumstances under which selling prices below marginal cost may be justified.
- 6) How does cost volume profit analysis help control of cost?
- 7) "Cost Volume Profit analysis is helpful for profit planning". Explain.
- 8) What is 'analysis of margin of contribution' ? Discuss the need for it.
- 9) Define marginal costing, What are the features of marginal costing?
- 10) "Cost-volume profit analysis is a very useful technique to management for cost control, profit planning and decision making". Explain.
- 11) In the context of cost-volume profit analysis, what is meant by limiting factor? Discuss its utility.
- 12) Define cost-volume profit analysis and explain its main features and useful contribution to the management in decision making.
- 13) How does cost-volume profit analysis help control of cost?

1.7.4 Practical Problems

Illustration 1:

You are supplied with the information relating to sales and costs of sales of a manufacturing company. you are required to find out :

- 1) a) P. V. Ratio.
- b) Break even Point.
- c) Margin of safety in 2002.
- d) Profit when sales are Rs. 1, 20,000.
- e) Sales required earning a profit of Rs. 75,000

2) Calculate the revised P. V. ratio, break even point in each of the following cases :

- Decrease of 10% in selling price.
- Increase of 10% in variable costs.
- Increase of sales volume to 4000 units and increase in fixed costs by Rs. 40,000.
- Increase of Rs. 18,000 in fixed costs.
- Increase of 20% in selling price and increase of Rs. 8,000 in fixed costs.

3) The sales and cost of sales during the two years were as follows:

Year	Sales Rs.	Costs of Sales Rs.	Units
2001 	6,00,000	5,60,000	2,400
2002 	7,50,000	6,80,000	3,000

(M.Com., Apr. 03, Adapted)

(Ans: P/V Ratio 20%, Fixed Cost- Rs. 80,000)

Illustration 2 :

You are given the following information for the next year.

Year	Units
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.
- Evaluate the effect of following on P. V. Ratio, Break-even point and the margin of safety.
 - 10% increase in Variable Cost.
 - 10% decrease in Variable Cost.
 - 10% increase in Fixed Cost.
 - 10% decrease in Fixed Cost.
 - 10% increase in Physical Sales Volume.
 - 10% decrease in Physical Sales Volume.
 - 5% increase in Selling Price.

- h) 5% decrease in Selling Price.
- i) 10% increase in Selling Price and 10% decrease in Physical Sales Volume.
- j) 5% decrease in Selling Price and 10% increase in Physical Sales Volume.

([M.Com.](#), Oct 96, Adapted)

(Ans: P/V Ratio 60%, BEP- Rs.1,00,000, MOS- Rs. 20,000)

Illustration 3:

AB Ltd. and LM Ltd. are manufacturing the same product. The Profit & Loss details are as under :

Particulars	AB Ltd. Rs.	LM Ltd. Rs.
Sales	10,00,000	10,00,000
Less : Variable Cost	4,00,000	6,00,000
.....	6,00,000	4,00,000
Less : Fixed Cost	3,00,000	1,00,000
Profit	3,00,000	3,00,000

You are required to:

- 1) Calculate Contribution / Sales ratio for each company.
- 2) Calculate BEP for each company.
- 3) Profits of each company if sales increase by 20%.
- 4) Profits of each company if sales decrease by 20%.
- 5) Comment on the profitability of both companies.

([M.Com.](#) Apr 04, Adapted)

(Ans: P/V Ratio AB Ltd. 60%, LM Ltd. 40% BEP- AB Ltd. Rs. 5,00,000, LM.Ltd- Rs. 2,50,000)

Illustration 4:

The Vijaya Electronics Co. furnishes you the following income information of the year 1995.

Particulars	First Half	Second Half
Sales	4,05,000	5,13,000
Profit	10,800	32,400

From the above table you are required to compute the following assuming that the fixed cost remains the same in both the periods.

- a) P/V Ratio
 - b) Fixed Cost
 - c) Break-even point
 - d) Variable Cost for first and second half of the year
 - e) The amount of Profit or Loss where sales are Rs. 3,24,000. f) The amount of sales required to earn a profit of Rs. 54,000.
- ([M.Com.](#) Apr 08, Adapted)

(Ans: P/V Ratio 20%, Fixed Cost Rs. 1, 40,000, BEP- Rs. 7, 02,000)

Illustration 5:

National Plastic Ltd. manufacturing chairs provides the following information:

Fixed cost Rs. 50,000 for the year
 Variable cost Rs. 20 per chair
 Capacity Rs. 2,000 chairs per year
 Selling price Rs. 70 per chair

From the above mentioned information:

- i) Find the Breakeven point
- ii) Find the number of chairs to be sold to get a profit of Rs. 30,000
- iii) Find out Breakeven point and sales if the selling price changes to Rs. 60 per chair.
- iv) If the company can manufacture 600 chairs more per year with an additional fixed cost of Rs. 2,000, what should be the selling price to maintain profit per chair as at (ii) above?

([M.Com.](#) Oct 04, Adapted)

(Ans: P/V Ratio 71.43% BEP- 1,000 Chairs)

Illustration 6 :

Sunil Ltd. had prepared the following budget estimates for the year 2004 :

Sales Units	Rs. 15,000
Fixed Expenses	Rs. 34,000
Sales Value	Rs. 1, 50,000
Variable Costs	Rs. 6 per unit

You are required to:

- i) Find out the P/V Ratio, Break Even Point and Margin of Safety.
- ii) Calculate the revised P/V Ratio, Break Even Point and Margin of Safety in each of the following cases :
 - a) Decrease of 10% in the selling price
 - b) Increase of 10% in the variable costs
 - c) Increase of sales volume by 2,000 units
 - d) Increase of ` 6,000 in fixed costs.

([M.Com.](#) Oct 05, Adapted)

(Ans: P/V Ratio 40%, BEP- Rs.85, 000, MOS- Rs. 65,000)



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Unit-2

MANAGERIAL DECISIONS - I

Unit Structure :

- 2.0 Learning Objectives
- 2.1 Introduction
- 2.2 Long –term and Short-term decisions
- 2.3 Application s of Marginal Costing
- 2.4 Solved Problems
- 2.4 Illustration
- 2.5 Questions

2.0 LEERING OBJECTIVES

After Studying this chapter, you should be able to:

- Explain distinction between a) relevant cost and irrelevant cost's) marginal cost and differential cost c) breakeven point and cost indifference point; d) relevant cost and opportunity cost and g) traceable cost and common cost.
- Explain the importance of qualitative factors in decision making
- Construct the statements of relevant costs and relevant revenues for such Problem as:
 - A) Deleting a segment; b) special selling price decisions;
 - c) make or buy decision and d) accepting or rejecting an export order.
- Explain and consider the impact of opportunity cost, shadow price or incremental opportunity cost and imputed cost on decision making.
- Distinguish between situation of decision making (i.e. choice among the alternatives) and performance evaluation (i.e. evaluation of managerial performance with reference to overall contribution to companies' profit.)
- Explain the short term decision making and long term decision making
- Advise the management the best course of action after proper evaluation of all the available information

2.1 INTRODUCTION

Decision making involves choice between alternatives. Many quantitative and qualitative factors have to be taken into account in decision making. The term cost is very elusive; it has different meanings in different situations. A cost accountant examines each situation in depth to decide the kind of cost concepts to be used and plays an important role in decision making by making precise and relevant data available to management. In cost studies, a cost accountant should always consider four points for decision makings; (i) he must establish why a choice is necessary (ii) he must separately analyze each available alternatives, (iii) specific effort should be made to determine how every alternative alters or influences decision makers choice, and (iv) choice of a particular course of action from among the alternatives. Decision making involves prediction, which cannot change the past, but it is expected to influence the future.

2.2 LONG –TERM AND SHORT-TERM DECISIONS

Decision making involves two types of decisions i.e. long term decisions and short term operating decisions. The long term decisions force management to look beyond the current year. Time value of money and return on investment are major considerations in long term decisions. Short run operating decisions involves the selection of alternatives that can be implemented within a one year period. These short run operating decisions involve many special non recurring decisions such as: i) make or buy: ii) sell or process further; iii) accept or reject an order and countless other decisions.

2.3 APPLICATION S OF MARGINAL COSTING

The technique of marginal costing is largely use in the managerial decision making process. The application of marginal costing I the day to day decision making process are as follows.

2.3.1 Make or Buy decision:

Very often management is confronted with the problem of deciding whether to buy a component or product from an outside source or to manufacture the same if it is economical as compared to the price quoted by a supplier. In deciding the absorption costing would mislead. If the decision is to buy from an external source the price quoted by the supplier should be less than marginal cost. If the decision is to make within the organization, the cost of production should include all additional cost such as depreciation on new plant interest on capita, etc., If this cost of production is less

than the quotation price, it should be decided making the product rather than procure it from an external source.

Factors that influence make or buy decision:

In a make or buy decision the following cost and non cost factors must be considered specifically.

a) Cost factors

1. Availability of plant facility.
2. Quality and type of item which affects the production schedule
3. The space required for the production of item.
4. Any special machinery or equipment required.
5. Any transportation involved due to the location of production
6. Cost of acquiring special know how required for the item.

b) Replacing existing machinery with new machinery

Sometimes with a view to derive maximum efficiency an existing plant may have to be replaced by a new one. Again the guiding factors mentioned earlier will help in such decision making process.

Items of differential costs

- i) Capital equipment and associated costs, viz., interest, depreciation., etc.,
- ii) Loss on sale of old equipment
- iii) Increased in fixed overhead costs.

Items of differential benefits

- i) Saving in operating costs.
- ii) Increased volume and value of production
- iii) Realizable value of old machine
- iv) Tax benefits, if any.

c) Alternative use of plant or productive facility-

To take advantage of alternative use of production facility or alternative use of plant it is necessary to know the contribution margin. That alternative which yields highest contribution margin shall be selected.

d) Product Mix, Profit planning and profit maximization-

Companies manufacturing varieties of products often have to decide which product mix is more profitable. That product mix which gives maximum contribution is to be considered as best product mixes. Similarly, profit planning is often considered so as to earn reasonable profit if not maximum profit. The profit planning is affected by factors such as i) volume of output, ii) Product mix, iii) costs to be incurred, iv) Prices to be charged and so on. Marginal costing techniques guide the management in this regard.

e) Avoidable and unavoidable cost

Avoidable costs are those which can be eliminated if a particular product or department, with which they are directly related, is discontinued. Unavoidable cost is that cost which will not be eliminated with the discontinuation of a product or department.

f) Relevant Cost and Irrelevant Cost

A cost that is relevant to a decision is called relevant cost. Past costs are not generally relevant costs because they are sunk costs or costs already incurred. Thus the book value of an asset or depreciation charged in accounts in respect of an asset is not relevant cost. On the other hand, the fall in the resale value of an asset as a result of using it, as also the running expenses incurred to make use of the asset are relevant costs.

g) Profitability of the department or products;

The preparation of a departmental profit and loss account under marginal costing is useful in determining which department is making profit and which department is incurring a loss. This enables the management to decide whether a particular department, must continue operation or it should be eliminated. The decision is taken by referring to the contribution made or loss incurred by the department or product.

2.3.2 Selling at or below marginal cost:

Some time it may become necessary to sell the goods at a price below the marginal cost some such situations are as follows:

- a) Where materials are of perishable nature
- b) Where large quantities of stock are accumulated and whose market prices have fallen. This will save the carrying cost of stocks.
- c) In order to popularize a new product.
- d) In order to increase sales of those products having higher margin or profits.

If the selling price is below the total cost but above the marginal cost, the contribution will leave on under recovering of fixed cost. If the selling price fixed is equal to marginal cost, there will be a loss which is equal to fixed cost. However, where the selling price is fixed is lesser than the marginal cost, the loss will be greater than fixed cost.

2.3.3 Determination of selling price and volume of output :

The determination of selling price and volume of output is based on differential costing. The difference in total cost due to difference in sales volume is known as differential costing. The increase in sales volume is known as incremental revenue. The analysis of differential cost and incremental revenue helps in determining selling price which will yield the optimum profit. So

long as incremental revenue is more than the differential cost it is advantages to increase the output. But as soon as incremental revenue equals the differential cost further increase in output is not advantages. Different cost analysis thus helps to determine the selling price and the level of activity which are expected to yield the highest profit.

2.3.4 Shut Down or Continue:

A business is sometimes confronted with the problem of suspending its business operations for a temporary period or permanently closing down. Permanent closure of the business is a very drastic decision and should be carried out only in extreme circumstances.

Temporary shut down

The following items of costs and benefits should be considered while deciding about the temporary shutdown of plant.

Items of cost

- i) Effect on fixed overhead costs.
- ii) Packing and storing of plant and equipment costs.
- iii) Setting up costs.
- IV) Loss of goodwill/market.
- v) Lay off or retrenchment compensation to workers

Check Your Progress:

- 1) Why the goods are sold at or below the Marginal Cost?
- 2) Distinguish between
 - a) Long Term Decisions and short Term Decisions.
 - b) Relevant Cost and Irrelevant cost
 - c) Avoidable and unavoidable cost

2.4 EXERCISE

Answer in Brief

1. Comment –Pricing decisions may be based on Percentage of profit on total cost
2. Comment –Pricing decisions may be based on percentage of profit on selling price.

3. Enumerate any two limitations of Marginal Costing
4. Comment –major limitation of Marginal Costing is that it is difficult to separate fixed and variable costs.
5. Comment-Marginal Costing is not applicable to Contract Costing.
6. Comment profit volume ratio ignores price changes.
7. Define-opportunity Cost.
8. Define-Replacement Cost
9. Define-Normal Cost
10. Define –Differential Cost
11. Define Avoidable cost
12. Define-Unavoidable Cost
13. Define-differential Costing
14. Define Differential Cost Analysis.
15. Define Differential Costing

Select the correct answer in each of the following:

1. Measurable value of an alternative use of resources is
 - a) Sunk Cost
 - b) Imputed cost
 - c) Opportunity cost
 - d) Differential cost
2. The decision maker should consider, in case of limiting factor to maximize the Profit
 - a) Sales
 - b) Contribution
 - c) Variable cost
 - d) Fixed cost
3. In make or buy decision
 - a) Only marginal cost is relevant
 - b) Only fixed cost is relevant
 - c) Total cost is relevant
 - d) None of these
4. Ideal product mix is decided in terms of
 - a) Sales
 - b) Variable cost
 - c) Total cost
 - d) Marginal cost
5. A cost incurred in the past and hence irrelevant for current decisions making is
 - a) Fixed cost
 - b) Direct cost
 - c) Discretionary cost
 - d) Sunk cost
6. A cost that cannot be changed by any decision made now is
 - a) Sunk cost
 - b) Opportunity cost
 - c) Indirect cost
 - d) mixed cost
7. A shut down point is the point at which
 - a) Marginal cost and purchase price should be considered
 - b) Contribution is less than fixed cost

- c) Contribution is equal to fixed cost
- d) None of these
- 8. In a decision situation which one is the cost not likely to contain a variable cost component
 - a) Material b) Labour
 - c) Overhead d) Direct expenses
- 9. In a situation when the decision is to be taken about acceptance or rejection of special orders where there is a sufficient idle capacity which one is not relevant for decision making'
 - a) Absorption cost b) Variable cost
 - c) Differential cost d) Incremental cost

Theory Questions

1. What do you mean by limiting factor? How does the management elect the most profitable mix the presence of a limiting factor?
2. The effect of price reduction is always to reduce p/v ratio, to raise the BEP and to shorten the margin of safety. Explain and illustrate your views with appropriate illustrations.
3. How does marginal cost differ from total cost? In what circumstances, if any, may it be to the advantage of manufacturer to sell some of its products at price :
 - a) below total cost
 - b) below marginal cost.
4. What is "cost and profit"? Bring out its importance.
5. "Profit-Volume analysis" is a technique of analyzing the costs and profits at various levels of volume'. Explain how such analysis helps management.



Unit-3

MANAGERIAL DECISIONS - II

Unit Structure :

- 3.0 Objectives
- 3.1 Solved Problems
- 3.2 Exercise

3.0 OBJECTIVES

After studying the unit the students will be able to solve the problems on managerial decision making.

3.1 SOLVED PROBLEMS

Illustration: 1

A company which sells four products, some of them unprofitable proposes discontinuing the sales of one of them. The following information is available regarding its income, cost and activities for a year.

	Products			
	A	B	C	D
	Rs.	Rs.	Rs.	Rs.
Sales	3,00,000	5,00,000	2,50,000	4,50,000
Cost of sales at purchase price	2,00,000	4,50,000	2,10,000	2,25,000
Area of storage (sq. ft.)	50,000	40,000	80,000	30,000
No. of parcels sent	1,00,000	1,50,000	75,000	1,75,000
No. of invoices sent	80,000	1,40,000	60,000	1,20,000

Its overhead cost and basis of allocation are :

Fixed costs	Rs.	Basis of allocation
Rent and insurance	30,000	Sq. ft.
Depreciation	10,000	Parcel
Salesman's salaries and expenses	60,000	Sales volume
Administrative wages and salaries	50,000	No. of invoices
Variable costs		
Packing, wages and materials		20 p. per parcel
Commissions		4 % of sales
Stationery		10 p. per invoice

You are required to:

- Prepare a profit and loss statement showing percentage profit or loss to sales for each product.
- Compare the profit in the company discontinues sales of product B with the profit if it discontinues product C. [I.C.W.A., Inter]

Solution:

(a) Profit and Loss Statement:

Product	A	B	C	D	Total
	Rs.	Rs.	Rs.	Rs.	Rs.
Sales (A)	3,00,000	5,00,000	2,50,000	4,50,000	15,00,000
Variable costs :					
Cost of sales at Purchase Price	2,00,000	4,50,000	2,10,000	2,25,000	10,85,000
Commission @ 4% of sales	12,000	20,000	10,000	18,000	60,000
Packing, wages & materials @ 20 p. per parcel	20,000	30,000	15,000	35,000	1,10,000
Stationery @ 10 p. per invoice	8,000	14,000	6,000	12,000	40,000
Total variable costs (B)	2,40,000	5,14,000	2,41,000	2,90,000	12,85,000
Contribution (A) – (B)	60,000	(-) 14,000	9,000	1,60,000	2,15,000

Fixed Costs :					
Rent and insurance					
@ 15 p. per sq. ft.	7,500	6,000	12,000	4,500	30,000
Depreciation @ 2 p. per parcel	2,000	3,000	1,500	3,500	10,000
Salesmen's salaries & expenses					
@ 4 p. per Re. of sales	12,000	20,000	10,000	18,000	60,000
Administrative wages & Salaries @ 12.5 p. per invoice	10,000	17,500	7,500	15,000	50,000
Total Fixed Cost (Y)	31,500	46,500	31,000	41,000	1,50,000
Profit & Loss (X)-(Y)	28,500	(-) 60,500	(-) 22,000	1,19,000	65,000
Percentage of Profit or loss on sales	9.5	(-) 12.1	(-) 8.8	26.4	4.3

(b) If either product B or product C is discontinued then the result will be as follows:

Contribution	Product B if discontinued Rs.	Product C if discontinued Rs.
Product A	60,000	60,000
Product B	--	--
Product C	9,000	(-) 14,000
Product D	1,60,000	1,60,000
Total Contribution	2,29,000	2,06,000
Less : Fixed Costs	1,50,000	1,50,000
Total Profit	Rs. 79,000	Rs. 56,000

Thus, if product B is discontinued the total profit may rise to Rs. 79,000 whereas if product C is discontinued the total profit may fall to Rs. 56,000.

Illustration - 2

A company produces and sells four types of dolls for children. It also produces and sales a set of dress kit for the dolls. The company has worked out the following estimates for the next year.

Doll	Estimated demand	Standard Material cost (Rs.)	Standard Labour Cost (Rs.)	Estimated sale price per unit (Rs.)
A	50,000	20	15	60
B	40,000	25	15	80
C	35,000	32	18	100
D	30,000	50	20	120
Dress Kit	2,00,000	15	5	50

To encourage the sale of dress kits, a discount of 20 % in its price is offered if it were to be purchased along with the doll. It is expected that all the customers buying dolls will also buy the dress kit.

The company's factory has effective capacity of 2, 00,000 labour hours per annum on a single shift basis and it produces all the products on that basis the labour hour rate is Rs. 15. Overtime of labour has to be paid at double the normal rate.

Variable cost works out to 40% of direct labour cost fixed costs are Rs. 30 lakhs per annum.

There will be no inventory at the end of the year.

You are draw a conservative estimate of the year's profitability.
[C.A., Inter]

Solution :

Statement of conservative estimate of the year's profitability

	Doll A	Doll B	Doll C	Doll D	Dress Kit
Estimated Demand (Units)	50,000	40,000	35,000	30,000	2,00,000
	Rs.	Rs.	Rs.	Rs.	Rs.
Selling Price per unit (A)	60	80	100	120	50
Marginal cost per unit					
Material Cost	20	25	32	50	15
Labour Cost	15	15	18	20	5
Variable Cost (40% of labour cost)	6	6	7.20	8	2
Total marginal cost : (B)	41	46	57.20	78	22
Contribution per unit: (C) = [(A) – (B)]	19	34	57.20	78	22

Total contribution on Estimated demand	9,50,000 (50,000 x Rs. 19)	13,60,000 (40,000 x Rs. 34)	14,98,000 (35,000 x Rs. 42.80)	12,60,000 (30,000 x Rs. 42)	56,00,000 (2,00,000 x Rs. 28)
Less : Discount on dress kits	--	--	--	--	15,50,000
Net contribution	9,50,000	13,60,000	14,98,000	12,60,000	40,50,000
Total net contribution (Rs.)		91,81,000			
Less: Overtime Premium (Rs.) (38,666 hrs x Rs. 15)		5,79,990			
Less : Fixed Cost (Rs.)		30,00,000			
Profit (Rs.)		55,38,000			

Total labour hours required to meet estimated demand of four types of dolls and their dress kit.

Doll (a)	Estimated demand (Units) (b)	Std. labour time P.U. (Std. labour cost ÷ 15) (c)	Total labour hours (d) = (b) – (c)
A	50,000	1 hr.	50,000.00
B	40,000	1 hr.	40,000.00
C	35,000	1.2 hrs	42,000.00
D	30,000	1.3333 hrs.	40,000.00
Dress kit	2,00,000	0.33333 hrs.	66,666.00
Total labour hours to meet estimated demand			2,38,666.00

Since the total available hours are only 20,000, therefore 38,666 hours will be utilized by employing the labour on overtime basis.

** Total discount on the sale of dress kit.

Out of 2, 00,000 dress kits, 1, 55,000 were sold along with four types of dolls. Each unit of sale of dress kit along with a unit of doll is entitled for a discount of 20 % of Rs. 50 i.e., Rs. 10. The total discount amount on the sale of 1,55,000 dress kit comes to Rs. 15,50,000.

Illustration :3

The following particulars are extracted from the records of ELLORA SALES LTD.

Direct wages per hour is Rs. 5.

Particulars	Product A	Product B
Sales (per unit)	Rs. 100	Rs. 120
Consumption of material	2 kgs	3 kgs
Material cost	Rs. 10	Rs. 15
Direct wage cost	Rs. 15	Rs. 10
Direct expenses	Rs. 5	Rs. 6
Machine hours used	3 hrs	2 hrs.
Overhead expenses		
Fixed	Rs. 5	Rs. 10
Variable	Rs. 15	Rs. 20

- (a) Comment on the profitability of each product (both use the same raw material) when (i) Total Sales potential in units is limited; (ii) Total sales potential in value is limited; (iii) Raw material is in short supply; and iv) Production capacity (in term of machine hours) is the limiting factor.
- (b) Assuming raw material as the key factor, availability of which is 10,000 kg and maximum sales potential of each product being 3,500 units, find out the product mix which will yield the maximum profit.

[I.C.W.A., Inter]

Solution :

(a) Marginal Cost Statement

	Product	
	A	B
	Rs / Per Unit	Rs / Per Unit
Selling Price	100	120
Direct Materials	10	15
Direct Wages	15	10
Direct Expenses	5	6
Variable Overheads	15	20
Marginal Cost	45	51
Contribution margin	55	69
P/V ratio	55 %	57.5 %
Contribution per kg. of material	27.5	23
Contribution per machine hour	18.3	34.5

Comments:

- (1) When total sales potential in units is a limiting factor, B is more profitable as it is making a larger contribution margin per unit as compared to A.
- (2) When total sales potential in value is a limiting factor, still B is more profitable as its P / V ratio is more than that of A.

- (3) When raw material is in short supply, A is more profitable as its contribution per kg of material is more than that of product B.
- (4) When production capacity is limited, B is more profitable as it makes larger contribution per machine hour than A.

(Note: Best position is reached when contribution per unit of key factor is maximum)

- (b) When raw material is a key factor, A is more profitable to produce as its contribution per kg of material is higher than B. If 3,500 units of A are manufactured, total material consumption will be 7,000 kg (i.e. $35,00 \times 2$ kg). The balance 3,000 kg of material can be used to manufacture 1,000 units ($3000 \text{ kg} \div 3$) of B. The total contribution by this product mix will be :

	Contribution
Product A, 3,500 units @ Rs. 55 each	Rs. 1, 92,500
Product B, 1,000 units @ Rs. 69 each	<u>Rs. 69,000</u>
Total	<u>Rs. 2, 61,500</u>

This sales-mix would give maximum contribution, therefore maximum profit. Profit figure cannot be calculated as total fixed cost is not given in the question.

Illustration: 4

A company produces a single product which is sold by it presently in the domestic market at Rs. 75 per unit. The present production and sales is 40,000 units per month representing 50 % of the capacity available. The cost data of the product are as under:

Variable costs per unit	Rs. 50
Fixed costs per month	Rs. 10 lakhs

To improve the profitability, the management has 3 proposals on hand as under :

- (a) to accept an export supply order for 30,000 units per month at a reduced price of Rs. 60 per units, incurring additional variable costs of Rs. 5 per unit towards export, packing, duties etc.
- (b) to increase the domestic market sales by selling to a domestic chain stores 30,000 units at Rs. 55 per unit, retaining the existing sales at the existing price.

(c) to reduce the selling price for the increased domestic sales as advised by the sales department as under :

Produce selling price per unit by Increase in sales expected

Rs.	(in units)
5	10,000
8	30,000
11	35,000

Prepare a table to present the results of the above proposals and give your comments and advice on the proposals.

[I.C.W.A., Intermediate]

Solution :

	Proposal (a) Present + export Level order		Proposal (b) Present + export Level order		Proposal (c) Price reduction over present levels I or II or III		
Selling price per unit (Rs.)	75	60	75	55	70	67	64
Less : Variable cost Per unit (Rs.)	50	55	50	50	50	50	50
Contribution per unit (Rs.)	25	5	25	5	20	17	14
Sales (in units)	40,000	30,000	40,000	30,000	50,000	70,000	75,000
Contribution (Rs. In lakh)	10	1.5	10	1.5	10	11.9	10.5
Total Contribution (Rs. In lakhs)	11.5		11.5		10	11.9	10.5

Note: Fixed cost has been excluded as they would remain the same under all alternatives.

Comment & Advise:

- 1) Proposal to sell 70,000 units (under proposal 'C' II) at a reduced price of Rs. 67 is most profitable, as it would give maximum contribution of Rs. 11 .9 lakhs.

- 2) Between proposal (a) and (b) there is no difference in profitability. However, it is advisable to accept to accept export order as there is no danger of competition in the domestic market. It may happen that domestic chain stores may starts selling at lower price.
- 3) There is a profitability of going wrong in estimating sale demand at reduced prices; we may not be able to achieve sales of 70,000 units at reduced price of Rs. 67. Therefore, it is advisable to go for export order.

Illustration - 5

Sports Specialists Ltd. are famous for specialized manufacture of quality ches boards sets. Presently, the company is working below chess boards sets in the national market at Rs. 150 per unit. During April, 1994, 600 units were sold which is the regular sales volume for each month all through the year. The unit cost of production is :

Direct Materials	Rs. 60
Direct Labour	Rs. 30
Factory Overhead	Rs. 30
Selling and administration Overhead	Rs. 15

The company has received an export order on 20-4-1994 for supply of 600 units to be dispatched by 30-6-1994. However, the order stipulates the price per unit at Rs. 100 only. The cost analysis indicated that the cost of direct material and direct labour that are to be incurred on the export order would be same amount per unit as the regular line of production. However an amount of Rs. 2,000 will have to be incurred on special packing, labeling get up etc. No additional factory selling or administrative overhead costs would be incurred in executing the export order since the firms is operating below normal capacity.

Using differential cost analysis method, prepare the income statement to show whether the acceptance of the export order would be profitable to the company. Assumptions and comments if any may be given separately.

[I.C.W.A., Intermediate]

Solution :

	Existing Position without export order	Export order differential figures	Proposed position with export order
Units for 2 months (nos.)	1,200		
Selling price per unit	Rs. 150	Rs. 100	Rs. --
Sales (A)	1,80,000	60,000	2,40,000
Direct Material @ Rs. 60 p.u.	72,000	36,000	1,08,000
Direct Labour @ Rs. 30 p.u.	36,000	18,000	54,000
Factory Overheads	36,000*	--	36,000
Special packing, labeling etc.	--	2,000	2,000
Selling & Admin. Overheads @ Rs. 15 p.u. (for 2 months)	18,000	--	18,000
Total Cost (B)	1,62,000	56,000	2,18,000
Profit (A – B)	18,000	4,000	22,000

600 units p.m. x Rs. 30 x 2 months = Rs. 36,000

Assumptions & Comments :

- 1) As there is no change in factory, selling or administrative overheads costs, these overheads has been taken as fixed. Hence, they are irrelevant to the decision of accepting export order.
- 2) The company can manufacture 600 units for export order in May and June 1994 as it has a spare capacity of 800 units in two months.

Conclusion:

The export order should be accepted as it would give additional profit of Rs. 4000.

Illustration: 6

X Ltd. has two factories, one at Lucknow and another at Pune producing 7,200 tons and 10,800 tonnes of a product against the maximum production capacity of 9,000 and 11,880 tons respectively at Lucknow and Pune.

10% of the raw material introduced is lost in the production process. The maximum quantity of raw material available locally is 6,000 and 13,000 tons at Rs. 720 and Rs. 729 per tones at Lucknow and Pune respectively. For the additional needs a supplier of Bhopal is ready to supply raw material at a factory site at Rs. 792 ton.

Other variable costs of the production process are as 22.32 lakhs and Rs. 32.94 lakhs and fixed costs are Rs. 18 lakhs and Rs. 24.84 lakhs respectively for Lucknow and Pune factory.

The output is sold at a selling price of Rs. 1,450 and Rs. 1,460.

You are required to compute the cost per tone and net profit earned in respect of each factory.

Can you suggest any other alternative production plan for both the factories without any change in present total output of 1,80,000 tons whereby the company may earn optimum profit.

[C.A. Final]

Solution :

Statement of cost per tone and net profit earned in respect of each factory

	Lucknow	Pune
Present Production (tones)	7,200	
	Rs.	Rs.
Cost of raw material (Rs. In lakhs) (Refer to working note 1)	59.04	87.48
Other variable costs (Rs. In lakhs)	22.32	32.94
Fixed costs (Rs. In lakhs)	18.00	24.84
Total cost (Rs. In lakhs)	99.36	145.26
Cost per ton(Rs.):total cost/production in tones	1,380	1,345
Selling price (Rs.) per tone	1,450	1,460
Net profit per ton (Rs.) : (S.P.–cost per ton)	70	115
Total net profit (Rs. In lakhs)	Rs.(70 x 7,200 tons)	(Rs. 115 x 10,800 tons)

Total profit of the company (Rs. 5.04 lakhs + Rs. 12.42 lakhs)
= Rs. 17.46 lakhs

Computation of contribution per ton of output

	Lucknow	Pune
Maximum production capacity (tones)	9,000	11,880
Present production (tones)	7,200	10,800
Cost per ton of output :	Rs.	Rs.
Cost per ton of output manufactured from		
Locally purchased raw material (Refer to working note 2)	800	810
Cost per ton of output manufactured from		
Material purchased from Bhopal (Refer to working note 3)	880	880
Other variable cost (Rs.)	310	305
	(Rs.22.32 lakhs + 7,200tons)	(Rs. 32.94 lakhs + 10,800 tons)
Total variable cost (when material is purchased locally)	1,110	1,115
Total variable cost (when material is purchased from Bhopal)	1,190	1,185
Selling Price per ton (Rs.)	1,450	1,460
Contribution per ton of output : (S – V) (Locally purchased raw material)	340 (1,450 – 1,110)	345 (1,460 – 1,115)
Contribution per ton of output (S – V) (when material was purchased from Bhopal)	260 (1,450 – 1,190)	275 (1,460 – 1,185)

The priority to produce 18,000 of total output depends on contribution per ton from

	Contribution per unit	Priority
Pune factory (local purchase of raw material)	345	I
Lucknow factory (local purchase of raw material)	340	II
Pune factory (raw material purchased from Bhopal)	275	III
Lucknow factory (raw material purchased from Bhopal)	260	IV

Suggested alternative production plan to earn optimal profit

Production priority		Raw material input (in tones)	Output (in tones)		
			Lucknow	Pune	Total
I	11,700 tons	13,000	--	11,700	11,700
II	5,400 tons	6,000	5,400	--	5,400
III	(11800 – 11700) 180 tons	200		180	180
IV	720 tons (balancing figure) (18,000 – 17,280 tons)	800	720	--	720
		20,000	6,120	11,880	18,000

Working Note :

		Lucknow	Pune
1	Present production output (formal)	7,200	10,800
	Total raw material required for Present production (tons)	8,000	12,000
		$[7,200 \times 100 \div 90]$	$[10,800 \times 100 \div 90]$
	Raw material procured locally (tones)	6,000	12,000
	Raw material procured from Bhopal	2,000	--
	Cost of raw material purchased		
	Locally and from Bhopal	59.04	87.48
	(Rs. In lakhs)	(Rs. 720 x 6,000 + Rs. 792 x 2,000)	(12,000 x Rs. 729)
2	Cost per ton of output		
	Manufactured from locally	800	810
	Purchased raw material (in Rs.)	$[Rs. 720 \times 100 \div 90]$	$[Rs. 729 \times 100 \div 90]$
3)	Cost per ton of output		
	Manufactured from material	880	880
	Purchased from Bhopal (in Rs.)	$[Rs. 792 \times 100 \div 90]$	

Illustration - 7

ZED Ltd. manufacturing two products P and Q and sells them at Rs. 215 and Rs. 320 per unit respectively. The variable costs per unit are as under:

Particulars	Product P Rs.	Product Q Rs.
Raw Materials :		
Material – X	22.00	28.00
Material – Y	8.00	32.00
Direct wages (Rs. 6 per labour hour)		
Department – A	36.00	54.00
Department – B	18.00	36.00
Department – c	54.00	--
Department – D	--	72.00
Variable overheads	23.00	14.30

The company procures raw materials against import license. The company operates at single shift a day of 8 hours for 300 days in a year. The number of workmen engaged is 30, 16, 18 and 24 in department A, B, C and D respectively. Neither the workers are subject to transfer from one department to another nor is any new recruitment possible at present. Fixed costs are Rs. 12,000 per month.

You are required to find out the following :

- the product mix to yield maximum profit.
- The most profitable product if only one product is to be manufactured. Whether the answer will differ if license to import raw material is released only for Rs. 1,80,000

[C.A., Final]

Solution:

Product wise contribution per direct labour hour

	Product P Rs.	Product Q Rs.
Selling price per unit	215	320
Total Raw material cost per unit (Rs. 22 x Rs. 8) (Rs. 28 + Rs. 32)	30	60
Direct Wages per unit (Rs. 36 + Rs. 18 + Rs. 54) (Rs. 54 + Rs. 36 + Rs. 72)	108	162
Variable overheads per unit	23	14.30
Total variable cost per unit	160	236.30
Contribution per unit (Sp – Vc)	54	83.70
Direct labour hours per unit	18	27
Contribution per direct labour hour (contribution per DLH per unit)	3	3.10

Through the contribution per direct labour hour of production Q is better but there is a limitation that workers in each department can neither be interchanged nor newly recruited, hence due to this following two alternatives are possible and company will have to choose between the two.

Alternative – I : Procuring 4,800 units of product Q and utilizing the remaining available hours of labour for making units of product P as number of hour in department D are only 57,600 sufficient to produce only 4,800 units of product Q

Alternative – II : Producing 4,800 units of product P and utilizing the remaining available hours of labour for making units of product Q as number of hours in department C are only 43,200 sufficient to produce only 4,800 units of product P.

Statement of product mix under alternative I

Department	Available Hours	Hours required for 4,800 units of Q	Remaining hours	Hrs / units of product P	Units of product P
	(a)	(b)	c = (a) – (b)	(d)	(e)=(c) / (d)
A	72,000 WN 1	43,200	28,800	6 WN 2	4,800
B	38,400	28,800	9,600	3	3,200
C	43,200	--	43,200	9	4,800
D	57,600	57,600	NIL	--	--

The above table shows that out of the available hours under alternative 1; 4,800 units of product Q and 3,200 units of Product P can be made. This would result in 9,600 idle hours in department A and 14,400 idle hours in Department D.

Statement of product mix under alternative II

Department	Available Hours	Hours required for 4,800 units of P	Remaining hours	Hrs / units of product Q	Units of product P
	(a)	(b)	c = (a) – (b)	(d)	(e)=(c) / (d)
A	72,000	28,800	43,200	9 WN 2	4,800
B	38,400	14,400	24,000	6	4,000
C	43,200	43,200	--	--	--
D	57,600	--	57,600	12	4,800

The above table shows that out of the available hours under alternative II; 4,800 units of product P and 4,000 units of product Q can be made. This would result in 7,200 idle hours in department A and 9,600 idle hours in department D

Profit statement under above alternatives.

Product	First alternative			Second alternative		
	Unit	Contribution P.U. (Rs.)	Amount (Rs.)	Unit	Contribution P.U. (Rs.)	Amount (Rs.)
P	3,200	54.00	1,72,800	4,800	54.00	2,59,200
Q	4,800	83.70	4,01,760	4,000	83.70	3,34,800
Total contribution			5,74,560	5,94,000		
Less : fixed cost P.A.			1,44,000	1,44,000		
PROFIT			4,30,560	4,50,000		

Comments, although contribution per direct labour hour is more in case of product Q, it is not advisable to produce 4,800 units

of Q first as it would result in more idle hours in some departments, viz., department A and D as compared to that of second alternative. It is, therefore, second alternative has given higher profit figure. Hence second alternative is the most profitable product mix.

Statement of most profitable product if only one product is to be manufactured.

	Product P Rs.	Product Q Rs.
Contribution per unit (Rs.) : (a)	54.00	83.70
Maximum possible output (in units) : (B)	4,800	4,800
Total contribution = (A) x (B)	2,59,200	4,01,760

Product Q is to be preferred as it would give more contribution.

Statement of most profitable product if only one product is to be manufactured and license to import the raw material is only worth Rs. 1, 80,000.

	Product P	Product Q
Raw material required P.U. (Rs.)	30	60
Permissible output (in units) out of imported		
Material of Rs. 1,80,000	6,000	3,000
Maximum output possible in the available hours	4,800	4,800
Output possible keeping in view the availability		
Of imported material and labour hours (units)	4,800	3,000
Contribution per unit (Rs.)	54	83.70
Contribution per rupees of material	1.80	1.395
Total contribution : (Rs.)	2,59,200	2,51,100
	(4,800 units x Rs. 54.00)	(3,000 units x Rs. 83.70)

Product P is to be preferred (i.e. answer differs) because it gives higher contribution per rupee of material, which is a limiting factor.

Working notes :

1) Computation of total Labour hours available:

Departments (a)	No. or workmen (b)	Days (c)	Hrs / days (d)	Total Hours (e) = (b) x (c) x (d)
A	30	300	8	72,000
B	16	300	8	38,400
C	18	300	8	43,200
D	24	300	8	57,000

2) Computation of hours required per unit of each product

Department	First alternative			Second alternative		
	Wages (Rs.) (a)	Wages / Hr (Rs.) (b)	Hrs (c) = (a) + (b)	Wages (Rs.) (d)	Wages / Hr (Rs.) (e)	Hrs (f) = (d) + (e)
A	36	6	6	54	6	9
B	18	6	3	36	6	6
C	54	6	9	--	--	--
D	--	--	--	72	6	12
Total hours per unit			18			27

Illustration : 8

A multi product company has the following costs and output data for the last year.

Particulars	Product		
	X	Y	Z
Sales mix	40 %	35 %	25 %
	Rs.	Rs.	Rs.
Selling price	20	25	30
Variable cost per unit	10	15	18
Total fixed cost			1,50,000
Total sales			5,00,000

The company proposes to replace product Z by product S.

Estimated cost and output data are :

Sales mix	50 %	30 %	20 %
Selling price	20	25	28
Variable cost per unit	10	15	14
Total fixed costs			1,50,000
Total sales			5,00,000

Analyze the proposed change and suggest what decision the company should take.

Solution :**(1) Computation of Present Profit and BEP**

Particulars	Product			
	X Rs.	Y Rs.	Z Rs.	
Selling Price	20	25	30	
Variable cost	10	15	18	
Contribution	10	10	12	
P/V Ratio	50 %	40 %	40 %	
Sales Mix	40 %	35 %	25 %	100 %
Contribution per rupee of sales (P/V ratio x sales mix)	20 %	14 %	10 %	44 %
Sales			Rs.	500000
Total contribution (Rs. 5,00,000 x 44 ÷ 100)			Rs.	220000
Fixed Costs			Rs.	150000
Profit			Rs.	70000
Break-even point (Rs. 1,50,000 x 100 ÷ 44)			Rs.	340909

2) Computation of Proposed Profit and BEP

Particulars	Product			
	X Rs.	Y Rs.	Z Rs.	
Selling Price	20	25	28	
Variable cost	10	15	14	
Contribution	10	10	14	
P/V Ratio	50 %	40 %	50 %	
Sales Mix	50 %	30 %	20 %	100 %
Contribution per rupee of sales (P/V ratio x sales mix)	25 %	12 %	10 %	47 %
Sales			Rs.	500000
Total contribution (Rs. 5,00,000 x 47 ÷ 100)			Rs.	235000
Fixed Costs			Rs.	150000
Profit			Rs.	85000
Break-even point (Rs. 1,50,000 x 100 ÷ 47)			Rs.	319149

A comparison of the present situation and the proposed situation shows that if product Z is replaced by product S, profit would increase by Rs. 15,000 and breakeven point will reduce by Rs. 21760/-. This change is beneficial and therefore product Z may be dropped, provided all other relevant factors remain constant.

Illustration : 9. (Make or Buy)

Auto Parts Ltd. has an annual production of 90,000 units for a motor component. The component's cost structure is as below :

	Rs.
Material	270 per unit
Labour (25 % fixed)	180 per unit
Expenses	
Variable	90 per unit
Fixed	135 per unit
Total	675 per unit

- a) The purchase manager has an offer from a supplier who is willing to supply the component at Rs. 5.40. should the component be purchased and production stopped ?
- b) Assume the resources now used for this components manufacture are to be used to product another new product for which the selling price is 485.

In the latter case the material price will be Rs. 200 per units 90,000 units of this product can be produced on the same cost basis above for labour and expenses. Discuss whether it would be advisable to divert the resources to manufacture the new products on the footing that the component presently being produced would instead of being produced, be purchased from the market.

[C.A. Inter]

Solution :

Statement showing the variable cost and purchase cost of component. Used by Auto Parts Ltd.

Variable cost	Per Unit Rs.	Total for 90,000 units Rs.
Materials	270	2,43,00,000
Labour	135	1,21,50,000
Expenses	90	81,00,000
Total Variable cost (when component is produced)	495	4,45,50,000
Cost of purchase (when component is purchased)	540	4,86,00,000
Difference, excess of purchase price over variable cost	45	40,50,000

Fixed expenses not being affected, it is evident from the above statement that if the component is purchased from the outside supplier, the company will have to spend Rs. 45 per unit more and on 90,000 units the company will have to spend Rs. 40,50,000 more. Therefore, the company should not stop the production of the component.

- b) The following statement shows the cost implications of the proposal to divert the available facilities for a new product.

Statement showing the contribution per unit if the existing resources are used for the production of another new product.

	Rs.	Rs.
Selling price of the new product per unit		485
Less : Material cost	200	
Labour (variable)	135	
Expenses (variable)	90	425
Contribution per unit		60
Loss per unit if the present component is purchased		
Purchase price of the existing product		540
Less : Total Variable cost of producing the existing component		495
Excess cost		45

Thus, if the company diverts its resources for the production of another new product, it will benefit by Rs. 15, i.e. Rs. 60 – 45 per unit. On 90,000 units the company will save Rs. 13,50,000. Therefore, it is advisable to divert the resources to manufacture. The new product and the component presently being produced should be purchased the market. This is also brought out by the following figures :

	Rs.
Total cost producing the component (90,000 x 675) (A)	6,07,50,000
Cost of purchasing the component (90,000 x 540)	4,86,00,000
Fixed Expenses, not having been saved (90,000 x 180 i.e. 675 – 495)	1,62,00,000
	6,48,00,000
Less : Contribution from the new product (90,000 x 60)	54,00,000
Total cost if component is purchased and new product is made (B)	5,94,00,000
Savings (A – B)	13,50,000

Illustration : 10. (Export proposals)

Vinayak Ltd. opening at 75 % level of activity produces and sells two products A and B. the cost sheets of the two products are as under :

	Product A	Product B
Units produced and sold	600	400
Direct Materials	Rs. 2.00	Rs. 4.00
Direct Labour	4.00	4.00
Factory overheads (40 % fixed)	5.00	3.00
Selling and administration overheads (60% fixed)	8.00	5.00
Total cost per unit	19.00	16.00
Selling price per unit	23.00	19.00

Factory overheads are absorbed on the basis of machine hour which is limiting (key) factory. The machine hour rate is Rs. 2 per hour.

The company receives an offer from Canada for the purchase of product A at a price of Rs. 17.50 per unit.

Alternatively, the company has another offer from the Middle East for the purchase of product B at a price of Rs. 15.50 per unit.

On both the cases, a special packing charge of 50 p. per unit has to be borne by the company.

The company can accept either of the two export order and in either case the company can supply such quantities as may be possible to be produced by utilizing the balance of 25% of its capacity.

You are required to prepare:

- a) A statement showing the economics of the two export proposals giving your recommendations as to which proposal should be accepted.
- b) A statement showing the overall profitability of the company offer incorporating the export proposal recommended by you.

[C. A. Inter]

Solution:

- (i) Economics of the two Export Proposals

	Order from Canada for Product A Rs.	Order from Middle East for Product B Rs.
Marginal Cost per unit		
Materials	2.00	4.00
Labour	4.00	4.00
Variable factory overheads	3.00	
Variable selling and admin.	3.20	2.00
Overheads		
Special Packing charges	0.50	0.50
Total variable cost	12.70	12.30
Export price per unit	17.50	15.50
Contribution per unit	4.80	3.20

Since machine hour is the limiting (Key) factor, the contribution should be linked with the machine hours. This has been worked out as follows:

Machine hour per unit	2.5 hour	1.5 hour
Contribution per machine hour	Rs. 1.92	Rs. 2.13

Product B yield a better contribution per machine hour. The order from the Middle East should therefore be accepted as compared to the Canadian offer.

Working Note	A	B	Total
Factory overheads per unit	Rs. 5	Rs. 3	
Machine hour rate per hour	Rs. 2	Rs. 2	
Machine hour per unit	2.5	1.5	
Units produced	600	400	
Machine hour utilized	1,500	600	2,100
Lever of activity		75 %	

Maximum hours at 100% activity; $2100 \div 75 \times 100 = 2,8000$ hours

Capacity hours available for export $2,800 - 2100 = 700$ hours

(ii) Statement of overall profitability

Units	Product A 600 Rs.	Product B 867 Rs.	Total Rs.
Materials	1,200	3,468	4,668
Labour	2,400	3,468	5,868
Factory Overheads :			
Variable	1,800	1,561	3,361
Fixed	1,200	480	1,680
Selling and admin. Overheads :	1,920	1,734	3,654
Variable			
Fixed	2,880	1,200	4,080
Special Packing			
Total Costs	11,400	12,145	22,545
Sales	13,800	14,839	28,639
Profit	2,400	2,694	5,094

Working notes:

1) Number of Units of B :

Sales in the home market	400
Export market 700 / hr / 1.5	<u>467</u>
Total	<u>867</u>

2) Sales value of B :

400 units in the home market @ Rs. 19/-	Rs. 7,600
467 units for export @ Rs. 15.50	<u>Rs. 7,239</u>
Total	<u>Rs. 14,839</u>

Illustration: 11. (Decision about mechanization)

The present output details of a manufacturing department are as follows :

Average output per week 48,000 units from 160 employees
Saleable value of output Rs. 6,00,000

Contribution made by output towards fixed expenses and profit Rs. 2,40,000

The board of directors plans to introduce more mechanization into the department at capital cost of Rs. 1,60,000. The effect of this will be to reduce the number of employees to 120, and increasing the output per individual employee by 60 %. To provide the necessary incentive to achieve the increased output, the Board intends to offer a 1 % increase on the price work rate of Re. 1 per unit for every 2 % increase in average individual output achieved.

[C.A. Inter]

Solution :

Working Notes :

- 1) Present average output employee and total future expected output per week

Present average output per employee per week

$$\begin{aligned}
 &= \frac{\text{Total Present Output}}{\text{Total Number of Present employees}} \\
 &= \frac{48,000}{160 \text{ employees}} \\
 &= 300 \text{ units}
 \end{aligned}$$

Total future expected output per week

$$\begin{aligned}
 &= \text{Total Number of future employees} \\
 &\quad [\text{present output} + 60 \% \text{ of present output per employee}] \\
 &= 120 \text{ employees } (300 \text{ units} + 60 \% \times 300 \text{ units}) \\
 &= 57,60 \text{ units}
 \end{aligned}$$

- 2) Present and proposed price work rate:

$$\begin{aligned}
 \text{Present price work rate} &= \text{Re. 1.00 per unit} \\
 \text{Proposed price work rate} &= \text{Present Price work Rate} + 30 \% \\
 &\quad \times \text{Re. 1} \\
 &= \text{Re. 1.00} + 0.30 \\
 &= \text{Re. 1.30 per unit}
 \end{aligned}$$

present sale price per unit.

- 3) Present and proposal sales price per unit present sale price per unit.

$$\begin{aligned}
 \text{Present Sale price per unit} &= \text{Rs. 12.50} \\
 (\text{Rs. 60,000} \div 48,000 \text{ units}) \\
 \text{Proposed sale price per unit} &= \text{Rs. 12.00} \\
 (\text{Rs. 12.50} - 4\% \times \text{Rs. 12.50})
 \end{aligned}$$

- 4) Present marginal cost (excluding wages per unit) :

$$\begin{aligned}
 &\text{Present sales value} - \text{fixed expenses \& profit} - \text{contribution} \\
 &\quad \text{towards present wages} \\
 &\text{Present output (units)} \\
 &= \text{Rs. 6,00,000} - \text{Rs. 2,40,000} - \text{Rs. 48,000} \\
 &= \text{Rs. 6.50 per unit} \\
 &\quad 48,000 \text{ units}
 \end{aligned}$$

Statement of extra weekly contribution (information resulting from the proposed change of mechanization meant for board's evaluation)

Expected sales units (refer to working note 1)		57,600
	Rs.	Rs.
Sales value (A) (57,600 units x Rs. 12) (refer to working note 3)		6,91,200
Marginal cost (excluding wages) (B) (57,600 units x Rs. 6.50) (refer to working note 4)	3,74,400	
Wages : (C) (57,600 units x Rs. 1.30) (refer to working note 2)	74,800	
Total marginal cost : (D) = [(B) + (C)]		4,49,280
Marginal Contribution [(A) – (D)]		2,41,920
Less : Present Contribution		2,40,000
Increase in Contribution (per week)		1,920

Evaluation: Since the mechanization has resulted in the increase of contribution to the extent of Rs. 1,920 per week, therefore the proposed change should be accepted.

Illustration: 12. (Limited factor decision)

A company producing products 'PIE' n 'SIGMA' using a single production process, has the following cost data

	PIE	SIGMA
Selling price per unit (Rs.)	20	30
Variable cost per unit (Rs.)	11	16
Machine hours required per unit production (hrs)	1	2
Market limitation (units)	1lakh	2.5lakh
Total machine hours available – 4 lakhs		
Fixed cost per annum – Rs. 26 lakhs		

Considering the limiting factors of machine hours and market limitations, you are required to

- Indicate the best combination of products to give optimum contribution,
- Show the additional machinery requirement to be augmented on rental basis at an annual rent of Rs. 1.5 lakhs per machine to provide additional capacity of 30,000 hours per machine;
- Change in number to be if the annual rental charges reduce to Rs. 1,25,000 per machine

[I.C.W.A., Inter]

Solution :

Particulars	Products		Total
	PIE	SIGMA	
Total Machine hours available			4 lakhs
Market Limitation (units)	1 lakh	2.5lakhs	
Machine hours required per unit of production	1	2	
Fixed cost per annum (Rs. In lakhs)			4.00
Selling price per unit (Rs.)	20	30	
Variable cost per unit (Rs.)	11	16	
Contribution per unit (Rs.)	9	14	
Contribution per machine hour (Rs.)	9	7	
Ranking	1	2	

a) Statement showing best combination of Product Mix towards optimum contribution

Production for market demand (units)	1,00,000	1,50,000	2,50,000
Total Hours required	1,00,000	3,00,000	4,00,000
Total Contribution (Rs.) (Total Production x contribution per unit)	9,00,000	21,00,000	30,00,000

b) Computation of Requirement of Additional Machines on Rental Basis

Particulars	
Annual rent per machine having capacity of 30,000 hrs.	Rs. 1,50,000
No. of additional units of SIGMA to be produced to meet the market demand (additional)	1,00,000 units
Requirement of machine hours for production (1,00,000 x 2)	2,00,000 hrs.
Number of Machines required (2,00,000 ÷ 30,000) = 6.67 (i.e. 6 + 1)	7 machines
(1) In case 6 machines are hired; Total net contribution from 6 rented machines with full capacity utilization (Rs.) 3,60,000	
(2) In case 7 machines are hired :	
(i) Net contribution from 6 machines on full utilization. = (30,000 hrs. x Rs. 7 – Rent Rs. 1,50,000) x 6 = 2,10,000 – 1,50,000 = 60,000 x 6 =	3,60,000
(ii) Net contribution from 7th Machine = 20,000 hrs. x Rs. 7 – Rs. 1,50,000 = (10,000)	3,50,000

Thus, the net contribution will stand reduced by Rs. 10,000 in case seven machines are hired. It is, therefore, better to hire only six machines.

C) In case the annual rental charges are reduced to Rs. 1,25,000, the position will be as under;

$$\begin{aligned}\text{Net contribution from 7th Machine} &= 20,000 \text{ hrs.} \times \text{Rs. } 7 - \text{Rs. } 1,25,000 \\ &= \text{Rs. } 15,000\end{aligned}$$

Thus, the seventh machine will also give additional contribution of Rs. 15,000.

Hence, in all seven machines may be taken on rent.

3.2 EXERCISE

Practical problems

Illustration 1:

From the following data you are required to present.

- 1) The marginal cost of product x and y and the contribution per unit.
- 2) The total contribution and profits resulting from each of the suggested sales mixtures.

Particulars	Product	Per unit Rs.
Direct Materials 	X	10.50
Direct Materials 	Y	8.50
Direct Wages 	X	3.00
Direct Wages 	Y	2.00

Variable expenses 100% of direct wages per product.

Fixed expenses (total) 800

Sales Price X 20.50 and
 Y 14.50

Suggested sales mixes:

Alternatives	No of Units	
	X	Y
A 	100	200
B 	150	150
C 	200	100

(M.Com. Oct. 97, adapted)

(Ans.: Contribution per Unit : Product X - Rs. 4, Product Y - Rs. 2)

Illustration 2 :

A manufacturer of packing cases makes three main types- Deluxe, Luxury and Economy. Overheads are incurred on the basis of labour hours. Wages are paid at Re. 1.00 per hour.

Estimates for the cases show the following :

Particulars	Delux Rs.	Luxury Rs.	Economy Rs.
Materials	10.00	8.00	3.00
Wages	6.00	3.00	2.00
Overheads	12.00	6.00	4.00
	28.00	17.00	9.00
Net Profit / Loss	2.00	3.00	3.00
Average Selling Price	26.00	20.00	12.00
Annual Sales (Units)	10,000	20,000	5,000

The manufacturer felt that he would be well advised to discontinue producing the Delux and Economy cases even though it would mean that some of production facilities would remain unused. He cannot increase the sale of Luxury cases. It has been ascertained that 60% of the overheads is fixed.

You are required to advise the manufacturer.

([M. Com.](#), Mar. 98, adapted)

(Ans.: Contribution per Unit: Deluxe- Rs. 5.20, Luxury- Rs. 6.60, Economy- Rs. 5.40)

Illustration 3 :

Suyash 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 this 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 or 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 per month	12,00,000 per month
Semi-variable costs :		
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.

It may be assumed that the fixed cost element of the semi-variable cost will remain constant throughout the range of activity shown. The company sells a magazine covering related topics to those that will be included in the new publication, and consequently, it is anticipated that sales of this existing magazine will be adversely affected. It is estimated that for every ten copies sold of the new publication, sales of the existing magazine are as shown below : -

Sales	2,20,000 copies per month
Selling Price	Rs. 8.50 per copy
Variable Costs	Rs. 3.50 per copy
Specific Fixed costs	Rs. 8,00,000 per month

You are required to calculate for each production method :

- 1) 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.
- 2) The amount by which sales volume of the new 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 conclusions which may be drawn from your calculations.

(M.Com., Oct. 01, adapted)

Illustration 4 :

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 (Re. 1 per hr)	2	13
Variable Overhead (2 per hr)	4	6
Selling Price	100	110
Standard time to produce	2hrs	3hrs

(M.Com. Mar. 04, adapted)

(Ans.: Contribution per Standard Hour: Product A- Rs. 35, Product B- Rs. 25.67)

Illustration 5 :

From the following information you are required to :

- Calculate and present the marginal product cost and contribution per unit.
- State which of the alternative sales mixes you would recommend to management? and Why?

Particulars	Per Unit Rs.
Selling Price :	
For X	250
For Y	200
Direct Materials :	
For X	80
For Y	60
Direct Wages :	
For X	60
For Y	40

Fixed overheads are Rs. 75,000 and variable overheads are 150% of direct wages.

Alternative Sales Mix

- 2500 units of product X and 2500 units of product Y.
- Nil units of product X and 4000 units of Product Y.
- 4000 units of Product X and 1000 units of Product Y.

([M.Com.](#) Mar 96, adapted)

(Ans.: Contribution per Unit: Product X- Rs. 20, Product Y- Rs. 40)

Illustration 6 :

A pen manufacturer makes an average net profit of Rs. 25.00 per pen on a selling price of Rs. 143.00 by producing and selling 60,000 pens, or 60% of the potential capacity. His cost of sales is :

	Rs.
Direct Materials	35.00
Direct Wages	12.50
Works Overheads (50% Fixed)	62.50
Sales Overheads (25% Variable)	8.00

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 this situation, he obtains an offer for a further 20% of his capacity. What minimum price will you recommend for acceptance to ensure the manufacturer an overall profit of Rs. 16,73,000.

([M.Com.](#) Mar. 2000, adapted)

(Ans.: Selling Price per Unit of 80% capacity: Rs.135.49)

Illustration 7 :

The price structure of an electric Fan made by the Vijaya Electric Company Ltd. is as follows :

Particulars	Per Fan Rs.
Materials	600
Labour	200
Variable Overheads	200
	1,000
Fixed Overhead	500
Profit	500
Selling Price	2,000

This cost is based on manufacture of 1,00,000 fans p.a. The company expects that due to competition, they will have to reduce the selling price. However, they want to keep the total profit intact.

You are required to prepare a statement showing the position, if

- 1) Selling price is reduced by 10% and
- 2) Selling price is reduced by 20%.

([M.Com.](#) Oct. 2000, adapted)

(Ans.: P/V Ratio: Option I-44.44%, Option II-37.5%)

Illustration 7 :

Modern Chair Manufacturing Company received an offer to sell 25,000 outdoor patro chairs to Easy Life Corporation. Modern Chair Manufacturing Company produces 4,00,000 chairs annually by operating at 80% of full capacity. Regular selling price for this type of chairs is 33. the chairs required are similar to those currently being produced by Modern Chair Manufacturing Company.

Budgeted annual production costs and other expenses are as follows :

Particulars	Per Unit	Total
Raw material	4.25	17,00,000
Direct Labour	5.75	23,00,000
Variable factory overhead	7.75	31,00,000
Fixed factory overhead	--	25,00,000
Variable Selling Costs	--	5% of sales price
Fixed Selling and Administration overhead	--	14,50,000

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 regular sales volume for the year is 4,00,000 chairs as initially planned. You are required:

What should be the minimum price to be quoted by Modern Chair Manufacturing Company?

Prepare an income statement showing the position of the company without special order, for special order and with special order.

([M.Com.](#) Oct. 2004, adapted)

(Ans.: Minimum Price to be quoted Rs. 18.75)

Illustration 8 :

A manufacturer has planned his level of operation at 50% 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	Rs. 8,280
ii) Direct Materials	Rs. 11,160
iii) Variable and Other Manufacturing Expenses	Rs. 3,960
iv) Total Fixed Expenses irrespective of Capacity utilization	Rs. 6,000

The expected selling price in the domestic market is Rs. 2 per unit. Recently the manufacturer has received a trade enquiry from an Overseas Organisation interested in purchasing 6,000 units at a price of Rs. 1.45 per unit.

As a Professional Management Accountant, what should be your suggestion regarding acceptance or rejection of the offer?

Support your suggestion with suitable quantitative information.

([M.Com.](#) Oct. 2006, adapted)

(Ans.: Total Contribution: Present position Rs. 6,600, Proposed Offer Rs. minus 600)

Illustration 9:

X Ltd. manufactured and sold 14,000 units and 18,000 units in the first year and the second year respectively. The selling price per unit was Rs. 100 in both the years. In the first year it suffered a loss of 20,000 and in the second year earned profit of Rs. 20,000. calculate the following :

- The amount of fixed cost
- The BEP in units and in Sales Value
- Profit when 26,000 units are sold
- The number of units to be sold to earn post-tax profit of ` 30,000. Tax rate is 40%.

X Ltd. estimates that its sales will be ` Nil in the next year. The competitor 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 competitor from X Ltd. The competitor's product selling price is Rs. 90 and fetches contribution of Rs. 25 per unit. If the competitor's offer is accepted, calculate:

- BEP in units purchased and sold by X Ltd.
- No. of units to be purchased and sold to earn profit of Rs. 40,000

([M.Com.](#) Mar 2007, adapted)

(Ans.: Contribution per Unit: Rs. 10, Fixed Cost Rs. 1, 60,000)

Illustration 10 :

Following relevant data of a firm is given :

	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	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 levels. Given that the firm operates 55,000 tons level at present –

- 1) Calculate the additional / incremental costs if it manufactures additional (a) 10,000 tons (b) 15,000 tons.
- 2) 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 Rs. 125/- per ton.
 - ii) for 15,000 tons at a selling price of Rs. 150/- per ton.

([M.Com.](#) Apr. 2009, adapted)

(Ans.: Additional Incremental Cost in thousands - 10,000 Tons Rs. 1,075, 15,000 Tons Rs. 2,100)



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Unit- 4

STANDARD COSTING - I

Unit structure :

- 4.0 Objectives
- 4.1 Introduction
- 4.2 Standard Costing
- 4.3 Standard Cost
- 4.4 Benefits of Standard Costing
- 4.5 Fixation of Standards
- 4.6 Analysis of Variances
- 4.7 Material Cost Variances
- 4.8 Labour Cost Variances
- 4.9 Overhead Cost Variances
- 4.10 Sales Variances
- 4.11 Limitations of Standard Costing
- 4.12 Exercises.

4.0 OBJECTIVES

After Studying this unit, you would be able to:

- Understand the terms Standard Cost and Standard Costing
- Understand the process of setting the standards for various elements of costs.
- Understand how standard costing operates.
- Explain the benefits of standard costing
- Calculate the material, labour, overhead and Sales Variances
- Understand the use of standard costing for cost reduction

4.1 INTRODUCTION

Managers are constantly comparing their product cost with the budgets. The reasons for deviations are constantly analyzed and responsibilities are promptly fixed. Thus, “What a product should have Coasted” is a question of great concern to the management for improvement of cost performance. Standard costing is a managerial device to determine efficiency and

effectiveness of cost performance. Standard costing explains the difference between actual profit and profit as per standard relating to the operating period. It also helps to explain the variances according to their causes and responsibilities.

4.2 STANDARD COSTING

Standard costing is a control technique which compares standard costs and revenues with actual result to obtain variances which are used to stimulate improved performance. Use of standard costing is not confined to industries having repetitive processes and homogeneous product only. This technique has established the advantages of its use in industries having non repetitive processes like manufacture of automobile, turbines, boilers and heavy electrical equipment.

4.3 STANDARD COST

Standard Cost is a scientifically pre-determined cost, which is arrived at assuming a particular level of efficiency in utilization of material labour and indirect services. CIMA defines standard cost as “a Standard expressed in money. It is built up from an assessment of the value of cost elements. Its main uses are providing bases for performance measurement, Control by exception reporting, valuing stock and establishing selling prices”. reveals a very useful information for cost control.

Standard cost is like a model which provides basis of comparison for actual cost.

This comparison of actual cost with standard cost control.

4.4 BENEFITS OF STANDARD COSTING

The benefits of standard costing are as follows:

- 1) Use of standard costing leads to optimum utilization of men, materials and resources.
- 2) Its use provides a yardstick for comparison of actual cost performance.
- 3) Only distinct deviations are reported to management. Thus, it helps application of the principle of “management by exception”
- 4) It is very useful to management in discharging functions, like planning control, decision – making and price fixation.
- 5) It creates an atmosphere of cost consciousness.

- 6) It motivates workers to strive for accomplishment of defined targets. It precipitates an attitude that is conducive to efficiency.
- 7) It highlights areas, where probe promise improvement.
- 8) Its introduction leads to simplification of procedures and standardization of products.
- 9) Its introduction enables the management to reduce time required for preparation of reports for pricing, control or quotation purposes.
- 10) Its use enables to find out the cost of finished goods immediately after completion.
- 11) If standard costing is used, stock ledgers can be kept in terms of quantities only. This eliminates much clerical effort in pricing, balancing and posting on stores ledgers cards.
- 12) Its use may encourage action for cost reduction.

4.5 SETTING OF STANDARDS

Determination of standards for various elements of cost is an exercise that requires skill, imagination and experience. For setting standards, routines and process of working conditions are thoroughly studied and motion studies are conducted and different tests are carried out to ensure that standards are realistic and conform to management's view of efficient operations and relevant expenditure. The job of setting the standards is done by a group, which is represented by Engineering Department, production Department, Purchase Department, personnel Department and Cost Accounts Department. Setting of standards can be divided in two categories:

- i) Determination of quantity standards; and
- ii) Determination of price standards.

Quantity standards are pre-determined expressing in physical terms the relationship between a unit produced and resources consumed. Price standards are pre-determined measures expressing in money terms the cost per unit of resources consumed. Quantity standards are developed by representatives of Engineering Department in liaison with representatives of purchase Department. Wage rate standards are developed by personnel Department. Accounts department works in advisory capacity supplying the information based on historical costing.

4.6 ANALYSIS OF VARIANCES

The comparison of actual performance with standard performance reveals the variance. A variance represents a deviation of the actual result from the standard result. There can be cost variance, profit variances, sales value and operational and planning variances. Whether a variance is favorable or unfavorable is ultimately determined with reference to its impact on profit. For example a variance will be adverse, if the actual cost exceeds the standard cost or vice versa. Profit variance will be favorable if actual profit exceeds standard profit or vice versa. Variance analysis is an exercise, which involves efforts to isolate the causes of variance in order to report to management those situations which can be corrected and control by timely action. The extent to which the causes are established, depends upon the amount of time effort and money, that a company is willing to spend in accumulating data as that variance occur. In variance analysis a point is reached where incremental information is not worth its incremental cost. This point indicates the limit of variance analysis and it is determined by judgment in the light of individual circumstances. Variance analysis must be devised to suit the conditions prevailing within a particular enterprise. Analysis of variances must be followed by intelligent and factual interpretation. Computation, classification and reporting of variances is a vital feature of standard costing.

4.7 MATERIAL COST VARIANCE

It represents the difference between actual cost of material used and standard cost of material specified for output achieved. Material cost variance arises due to variation in prices and usage of materials. The following formula is used to find out material cost variance:

Material cost variance = Standard cost of Material used – Actual cost of material

Materials cost variances are as follows: -

- a) Material Price Variance: It is that part of material cost variance which is due to the difference between the actual price paid and standard price specific for the material. It is determined as follows:

Material price variance = Actual quantity (Standard price – Actual price)

- b) Material usage variance: It is that part of material cost variance which is due to difference between the actual quantity used and standard quantity specific for output. This indicates whether or not material was properly utilized, it is determined as follows

Material usage variance = standard price (standard quantity – actual quantity)

- c) Material Mix variance: It is that part of material usage variance which is due to difference between the actual composition of mix and standard composition mixing the different types of material. It is determined as follows:

Material mix variance = standard price (revised standard quantity – actual quantity)

- d) Material yield variance: It is that portion of material usage variance which is due to difference between the actual yield obtained and standard yield specific. It is determined as follows:

Material yield variance = standard price (actual output – standard output)

Illustration 1

Yes Ltd manufactures a single product the standard cost of which is as follows :

Material A 60% @ Rs20/ per Kg.

Material B 40% @ Rs10/ per Kg.

Normal loss is 20% of input. Due to shortage of material A the standard mix was changed. Actual result for January 2011 were as follows :

Material A – 105 Kg. @ Rs20/ per kg

Material B – 95 Kg @ Rs9/ per Kg.

Input 200 kg

Loss 35 Kg

Output 165 Kg

Calculate A Material cost variance B Material price variance C Material usage variance D material mix variance E material yield variance.

Solution A Material Cost Variance is = Standard cost of Material used – Actual cost of material

Rs 3300 – Rs2955 = Rs345F
Actual cost of material used
A -105kg @ Rs20 = Rs2100
B – 95 kg @ Rs9 = Rs 855
Total = Rs2955

Standard cost of material = A 123.75 @ Rs20 = Rs2475
B 82.5 @ Rs 10 = Rs825
Total = Rs3300

$123.75 = 120 \times 165/160$ $82.5 = 80 \times 165/160$

B Material price variance = Actual quantity (Standard price – Actual price)

$$\begin{aligned} A &= 105(20-20) = 0 \\ B &= 95(10-9) = 95F \\ \text{Total} &= 95F \end{aligned}$$

C Material usage variance = standard price (standard quantity – actual quantity)

$A = 20 \times (495/4 - 105) = 375 \text{ F}$
 $B = 10 (165/2 - 95) = 125 \text{ A}$
 $\text{Total} = 250 \text{ F}$

D Material Mix variance = standard price (revised standard quantity - actual quantity)

$$\begin{aligned} A &= 20(120-105) = 300 \text{ F} \\ B &= 10(80-95) = 150 \text{ A} \\ \text{Total} &= 150 \text{ F} \end{aligned}$$

E Material yield variance = standard price (actual output – standard output) .

$$20 (165-160) = 100 \text{ F}$$

Standard price of output
Material A= 60 x 20 = Rs. 1200
Material B= 40 x 10 = Rs. 400
Total = 100 = Rs. 1600
Loss 20
Output 80
Standard Cost Price = Rs. 1600/80 = Rs. 20

Check Your Progress:

- 1) Define the following terms
 - (a) Standard Cost
 - (b) Material Price Variances
 - (c) Material Mix Variances
 - (d) Material yield variances

- 2) Give formulas of the following
 - a) Material cost variances
 - b) Material Price Variances
 - c) Material Mix Variances
 - d) Material yield variances

4.8 LABOUR COST VARIANCE

Labour cost variance is different between the actual wages paid and standard wages specific wages for the production. It is calculated as follows:

Labour cost variance = Standard labour cost – Actual labour cost
 $\text{STD Hours} \times \text{STD Rate} - \text{Actual Hours} \times \text{Actual rate}.$

Following are the labour cost variance.

A) Labour rate variance: It is that portion of labour cost variance which due to the different between the actual labour rate and standard labour rate specific. It determined has follows :

Labour rate variance = Actual hours (standard rate – Actual rate)

B) Labour efficiency variance: It is that part of labour cost variance which due to the different between the actual hours paid and standard hours allowed for output achieved. It determined as follows :

Labour efficiency variance = standard rate (standard hours – actual hours)

C) Labour mix variance: Production may be completed if labour is mixed according standard proportion. Standard mix may not be adhered to under sum circumstances and substitute will have to made. It is determined as follows: -

Labour mix variance = standard rate (actual labour mix – revised standard labour mix)

D) Labour yield variance: It is that part of labour efficiency variance which is due to different between actual output and standard output of workers specific . It is determined as follows:-

Labour yield variance = average standard labour hours rate (actual production – standard production on actual hour)

Check Your Progress:

- 1) Give the formulas of the following
 - a) Labour Cost variances

- b) Labour rate Variances
 - c) Labour efficiency Variances
 - d) Labour mix variances
 - e) Labour yield variances
- 2) Explain the following terms
- a) Labour cost variances
 - b) Labour rate Variances
 - c) Labour efficiency Variances
 - d) Labour mix variances
 - e) Material yield variances

Illustration 2

Standard labour hours and rate for production of one unit of article A is given below:

Particulars	Per unit Hours	Rate per Hours	Total Rs
Skilled workers	5	1.50	7.50
Unskilled workers	8	.50	4.00
Semi – skilled workers	4	.75	3
		Total	14.50

Actual Data

Articles Produces 1000 units

Particulars	Hours	Rate per Hours	Total Rs
Skilled workers	4500	2	9000
Unskilled workers	10000	.45	4500
Semi – skilled workers	4200	0.75	3150
		Total	16650

Calculated

1. 1 Labour cost variance
2. Labour rate variance
3. Labour efficiency variance
4. labour mix variance
5. labour yield variance

Solution:

1) Labour cost variance = Standard labour cost – Actual labour cost

$$\text{Skilled} = \text{STD Hours} \times \text{STD Rate} - \text{Actual Hours} \times \text{Actual rate.}$$

$$5000 \times 1.5 - 4500 \times 2 = 7500 - 9000 = \text{Rs } 1500 \text{ A}$$

Unskilled = $8000 \times 0.5 - 10000 \times 0.45 = 4000 - 4500 = \text{Rs } 500 \text{ A}$
 Semi Skilled = $4000 \times 0.75 - 4200 \times 0.75 = 3000 - 3150 = \text{Rs } 150 \text{ A}$
 $1500 + 500 + 150 = \text{Rs } 2150 \text{ A}$

2. Labour rate variance = Actual hours (standard rate – Actual rate)

Skilled = $4500 (1.50 - 2) = 2250 \text{ A}$
 Unskilled = $10000 (0.50 - 0.45) = 500 \text{ F}$
 Semi skilled = $4200 (0.75 - 0.75) = 0$

$2250 \text{ A} + 500 \text{ F} = 1750 \text{ A}$

3. Labour efficiency variance = standard rate (standard hours – actual hours)

Skilled = $1.5 (5000 - 4500) = \text{Rs } 750 \text{ F}$
 Unskilled = $0.5 (8000 - 10000) = \text{Rs } 1000 \text{ A}$
 Semi Skilled = $0.75 (4000 - 4200) = \text{Rs } 150 \text{ A}$
 Total = 400 A

4. Labour mix variance = standard rate (actual labour mix – revised standard labour mix)

Skilled = $1.5 (5500 - 4500) = \text{Rs } 1500 \text{ F}$
 Unskilled = $0.5 (8800 - 10000) = \text{Rs } 600 \text{ A}$
 Semi skilled = $0.75 (4400 - 4200) = \text{Rs } 150 \text{ F}$
 Total = $\text{Rs } 1050 \text{ F}$

5. Labour yield variance = average standard labour hour rate (actual production – standard production on actual hours)

$14.50 (1000 - 1100) = \text{Rs } 1450 \text{ A}$

Note: Standard production of actual hours = $18700 / 17000 \times 1000 = 1100 \text{ units}$

Average std rate = $\text{Rs } 7.5 + 4 + 3 = \text{Rs } 14.50$

4.9 OVERHEAD COST VARIANCE

It is different between standard overhead cost and actual overhead cost of producing goods . There are two types of overhead variance:

- A) Variable Overhead Variance
- B) Fixed Overhead Variance

A) Variable Overhead Variance : It is different between standard variable overhead cost and actual variable overhead cost. It determined as follows:

Variable overhead cost variance = Standard variable overhead cost – actual variable overhead cost.

Variable overhead cost is again divided into two parts

1) Variable overhead expenditure variance: It is that portion of variable overhead variance which arrives due to difference between actual overhead and standard variable overhead appropriate to the level activity. It is determined as follows:

Variable Overhead Expenditure variance = standard variable overhead at actual level – actual variable overhead

2) Variable overhead efficiency variance : It is the difference between actual hours work at standard variable overhead rate and standard variable overhead for production. It is determined as follows :

Variable Overhead Efficiency Variance = standard variable overhead – actual variable overhead for production.

Check your progress :

- 1) Explain the following terms :
 - a) Variable Overhead cost Variance
 - b) Variable Overheads expenditure Variance
 - c) Variable Overheads efficiency Variance
- 2) Give the formulas of the following :
 - a) Variable Overheads cost Variance
 - b) Variable Overheads expenditure Variance
 - c) Variable Overheads efficiency Variance

Illustration 3

Following information is obtained from Wise Ltd

Budgeted production for the period	600 units
Budgeted variable overhead	Rs 15600/-
Standard Time for one unit	20 hours
Actual Production for the period	500 units
Actual Variable overhead	Rs 14000/-
Actual Hours Worked	9000 Hrs

Calculate:

- A Variable overhead expenditure variance
- B variable overhead efficiency variance
- C Variable Overhead variance

Solution:

A VO Expenditure variance = standard variable overhead at actual level – actual variable overhead

$$= 11700 - 14000 = 2300 \text{ A}$$

$$\text{SVOH} = 15000 / 12000 \times 9000 = 11700$$

B VO Efficiency Variance = standard variable overhead – actual variable overhead for production.

$$= 13000 - 11700 = 1300 \text{ F}$$

C Variable overhead cost variance = Standard variable overhead cost – actual variable overhead cost.

$$= 13000 - 14000 = 1000 \text{ A}$$

4.10 FIXED OVERHEAD COST VARIANCE

It represents the difference between actual fixed overhead incurred and standard cost of fixed overhead absorbed. It determined as follows:

Fixed overhead Cost variance = Standard cost of fixed overhead – actual fixed overhead

Fixed overhead variance is follows:

A. Fixed overhead volume variance - It that part of fixed overhead variance which due different between actual fixed overhead incurred and standard allowance for fixed overhead.

Fixed overhead volume variance = standard rate X actual output - budgeted overhead

B. Fixed overhead expenditure variance - It that part of fixed overhead variance which is due different between actual fixed overhead incurred and budgeted fixed overhead.

Fixed overhead expenditure variance = budgeted fixed overhead – actual fixed overhead.

C. Fixed overhead Calendar Variance - It is that part of fixed overhead volume variance which is due to different between budgeted fixed overhead and fixed overhead for dates available during the period at standard rate.

Fixed Overhead Calendar variance = standard rate (actual quantity – Standard quantity)

D. Fixed overhead efficiency variance: It is that portion of volume variance which reflected increase or reduced output arising from efficiency being above or below standard.

Fixed overhead efficiency variance = standard rate (actual production – standard production)

E. Fixed overhead capacity variance: It is that part of fixed overhead variance which arises due to difference between capacity utilized and available capacity.

Fixed overhead capacity variance = Standard rate (revised budgeted - budgeted unit)

Check your progress :

1) Fill in the blanks :

- a. ----- represents the difference between actual fixed overhead incurred and standard cost of fixed overhead absorbed.
- b) The difference between actual fixed overhead incurred and standard allowance for fixed overhead means -----.
- c) The difference between actual fixed overhead incurred and budgeted fixed overhead means -----.
- d) ----- variance is the portion of volume variance.
- e) ----- variance arises due to difference between capacity utilized and available capacity.
- f) ----- variance reflects increase or reduced output arising from efficiency being above or below standard.
- g) Fixed overhead capacity variance is the difference between ----- and ----- available during the period at standard rate.

Illustration 4

From the following data calculate overhead variance :

Particulars	Budget	Actual
Output	15000 units	16000 units
No. of working days	25	27
Fixed overhead	Rs 30000	Rs 30500
Variable overhead	Rs 45000	Rs 47000

There was an increase of 5% in capacity.

Solution:

1. Total overhead variance = Actual output in standard rate – Actual overhead

$$16000 \times 5 - (30500 + 47000) \\ \text{Rs } 2500 \text{ F}$$

2. Variable Overhead Variance = Standard rate X Actual output – Actual Overhead

$$3 \times 16000 - 47000 = 1000 \text{ F}$$

3. Fixed Overhead Variance = Standard rate X Actual Output – Actual Overhead

$$2 \times 16000 - 30500 = \text{Rs } 1500 \text{ F}$$

4. Fixed overhead volume Variance = Standard Rate X Actual Output – Budgeted Overhead

$$2 \times 16000 - 30000 = 2000 \text{ F}$$

5. Fixed overhead Expenditure Variance = Budgeted Fixed – Actual Fixed overhead

$$\text{Rs } 30000 - \text{Rs } 30500 = \text{Rs } 500 \text{ A}$$

6. Fixed Overhead Capacity Variance = Standard Rate (Revised Budgeted Units – Budgeted Units)

$$\text{Rs } 2 (15750 - 15000) = 2 \times 750 \text{ Rs } 1500 \text{ F}$$

7. Fixed overhead calendar variance = Standard Rate (Actual Quantity – Standard Quantity)

$$2 (15750/25 \times 2) = \text{Rs } 1260 \times 2 \text{ Rs } 2520 \text{ F}$$

8. Fixed overhead efficiency variance = Standard Rate (Actual Production – Standard Production)

$$= 2 (16000 - 17010) = \text{Rs } 2020 \text{ A}$$

Note: Standard production = 15000 units

+ Increase Due Capacity increase = 750

+ Increased production for 2 days = 1260

Total = 17010

4.11 SALES VARIANCE

Sales variance is difference between the actual value achieved in a given period and budgeted value of sales. Sales value variance are useful for sales managers in determined the effect of changes in different factors on sales value. The following are Types of variance.

A) Sales value variance - It is the different between the actual sales value reliable and the standard value of sale as per the Budget.

Sale value variance = Actual Quantity X Actual price - Standard quantity X Standard Price

B) Sales price variance - It is that portion of the total sales value variance which due to different between actual sales price realised and budgeted sales price

Sales price variance = Actual Quantity (Actual price – standard price)

C) Sales volume variance - It is that portion of total sales value variance which due to difference between the standard value the actual sales effected and standard value of sales as per the budget.

Sales volume variance = standard price (Actual quantity – Standard quantity)

D) Sales Mix variance - It is that portion of sales volume variance which due the difference between the standard value of actual sales effected and Actual value of Sales.

Sales mixed variance = Standard Price (Actual proportion – revised standard mix actual sales)

E) Sales quantity variance - It is that portion of sales volume variance which due tot the difference between standard value of actual sales effected and standard values of sales as per the budged.

Sale quantity variance = standard price (revised standard mix – standard mix)

Check Your Progress :

1) Give formulas.

- a) Sales value variances
- b) Sales price variances
- c) Sales volume variances
- d) Sales mix variances
- e) Sales quantity variances

2) Fill in the blanks.

- a. Sales variance is difference between the actual value achieved in a given period and -----.

- b. ----- is the different between the actual sales value reliable and the standard value of sale as per the Budget.
- c. Sales price variance is the different between ----- and budgeted sales price.
- d. ----- variance is the difference between the standard value the actual sales effected and standard value of sales as per the budget.
- e. Sales mix variance is the difference between the ----- and Actual value of sales.

Illustration 5

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

STANDARD

Product	Quantity	Selling price per unit	RS
A	5000	5	25000
B	4000	6	24000
C	3000	7	21000
Total	12000		70000

ACTUAL

Product	Quantity	Selling price per unit	RS
A	6000	6	36000
B	5000	5	25000
C	4000	87	32000
Total	15000		93000

Solution :

A. Total Sales Variance = Rs 93000- Rs 70000 = Rs23000 F

B. Sales price Variance = Actual quantity (Actual Price – Standard Price)

$$\begin{aligned}
 &= A = 6000 \times (6-5) &&= \text{Rs } 6000 \text{ F} \\
 &B = 5000 \times (5-6) &&= \text{Rs } 5000 \text{ A} \\
 &C = 4000 \times (8-7) &&= \text{Rs } 4000 \text{ F} \\
 &&&\text{-----} \\
 &&&\text{Rs } 5000 \text{ F}
 \end{aligned}$$

C. Sales volume variance = Standard price (Actual Quantity – Standard Quantity)

$$\begin{aligned} &= A = 5 (6000-5000) = 5000 \text{ F} \\ &B = 6 (5000-4000) = 6000 \text{ F} \\ &C = 7 (4000-3000) = 7000 \text{ F} \\ &\text{Total} = 18000 \text{ F} \end{aligned}$$

D. Sales mix Variance = Standard price (Actual mix – Standard Mix)

$$= \text{Rs.}88000 - \text{Rs.}87500 = 500 \text{ F}$$

Note : Actual Mix

$$\begin{aligned} 6000 \times 5 &= 30000 \\ 5000 \times 6 &= 30000 \\ 4000 \times 7 &= 28000 \\ \text{Total} &= 88000 \end{aligned}$$

Revised Mix

$$\begin{aligned} 6250 \times 5 &= 31250 \\ 5000 \times 6 &= 30000 \\ 3750 \times 7 &= 26250 \\ \text{Total} &= 87500 \end{aligned}$$

E Sales Quantity Variance = Standard price (actual quantity – standard quantity)

$$\begin{aligned} &= 70000 / 12000 (15000-12000) \\ &= \text{Rs.}17500 \text{ F} \end{aligned}$$

4.12 EXERCISE

- 1) What standard costing? Explain the advantages and limitations of costing.
- 2) What is meant by standard cost? How standard cost is determined?
- 3) Choose the right answer with your reasoning:-
 - 1) Material cost variance arises due to variation in price and ----- of materials.
(a) Quality (b) Quantity (c) Volume (d) Delivery
 - 2) Idle time variance is due to difference between labour hours applied and labour hours -----.
(a) Utilised (b) Supplied (c) Unutilised (d) Underutilised
 - 3) Fixed overhead capacity variance arises due to difference between capacity utilized and ----- capacity.
(a) Spare (b) Excess (c) Fixed (d) Planned
 - 4) Sales mix variance is due to the difference between standard value of actual sales and actual value of sales -----.
(a) Realised (b) Effected (c) Margin (d) Volume
 - 5) Standard cost is a specifically ----- cost.
(a) Pre-determined (b) Estimated (c) Planned (d) Average
(Ans- 1- b , 2 – a , 3 – d , 4 – a , 5 – a)



Unit- 5

STANDARD COSTING - II

Unit structure :

- 5.0 Objectives
- 5.1 Solved Problems
- 5.2 Exercise

5.0 OBJECTIVES

After studying this unit the students will be able to solve the problems on variance analyses.

5.1 SOLVED PROBLEMS

Illustration 1

The standard cost of a certain chemical mixture is as follows:

Material	Cost per tonn (Rs.)
I (40%)	20
II (60%)	30

A standard loss of 10% is expected in production.

For a period, the actual consumption data was as follows:

Material	Cost per tonn (Rs.)
I (180 tonnes)	18
II (220 tonnes)	34

The actual weight produced was 364 tonnes.

Calculate the Material cost variance, Material price variance and Material quantity variance.

(M.Com. April 2011)

Solution :

Actual cost of Material used (M1)

Material I == 180 Tonnes X Rs. 18 = 3,240
 Material II == 220 Tonnes X Rs. 34 = 7,480
(M1) Rs.10, 720

Standard cost of Material used (M2)

Material I == 180 Tonnes X Rs. 20 = 3,600
 Material II == 220 Tonnes X Rs. 30 = 6,600
(M2) Rs.10, 200

Standard cost of material, if it has been in standard proportions (M3)

Standard Qty. of material I in

$$\begin{aligned} \text{Material I} &= \frac{\text{Standard mix in tonn}}{\text{Weight of Std. mix}} \times \text{weight in actual mix} \times \text{Standard rate of Mat. - I per tonn} \\ &= \frac{40\text{tonn}}{100\text{tonn}} \times 400\text{tonn} \times \text{Rs.20} \text{ or Rs.3,200} \end{aligned}$$

Standard Qty. of Material II in

$$\begin{aligned} \text{Material II} &= \frac{\text{Standard mix in tonn}}{\text{Wight of Std. mix}} \times \text{Weight in actual mix} \times \text{Standard Rate of Material - II per tonn} \\ &= \frac{60\text{tonn}}{100\text{tonn}} \times 400\text{tonn} \times \text{Rs.30} \text{ or Rs.7,200} \end{aligned}$$

Adding (i) and (ii) we get the value of M3

M3 = Rs. 3,200 + Rs. 7,200 = Rs. 10,400

Standard cost of output. (M4)

Let us find out the standard cost, when input is 100 tonn.

	Standard Mix	Standard Rate	Standard cost
	40 tonne	Rs. 20	Rs. 800
	60 tonne	Rs.30	<u>1,800</u>
	100 tonne		2,600
Loss 10%	10 tonne		<u>-----</u>
	90 tonne	(M4)	2,600

It means for output of 90 tonnes standard cost will be Rs. 2,600

Standard cost of actual output of 364 tonnes will be

$$= \frac{2,600}{90} \times 364 = \text{Rs. } 10,516.$$

Variance

1. Material price variance = $M1 - M2$
= $10,720 - 10,200 = \text{Rs. } 500 \text{ (A)}$
2. Material Mix variance = $M2 - M3$
= $10,200 - 10,400 = \text{Rs. } 200 \text{ (F)}$
3. Material Yield variance = $M3 - M4$
= $10,400 - 10,516 = \text{Rs. } 116 \text{ (F)}$
4. Material cost variance = $M1 - M4$
= $10,720 - 10,516 = \text{Rs. } 204 \text{ (A)}$

Alternatively it can be found out as follows:

= Material price variance + Material Mix variance + Material Yield variance

= Rs. 520 (A) + Rs. 200 (F) + Rs. 116 (F) = Rs. 204 (A)

5. Material Usages variance = $M2 - M4$
= $10,200 - 10,516 = \text{Rs. } 316 \text{ (F)}$

Alternatively it can be found out as follows:

= Material Mix variance + Material Yield variance

= Rs. 200 (F) + Rs. 116 (F) = Rs. 316 (F)

Illustration 2

The budgeted and the actual sales for a Quarter ended 31st March, 2012 in respect of three products are given below:

Product	Budgeted Sales		Actual Sales	
	Units	Rate per unit Rs.	Unit	Rate per unit Rs.
P	1500	40	1600	38
Q	1800	85	1900	82
R	1200	125	1300	128

Calculate:

1. Sales Value Variance
2. Sales Price Variance
3. Sales Volume Variance
4. Sales Mix Variance
5. Sales Quantity Variance

(M.Com. April 2012)

Solution :

Product	Budgeted Quantity (BQ)	Budgeted Price (BP)	Actual Quantity (AQ)	Actual Price (AP)	Revised Budgeted Quantity (RBQ)	BQXBP	AQXBP	AQXAP	RBQXBP
P	1500	40	1600	38	1600	60,000	64,000	60,800	64,000
Q	1800	85	1900	82	1920	1,53,000	1,61,500	1,55,800	1,63,200
R	1200	125	1300	128	1280	1,50,000	1,62,500	1,66,400	1,60,000
Total	4500		4800		4800	3,63,000	3,88,000	3,83,000	3,87,200

$$RBQ = \frac{\text{Total AQ}}{\text{Total BQ}} \times \text{BQ of concerned Product}$$

$$P = \frac{4800}{4500} \times 1500 = 1600 \text{ units}$$

$$Q = \frac{4800}{4500} \times 1800 = 1920 \text{ units}$$

$$R = \frac{4800}{4500} \times 1200 = 1280 \text{ units}$$

1. Sales value variances = (BQ X BP) – (AQ X AP)

$$P = 60,000 - 60,800 = 800 \text{ (F)}$$

$$Q = 1,53,000 - 1,55,800 = 2,800 \text{ (F)}$$

$$R = 1,50,000 - 1,66,400 = 16,400 \text{ (F)}$$

$$\text{Total} = 3,63,000 - 3,83,000 = 20,000 \text{ (F)}$$

2. Sales Price variances = AQ (BP - AP)

$$= (AQ \times BQ) - (AQ \times AP)$$

$$P = 64,000 - 60,800 = 3,200 \text{ (A)}$$

$$Q = 1,61,500 - 1,55,800 = 5,700 \text{ (A)}$$

$$R = 1,62,500 - 1,66,400 = 3,900 \text{ (F)}$$

$$\text{Total} = 3,63,000 - 3,83,000 = 5,000 \text{ (A)}$$

3. Sales Volume variances = (BQ X BP) – (AQ X BP)

$$= BP (BQ - AQ)$$

$$P = 60,000 - 64,000 = 4,000 \text{ (F)}$$

$$Q = 1,53,000 - 1,61,500 = 8,500 \text{ (F)}$$

$$R = 1,50,000 - 1,62,500 = 12,500 \text{ (F)}$$

$$\text{Total} = 3,63,000 - 3,83,000 = 25,000 \text{ (F)}$$

4. Sales Mix variances = (RBQ X BP) – (AQ X BP)

$$= BP (RBQ - AQ)$$

$$P = 64,000 - 64,000 = \text{NIL}$$

$$Q = 1,63,200 - 1,61,500 = 1,700 \text{ (A)}$$

$$R = 1,60,000 - 1,62,500 = 2,500 \text{ (F)}$$

$$\text{Total} = 3,63,000 - 3,83,000 = 800 \text{ (F)}$$

$$\begin{aligned}
 5. \text{ Sales Quantity variances} &= (\text{BQ} \times \text{BP}) - (\text{RBQ} \times \text{BP}) \\
 &= \text{BP} (\text{BQ} - \text{RBQ}) \\
 P &= 60,000 - 64,000 = 4,000 \text{ (F)} \\
 Q &= 1,53,000 - 1,63,200 = 10,200 \text{ (F)} \\
 R &= 1,50,000 - 1,60,000 = 10,000 \text{ (F)} \\
 \text{Total} &= 3,63,000 - 3,83,000 = 24,200 \text{ (F)}
 \end{aligned}$$

Illustration 3:

From the following information calculate Labour Rate Variance, Labour Cost Variance and Labour Efficiency Variance:

Standard Data for 20 units:

Standard Hours	60 Hours
Standard Rate	Rs. 21 per unit

Actual Data:

Actual Production	15,000 units
Actual Hours Worked	46,500 Hours
Actual Rate	Rs. 6.80 per Hour

([M. Com](#) April 2012)

Solution :**From the given information :**

$$\begin{aligned}
 \text{Standard Hours per unit} &= \frac{\text{Standards hrs.}}{\text{Standard units}} \\
 &= \frac{60 \text{ hrs.}}{20 \text{ units}} \\
 &= 3 \text{ hours per unit}
 \end{aligned}$$

$$\begin{aligned}
 \text{Standard Rate per hour} &= \frac{\text{Standard rate per unit}}{\text{Standard hours per unit}} \\
 &= \frac{\text{Rs. 21}}{3 \text{ hrs}} \\
 &= \text{Rs. 7 per hour.}
 \end{aligned}$$

Given Data

Standard Hours (SH)	Standard Rate (SR)	Actual Hours (AH)	Actual Rate (AR)
45,000 (15,000 units X 3 hrs. per unit)	7.00	46,500	6.80

Variances:

$$\begin{aligned}
 1) \text{ Labour cost variance} &= (\text{SH} \times \text{SR}) - (\text{AH} \times \text{AR}) \\
 &= (45,000 \times 7) - (46,500 \times 6.80) \\
 &= 3,15,000 - 3,16,200 \\
 &= 1,200 \text{ (A)}
 \end{aligned}$$

- 2) Labour rate variance = $AH (SR - AR)$
 = $46,500 (7.00 - 6.80)$
 = $9,300 (F)$
- 3) Labour efficiency variance = $SR (SH - AH)$
 = $7 (45,000 - 46,500)$
 = $7 (-1,500)$
 = $10,500 (A)$

Illustration 4:

AB Costing Ltd. manufactures a costing the standard specification are as under :

	Composition	Standard price
Raw material P	75%	Rs. 80 per Kg.
Raw material S	25%	Rs. 20 per Kg.
	100%	

Standard yield expected is 100% i.e. an total input of 100 Kgs. of raw material should give 100 Kgs. of costings.

The actual data for a period as follows :

- a) Output obtained 120 Kgs.
- b) Input of raw material :
- Raw material P 112 Kgs. at actual price of Rs. 85 per Kg.
- Raw material S 28 Kgs. at actual price of Rs. 15 per Kg.
- Calculate the material cost variances.

Solution :

The calculate the material cost variances, proceed as follows :

- a) For the output obtained, find out how much raw material should have been used.
- b) In this case, the output obtained was 120 Kgs.
- c) Hence as per standard specified, the total input should have been only 120 Kgs. and the break up should have been as follows and the Std. Cost per unit of output.

Raw material P . . . 90 Kgs. @ Std. Price of Rs. 30 = Rs.2,700
 S . . . 30 Kgs. @ Std. Price of Rs. 20 = Rs. 600
 120 Kgs. Rs. 3,800

The standard cost the material in the product is Rs. 27.50 per kg.

- d) Now let us construct the standard and actual data for 120 Kgs. of output :

Raw material	Standard		Actual	
	Standard allowance	Standard price Rs. per	Actually consumed	Actual price Rs. per Kg.
	Kgs.	Kg.	Kgs.	
P	90	30	112	85
S	30	20	28	15
	120		140	

The material cost variance can now be calculated :

Table

Raw material	Actual quantity @ Actual price		Actual quantity @ Std. Price		Standard quantity allowance for the output	
					Rs.	Rs.
P	112	x 85 = 3,920	112	x 80 = 8,360	90	x 80 = 8,700
S	28	x 15 = 420	28	x 20 = 560	30	x 20 = 600
	140	4,340	140	8,920	120	8,800
Columns	A		B		C	

According to the definitions, we have

- a) Price Variance

$$\begin{aligned}
 &= (\text{Actual quantity @ Actual price}) - (\text{Actual Quantity @ Std. Price}) \\
 &= (\text{Col. A} - \text{Col B}) \\
 &= \text{Rs. (440 - 8920)} \\
 &= \text{Rs. 420 advance as actual cost is more than the Std. cost.}
 \end{aligned}$$

- b) Usage variance

$$\begin{aligned}
 &= (\text{Actual quantity @ Std. Price}) - (\text{Std. Quantity @ Std. Price}) \\
 &= (\text{Col. B} - \text{Col. C}) \\
 &= \text{Rs. 8920 - 8800} \\
 &= 620 \text{ Adverse as std. cost of actual is more than the std. cost of standard allowance.}
 \end{aligned}$$

- c) Total variance = Price variance + Usage variance

$$\begin{aligned}
 &= \text{Rs. 420 A} + \text{Rs. 620 A} \\
 &= \text{Rs. 1040 adverse}
 \end{aligned}$$

The actual yeild obtained was 120 Kgs.

Hence we should have 120 Kgs. of material at standard mix.

That is to say, the consumption of P and S should have been.

Standard consumption for 120 kgs. yield:

Raw material	P	80 Kgs.
	S	40 Kgs.
		120 Kgs.

But the actual consumption was 140 kgs. yielding 120 kgs. hence, we compare :

- The actual consumption @ std. mix gave yield of 120 Kgs.
- The standard allowed for a yield of 120 Kgs.

Table

	Actual Consumption @ std. mix	Std. consumption allowed @ std. mix	Std. price	Std. cost of consumption	
Material	105	90	30	Actual	STD
P	<u>85</u>	<u>30</u>	20	3,150	2,700
	140	120		<u>700</u>	<u>600</u>
				8850	3300

The yield variance is given by the difference between:

- | | |
|---|---------|
| | Rs. |
| a) Std. cost of actual consumption that yielded 120 Kgs. | = 3,850 |
| b) Std. cost of allowed consumption that yielded 120 Kgs. | = 3,850 |
| Yield variance unfavorable | = 550 |

Illustration 5

For product A, F.O.G. is a compound made up of three raw materials F, O and G, in the standard proportion given below. The standard price per Kg. is also given. During January 1st week, actual input was for 100 mix and the other data are as under –

Standard for one mix			Actual for 1000 mix		
Product	Raw Material	Std. Price	Value	Consumption	Value
	in Kgs.	Rs. per Kg.	Rs. P.		Rs.
F	1	0.250	0.25 F	1000	260
O	5	0.525	1.25 O	1000	950
G	2	0.875	0.75 G	2000	1000
10% Normal Loss	5.0 0.5	Loss	2.25	5000 644	2210 -
Normal output 90% 4.5			2.25	4856	2210
			Actual Output		

Table
Suggested Solution :

Actual Consumption		Actual Consumption	Standard Consumption	
At actual price cost	Std. price Rs.	Std. price @ Std. mix Rs.	Price @ Std. Mix Rs.	
	(A)	(B)	(C)	(D)
F	260	250	250	242
O	950	10000	1250	1210
G	1000	900	750	726
	2210	2150	2250	2178
	(A-B) 60	ADV (B-C)	100 F	(C-D) 72 ADV

$$\begin{aligned}
 \text{Total Variance (A-D)} &= \text{Price Variance (A-B)} + \text{Mix Variance (B-C)} + \text{Yield Variance (C-D)} \\
 \text{Rs. (2210-2178)} &= \text{Rs. (2210-2150)} + \text{Rs. (2150-2250)} + \text{Rs. (2250-2178)} \\
 82 \text{ A} &= \text{Rs. 60 A} + \text{Rs. 100 F} + \text{Rs. 70 A}
 \end{aligned}$$

Note:-

- a) The actual yield was 43.56 kgs
Which is equal to 90% as per standard.
- b) Hence, the actual input should be

$$\frac{4356}{90} \times 100 = 4840 \text{ Kgs.}$$

Table for Example No.2

We can summarise the above calculations in the various tables and list them as shown below. In fact for examination work this table can be quickly written up and variances obtained.

	Price variance			Analysis of usage variance			Total variance		Note
	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	Rs.	Ps.	
1. Actual cost of raw material used @ actual prices	246	00					246	00	1. Take this as given in the example because this represents the expenditure.
2. Actual cost of raw material used at standard prices	272	00	272	00					2. Calculate the actual consumption at the standard price for each item and add up.
Price variance	26.00	FAV							372

3. Actual cost of raw material used at standard mix at standard price mix variance			264	96	264	96		3. Rework the actual input standard mix as per the date in the specification card.
			7.04					
			ADV					
4. Quantity of raw material that should have been used for the output of 88 Kgs @ standard price yield variance					281.60 16.64 FAV	281.60 035.60 FAV		4. Rework the quantity that must have been consumed to give and output of 88 Kgs. and the evaluate that cost @ standard price.
								5. Mix + Yield Variance = Usage Variance <u>7.04 + 16.64 = 9.60</u> ADV FAV FAV

Hence the standard quantity (that should have been used) for each raw material and the standard cost:

	Kgs.	Std. Price/Kg.	Values Rs.
F	968	0.250	242
O	1986	0.625	1210
G	1986	0.875	726
100% input	4840		2178
10% loss (STD)	484		---
90% Actual output	4356		2178

For Self Examination

1) What do you understand by:

- Price Variance
- Usage Variance
- Mix Variance
- Yield Variance

By assuming certain data work out each of these variance.

2) What is the relationship between usage variance, mix variance and yield variance?

3) From the following data calculate the material cost variances and check your answer with those given below

	Ingredients	Std. price	Std. price
	Kgs.	Rs.	Rs.
I	4000	0.25	1000
O	1600	0.20	820
E	2400	0.45	1080
	8000		2400
Std Loss	800		
Std Yields	7200		2400

The above quantity represents the standard mix for 80 mixes.
The actual mix for 80 mixes during a period was.

	Kgs.	Actual price	Actual value
			Rs.
I	4160	0.275	1144
O	1680	0.175	294
E	2560	0.475	1216
Actual	8400		
Loss	1050		
Actual	—		
Yields	7850		2400

Answer:

Material price variance = Rs. 126 adv.

Material usage variance = Rs. 78 adv.

Total Cost
variance Rs. 804

Analysis of usage
variance: 128 Adv.

Material mix variance 50 Fav.

Material yield 78 Adv,

Illustration 6

A contract work was estimated to be performed in a week of 40 hours by a labour force constituted as follows at the hourly rates given below.

The Standard Mix of Labour grade :

40 Men at Rs.0.60 per hour

20 Women at Rs.0.30 per hour

$\frac{10}{70}$ boys at Rs. 0.30 per hour

Standard Mix of Labour grade is as follows.

Men 40/70

Women 20/70

Boys 10/70

But however, as sufficient men were not available, the actual composition of Labour force employed and their rates of pay the job as under.

50 Men at Rs.0.60 per hour

20 Women at Rs.0.45 per hour 10 Women at Rs.0.30 per hour 15

Boys at Rs.0.32 per hour

And the work was completed in 50 hours and each of them was paid for the 50 hours.

Calculate the loss or gain on the Labour Cost of the contract and analyse the variance.

Answer

The first step is to be prepare a Standard Labour Cost of the job
See Table A.

The second step is to prepare the Actual Cost incurred
See Table B.

Table A
Standard Labour Cost Rs.

						Rs.
40 Men	X	40 Hrs.	=	1600 Hrs.	@	Rs.0.60 p.h. = 960
20 Women	X	40 Hrs.	=	800 Hrs.	@	Rs.0.40 p.h. = 320
10 Boys	X	40 Hrs.	=	400 Hrs.	@	Rs.0.80 p.h. = 120
<u>70</u>				<u>2800</u>		<u>1400</u>

Table B
The Actual composition of the Labour Cost

						Rs.	Rs.
30 Men	X	50 Hrs.	=	1500 Hrs.	@	Rs.0.60 p.h. =	900
20 Women	X	50 Hrs.	=	1000 Hrs.	@	Rs.0.40 p.h. =	450
10 Women	X	50 Hrs.	=	500 Hrs.	@	Rs.0.80 p.h. =	150
15 Boys	X	50 Hrs.	=	750 Hrs.	@	Rs.0.82 p.h. =	240
<u>75</u>				<u>3750</u>			<u>1740</u>

Hence from (A) and (B) the total Labour Cost Variance is Rs.840 Adverse i.e. Rs.1400 – Rs.1740 = Rs.340 it is adverse because the Actual Cost is more than the Standard Cost.

Now, let us analyse the Labour Cost variance under –

- Wage Rate Variance
- Time Usage Variance

Thereafter analyse the Time Variance under –

- c) Labour Mixture Variance
- d) Labour Efficiency Variance

Wages Rate Variance Calculation

In the third step we determine the wage rate variance which is the First Variance that should be calculated.

The wage rate variance analyse is prepared by comparing the data of (a) and (b) given below.

a) The Actual Wages paid i.e. The Actual time worked X the Actual rate paid.

b) The wages that should have been paid for the Actual Hours at the Standard rate specified.

The formula : The Actual time worked X Standard rate of Wage.
From table B. We have the data for Actual Wages @ Actual rates paid.

Table B

	Actual Hrs.	Actual rates paid (Rs.)	Actual Wages (Rs.)
Men	1500	0.60	900
Women	1000	0.45	450
Women	500	0.30	150
Boys	750	0.32	240
	8750		1740

2. We prepare table C to calculate the wages that should have been paid for the Actual Hours if the Rate per Hour had been as per the Standard.

Table C

	Actual Hrs. Worked	Standard Rate (Rs.)	Standard Wages for Actual Hours (Rs.)
Men	1500	0.60	900
Women	1500	0.40	600
Boys	750	0.80	225
	8750		1725

Now comparing the wages in Table B and Table C we find that –

- a) The Actual Hours are the same in both the cases.
- b) But in Table B we have used the Actual rate and in Table C we have used the Standard Rate.

Therefore, we get the Variance arising due to wage difference only and this known as Wage Rate Variance.

Calculation of Wage Rate Variance

	Actual Wages (Rs.)	Standard Wages (Rs.)	Variance (Rs.)
Men	900	900	-
Women	600	600	-
Boys	240	225	15 Adverse
	1740	1725	15 Adverse

The Variance is Adverse because the Actual Wages is more than the Standard Wages. Usage of Time Variance.

We determine this variance in the fourth step.

This is arrived at by comparing (c) and (d).

The standard time @ Standard Wage rate, and

(d) The Actual time @ Standard Wage rate.

The calculation already shown in Table A and C respectively are reproduced here for easy reference.

Table D

	Standard Hrs.	Actual Hrs.	Std. Rate Hrs.	At Standard Rate		Variance
				Standard Wage (Rs.)	Actual Wages (Rs.)	
Men	1600	1500	0.60	960	900	60 F
Women	800	1500	0.40	320	600	280 A
Boys	400	750	0.80	120	225	105 AA
	2800	3750		1400	1725	325 A

The difference between Rs.1400 (Standard Hours X Std. Rate and Rs.1725) (Actual Hours X Standard Rate) = Rs.325 Adverse represents the Variance due to usage of Time.

As the (Actual Hrs. X Std. Rate) is greater than the Standard Wages (Standard Hours X Std. Rate) the variance is Adverse.

Check

$$\begin{aligned} \left(\begin{array}{c} \text{The Total Labour} \\ \text{Cost Variance} \end{array} \right) &= \left(\begin{array}{c} \text{Wage Rate} \\ \text{Variance} \end{array} \right) + \left(\begin{array}{c} \text{Usage of} \\ \text{Time} \end{array} \right) \\ \text{Rs.34C (A)} &= \text{Rs. 15 (A)} + \text{Rs.325 (A)} \end{aligned}$$

Note

After you have carried out this primary variance analysis we can proceed to analyse the usage of Time Variance into its further components, namely,

- i) Labour Mix Variance
- ii) Efficiency Variance

Further analysis brings out any difference arising because of –

- a) The actual mix of Labour employed being different from the Standard “Mix Variance”

“Mix Variance”

B) Any difference on account of the Actual efficiency being different from the Standard efficiency of 100% called “Efficiency Variance”

(A) Mix Variance :

This variance, if any, can be established by comparing

- e) The Actual mix, of the Actual Hours worked and
- f) the Standard Mix of the Actual Hours worked.

Table E

	Actual Hours @ Actual Mix	Std. Mix.	Actual Hours @ Actual Mix	Std. Mix.	Std. Actual Hrs. @ Actual Mix	Rate in Actual Hrs. @ Std. Mix	Variance
Men	1500	40/70	2145	0.60	900	1286	886 F
Women	1500	20/70	1071	0.40	600	428	172 A
Boys	750	10/70	536	0.30	225	161	34 A
	<u>3750</u>		<u>3750</u>		<u>1725</u>	<u>1875</u>	<u>150 F</u>
	A	B	C	DE		EF	G

Example : 3750 x 40/70 = 2143 etc.

From the above table you will observe that Col. C. represents the Actual Hours worked by the labour employed whereas col. C represents the mix of Hours as specified in the Standard Mix giving rise Mix Variance in terms of Value.

The Mix Variance is reflected by the two figures Col E-F

Actual Hrs. @ Actual Mix Rs. 1725
 Actual Hrs. @ Standard Mix Rs. 1875
 Mix Variance in Col. G Rs. 150 F

As Standard Mix is more than the Actual Mix, the Variance is Favorable.

B) Efficiency Variance :

The work "Efficiency" Connotes the speed of working or doing job.

If a work is done in a shorter time than the specified time we say the efficiency is more than 100%, if not then the efficiency is less than 100% and if completed exactly within the Specified/Standard time, then the efficiency is 100%

Using these criteria, we compare-

- the standard time @ Standard Mix to complete the work and
- the Actual time W Standard Mix taken to do the work. The Table below gives the comparative Hours @ Standard Mix.

Table F

	At Standard Mix		Std. Rate	At Standard Mix		Variance
	Actual Hrs.	Standard Hrs.		Actual Wage	Standard Wage	
Men	2148	1600	0.60	1286	960	826 A
Women	1071	800	0.40	428	320	108 A
Boys	536	400	0.30	161	120	41 A
	3750	2800		1875	1400	475 A
	A	B		C	D	

Col. A gives the Actual Hours @ Standard Mix and Col. B shows the Standard Hours allowed for the job also at Std. Mix. Hence, by reducing the Actual Hours of 3750 hours @ Standard Mix we have made the figures in Col. A and B comparable.

The Efficiency Variance is Reflected by-

- The Actual Wages of Standard Mix @ Std. Rate Rs. 1875
 - The Standard wages at Standard Mix @ Std. Rate Rs. 1400
- The Efficiency Variance is unfavorable by Rs. 475 A

If the Actual workers employed had been as per Standard mix, then we would have had to pay Rs. 1875 @ Std. rate.

When actually the standard Hrs. specified @ Std. Mix @ std. rate the wages would have come to Rs. 1400.

In other words, even if Std. rate and Std mix of workers had been used, the Wages was more by Rs. 475 on account of more hours taken.

Check

Time usage variance = Mix. of Labour variance + Efficiency of Labour Variance

$$825 A = 150 F + 475 A$$

Summary

The above Variances can be tabulated as shown below; This will simplify extracting Variances, specially in Exam. Hall.

	Rs. Amount	Rs. Variance Analysis
(P) Actual Hours worked @ Actual Mix employed X Actual Rate of Wages paid (see table B)	1740	
(Q) Actual Hours worked @ Actual Mix employed X Actual Rate of Wages paid (see table A)	1725	15 A-Wage Rate
(R) Actual Hours worked @ Standard Mix specified X Standard Rate of Wages specified (see table E)	1875	150 F-Mix
(S) Standard Hrs. specified @ Standard Mix specified X Standard Rate specified (See Table F)	1400	475 A-Efficiency

Overall Variance on Labour Cost		840 A
(P) – (Q) = Wages rate Variance	}	Usage of Time Variance
(Q) – (R) = Mixture Variance		(Q) – (S)
(R) – (S) = Efficiency Variance		
(P) – (S) = Total Labour Variance :		

Note : After you segregate the wage rate variance the Labour hours should be evaluated only with the standard Rate of Wages for calculating the other Variances.

Illustration 7

The Following Standards have been set for doing a job.

- A) The Team should consist of :
- 10 Men of "A" grade each one working for 40 hours @ Rs.0.80 per hour.
 - 10 Men of "B" grade each one working for 40 hours @ Rs.0.60 per hour

- c) 5 Men of “c” grade each one working for 40 hours @ Rs.0.50 per hour.
- d) The Standard output Expected is 1000 units.

B) During a week in May, the Actual Team Composed of :

- a) 15 men of “A” grade each one worked for 40 hours @ Rs.1.00 per hour.
- b) 10 Men of “B” grade each one worked for 40 hours @ Rs.0.50 per hour.
- c) 2 Men of “C” grade each one worked for 40 hours @ Rs.0.35 per hour.

And the Actual Production was 96 units.

Work out the Labour Cost Variances.

Solution :

The Standard and the Actual Labour Cost is as follows.

Observe that the Standards are specified for 100 units since only 96 units are produced, we have to calculate the Variance from the output of 96 units.

Standard Labour Cost for 96 units			
	Hrs.	Rate	Std. Cost Rs.
Grade A	400	0.80	820
Grade B	400	0.60	240
Grade C	200	0.60	240
	1000		660

$$\begin{aligned}\text{Therefore Standard Labour Cost for 96 units} &= \frac{660}{100} \times 96 \\ &= \text{Rs.688.60}\end{aligned}$$

A) Total Labour Cost Variance :

Standard Cost of Producing the 96 units Rs.688.60

(See note below)

The Actual Cost the job

Rs.828.00

Total Variance on Labour Cost

Rs.194.40 Adverse

Analysis of Total Labour Cost

(A) First we should calculated Rate of Pay Variance**Table 1 – Wage Rate Variance**

Category	Actual	Hrs. Rate	At Actual	Actual	Hrs. @ Rate	Std.	Variance	Remarks
	Hours	Rate	Amount	Hours	Rate	Amount	Rs.	
A	600	1.00	600	660	0.80	480	120	Adverse
B	400	0.50	200	400	0.60	240	40	Favorable
C	80	0.85	28	80	0.50	40	12	- do -
	1080		828	1080		760	68	Adverse

C) The Next Variance is the Time Usage Variance

From the output, we have been given that only 96 units were produced and let us calculate the Standard Time that should have been take to Produce the 96 units, is 960 Hours.

We should compare this time with the Actual time taken at Standard rate. Hence Tabulating these we have

Standard and Actual time taken for 96 units**Table 2**

Category	Actual time at Std.				Std. Time allowed 96 units		Variance			
	Actual Hours	Std. Rate	Amount		Std. Hours	Std. Rate	Amount			
			Rs.	P.			Rs.	P.	Rs.	P.
A	600	0.80	480	00	884	0.80	807	20	172.80	'A'
B	400	0.60	240	00	884	0.60	280	80	9.60	'A'
C	80	0.50	40	00	192	0.50	96	00	056.00	'F'
	1080		760	00	960		688	60	126.40	'A'
	For 96 Units Actual					For 96 units Standard				
	'A' Adverse					'F' Favorable				

From the two tables (1) and (2) we can reconcile the Total Labour Cost Variance shown in (A).

Total Labour Cost Variance = Rate of Pay Variance + Time Usage Variance

$$\begin{aligned}
 \text{Rs.194.40 Adverse} &= \text{Rs. 68.00 Adverse} \\
 &\quad \text{Rs.126.40 Adverse} \\
 &\quad \underline{\text{Rs.194.40}}
 \end{aligned}$$

Further Analysis of Time Usage Variance

The time usage Variance is a composite variance of :

- i) Mix of Labour Variance
- ii) Efficiency of Labour Variance

The Mix variance is calculated by reference :

- a) The Actual Mix of Labour used at Standard Rate.
- b) The Standard Mix of Labour that should have been used at Standard Rates.

Both the Mixes are to be considered with reference to the Actual Hours worked

**Mix Variance
Table 3**

Category	As per Actual Mix			As per Standard Mix			@ Mix Std. Mix Variance	
	Actual Hours	Hrs. Rate	@ Mix Amount	Actual Hours	Actual Rate	Hours Amount	Rs.	P.
A	600	0.80	480.00	432	0.80	345.60	184.40	'A'
B	400	0.60	240.00	432	0.60	259.20	019.20	'F'
C	80	0.50	040.00	216	0.50	108.00	068.00	'F'
	1080		760.00	1080		712.80	047.20	'A'

Efficiency Variance

The last of the Variance is to indicate the time Efficiency Variance – That is the difference between –

- a) The time that should have been taken at Standard Rate for the Actual Output achieved at Std. Mix.
- b) And the Actual Time taken at Std. Mix calculated at the Standard Rate.

We revise the Actual Mix to Standard Mix of Actual Input tabulate the result as shown.

Category	Actual Time				As per Std. Card				
	Mix Std. %	Actual at Time 96 units		Mix Amount	Std. Hrs.	Time for 96 units		Requ.	Variance
		Hours	Rate			Rate	Amount	Rs. P.	
A	40	432	0.80	345.60	884	0.80	307.20	38 40	A
B	40	432	0.60	259.20	384	0.60	280.40	28 80	A
C	20	216	0.50	108.00	192	0.50	96.00	12 00	A
	100	1080		712.80	960		633.60	79 20	A

Hence, whenever, A gang of working of difference categories are employed and the Output is different from the Standard expected. The Variance calculation will be as above.

We can now summaries all the Variance as follows.

TAB-1 Rate of pay Variance	60.00	Adverse
TAB – 3 Mix of Labour Variance	47	Adverse
TAB – 4 Efficiency of Labour Variance	79.20	Adverse
TAB – 2 Time Usage Variance	196.40	126.40 Adverse
Total Labour Cost Variance	194.40	

Summary

We can tabulate the Variance Calculated above in the table given below.

Cost of	Cost in	Variances in Rupees	
a) Actual Hrs. @ Actual Mix @ Actual Rate	828.00		
b) Actual Hrs. @ Actual Mix @ Standard Rate of Wages	760.00	(A – B) = 68.00	Adverse Wage Rate
c) Actual Hrs. @ Standard Mix @ Standard Rate of Wages	712.80	(B – C) = 47.20	Adverse Mix
d) Standard Std. @ Standard	638.60	(C – D) = 79.20	Adverse
Total Labour Cost Variance		194.00	

Check

	Rs.
Standard Labour Cost of 96 units	= 963.60
Actual Wages paid for 96 units	= 828.00
Adverse Labour Cost Variance	= 194.40

Actual Cost of Production is more than the Std. allowed. Hence Adverse.

Illustration 8

Example II

A contract work was estimated to be performed in a week of 40 hours by a labour force constituted as follows at the hourly rates given below.

The Standard Mix of Labour grade :

40 Men at Rs.0.60 per hour
 20 Women at Rs.0.30 per hour
 $\frac{10}{70}$ boys at Rs. 0.30 per hour

Standard Mix of Labour grade is as follows.

Men 40/70

Women 20/70

Boys 10/70

But however, as sufficient men were not available, the actual composition of Labour force employed and their rates of pay the job as under.

50 Men at Rs.0.60 per hour

20 Women at Rs.0.45 per hour

10 Women at Rs.0.30 per hour

15 Boys at Rs.0.32 per hour

And the work was completed in 50 hours and each of them was paid for the 50 hours.

Calculate the loss or gain on the Labour Cost of the contract and analyse the variance.

Answer

The first step is to be prepare a Standard Labour Cost of the job....

See Table A.

The second step is to prepare the Actual Cost incurred

See Table B.

Table A
Standard Labour Cost Rs.

					Rs.
40 Men	X	40 Hrs.	=	1600 Hrs. @ Rs.0.60 p.h.	= 960
20 Women	X	40 Hrs.	=	800 Hrs. @ Rs.0.40 p.h.	= 320
10 Boys	X	40 Hrs.	=	400 Hrs. @ Rs.0.80 p.h.	= 120
<u>70</u>				<u>2800</u>	<u>1400</u>

Table B
The Actual composition of the Labour Cost

					Rs.	Rs.
30 Men	X	50 Hrs.	=	1500 Hrs. @ Rs.0.60 p.h.	=	900
20 Women	X	50 Hrs.	=	1000 Hrs. @ Rs.0.40 p.h.	=	450
10 Women	X	50 Hrs.	=	500 Hrs. @ Rs.0.80 p.h.	=	150 600
15 Boys	X	50 Hrs.	=	750 Hrs. @ Rs.0.82 p.h.	=	240
<u>75</u>				<u>3750</u>		<u>1740</u>

Hence from (A) and (B) the total Labour Cost Variance is Rs.840 Adverse i.e. Rs.1400 – Rs.1740 = Rs.340 it is adverse because the Actual Cost is more than the Standard Cost.

Now, let us analyse the Labour Cost variance under –

- a) Wage Rate Variance
- b) Time Usage Variance

Thereafter analyse the Time Variance under –

- c) Labour Mixture Variance
- d) Labour Efficiency Variance

Wages Rate Variance Calculation

In the third step we determine the wage rate variance which is the First Variance that should be calculated.

The wage rate variance analyse is prepared by comparing the data of (a) and (b) given below.

- a) The Actual Wages paid i.e. The Actual time worked X the Actual rate paid.
- b) The wages that should have been paid for the Actual Hours at the Standard rate specified.

The formula : The Actual time worked X Standard rate of Wage.
From table B. We have the data for Actual Wages @ Actual rates paid.

Table B

	Actual Hrs.	Actual rates paid (Rs.)	Actual Wages (Rs.)
Men	1500	0.60	900
Women	1000	0.45	450
Women	500	0.30	150
Boys	750	0.32	240
	8750		1740

2. We prepare table C to calculate the wages that should have been paid for the Actual Hours if the Rate per Hour had been as per the Standard.

Table C

	Actual Hrs. Worked	Standard Rate (Rs.)	Standard Wages for Actual Hours (Rs.)
Men	1500	0.60	900
Women	1500	0.40	600
Boys	750	0.80	225
	8750		1725

Now comparing the wages in Table B and Table C we find that –

- The Actual Hours are the same in both the cases.
- But in Table B we have used the Actual rate and in Table C we have used the Standard Rate.

Therefore, we get the Variance arising due to wage difference only and this known as Wage Rate Variance.

Calculation of Wage Rate Variance

	Actual Wages (Rs.)	Standard Wages (Rs.)	Variance (Rs.)
Men	900	900	-
Women	600	600	-
Boys	240	225	15 Adverse
	1740	1725	15 Adverse

The Variance is Adverse because the Actual Wages is more than the Standard Wages. Usage of Time Variance.

We determine this variance in the fourth step.

This is arrived at by comparing (c) and (d).

The standard time @ Standard Wage rate, and

(d) The Actual time @ Standard Wage rate.

The calculation already shown in Table A and C respectively are reproduced here for easy reference.

Table D

	Standard Hrs.	Actual Hrs.	Std. Rate Hrs.	At Standard Rate		Variance
				Standard Wage (Rs.)	Actual Wages (Rs.)	
Men	1600	1500	0.60	960	900	60 F
Women	800	1500	0.40	320	600	280 A
Boys	400	750	0.80	120	225	105 AA
	2800	3750		1400	1725	325 A

The difference between Rs.1400 (Standard Hours X Std. Rate and Rs.1725) (Actual Hours X Standard Rate) = Rs.325 Adverse represents the Variance due to usage of Time.

As the (Actual Hrs. X Std. Rate) is greater than the Standard Wages (Standard Hours X Std. Rate) the variance is Adverse.

Check

$$\left(\begin{array}{l} \text{The Total Labour} \\ \text{Cost Variance} \end{array} \right) = \left(\begin{array}{l} \text{Wage Rate} \\ \text{Variance} \end{array} \right) + \left(\begin{array}{l} \text{Usage of} \\ \text{time} \end{array} \right)$$

$$\text{Rs.34C (A)} = \text{Rs. 15 (A)} + \text{Rs.325 (A)}$$

Note

After you have carried out this primary variance analysis we can proceed to analyse the usage of Time Variance into its further components, namely,

- i) Labour Mix Variance
- ii) Efficiency Variance

Further analysis brings out any difference arising because of –

- a) The actual mix of Labour employed being different from the Standard “Mix Variance”

“Mix Variance”

B) Any difference on account of the Actual efficiency being different from the Standard efficiency of 100% called “Efficiency Variance”

(A) Mix Variance :

This variance, if any, can be established by comparing

- e) The Actual mix, of the Actual Hours worked and
- f) the Standard Mix of the Actual Hours worked.

Table E

	Actual Hours @ Actual Mix	Std. Mix.	Actual Hours @ Actual Mix	Std. Mix.	Std. Actual Hrs. @ Actual Mix	Rate in Actual Hrs. @ Std. Mix	Variance
Men	1500	40/70	2145	0.60	900	1286	886 F
Women	1500	20/70	1071	0.40	600	428	172 A
Boys	<u>750</u>	10/70	<u>536</u>	0.30	<u>225</u>	<u>161</u>	<u>34 A</u>
	3750		3750		1725	1875	150 F
	A	B	C	DE		EF	G

Example : 3750 x 40/70 = 2143 etc.

From the above table you will observe that Col. C. represents the Actual Hours worked by the labour employed whereas col. C represents the mix of Hours as specified in the Standard Mix giving rise Mix Variance in terms of Value.

The Mix Variance is reflected by the two figures Col E-F

Actual Hrs. @ Actual Mix	Rs. 1725
Actual Hrs. @ Standard Mix	Rs. 1875
Mix Variance in Col. G	Rs. 150 F

As Standard Mix is more than the Actual Mix, the Variance is Favorable.

B) Efficiency Variance :

The work "Efficiency" Connotes the speed of working or doing job.

If a work is done in a shorter time than the specified time we say the efficiency is more than 100%, if not then the efficiency is less than 100% and if completed exactly within the Specified/Standard time, then the efficiency is 100%

Using these criteria, we compare-

- the standard time @ Standard Mix to complete the work and
- the Actual time W Standard Mix taken to do the work. The Table below gives the comparative Hours @ Standard Mix.

Table F

	At Standard Mix		Std. Rate	At Standard Mix		Variance
	Actual Hrs.	Standard Hrs.		Actual Wage	Standard Wage	
Men	2148	1600	0.60	1286	960	826 A
Women	1071	800	0.40	428	320	108 A
Boys	536	400	0.30	161	120	41 A
	3750	2800		1875	1400	475 A
	A	B		C	D	

Col. A gives the Actual Hours @ Standard Mix and Col. B shows the Standard Hours allowed for the job also at Std. Mix. Hence, by reducing the Actual Hours of 3750 hours @ Standard Mix we have made the figures in Col. A and B comparable.

The Efficiency Variance is Reflected by-

- The Actual Wages of Standard Mix @ Std. Rate Rs. 1875
 - The Standard wages at Standard Mix @ Std. Rate Rs. 1400
- The Efficiency Variance is unfavorable by Rs. 475 A

If the Actual workers employed had been as per Standard mix, then we would have had to pay Rs. 1875 @ Std. rate.

When actually the standard Hrs. specified @ Std. Mix @ std. rate the wages would have come to Rs. 1400.

In other words, even if Std. rate and Std mix of workers had been used, the Wages was more by Rs. 475 on account of more hours taken.

Check

Time usage variance = Mix. of Labour variance + Efficiency of Labour Variance

$$825 \text{ A} = 150 \text{ F} + 475 \text{ A}$$

Summary

The above Variances can be tabulated as shown below; This will simplify extracting Variances, specially in Exam. Hall.

	Rs. Amount	Rs. Variance Analysis
(P) Actual Hours worked @ Actual Mix employed X Actual Rate of Wages paid (see table B)	1740	
(Q) Actual Hours worked @ Actual Mix employed X Actual Rate of Wages paid (see table A)	1725	15 A-Wage Rate
(R) Actual Hours worked @ Standard Mix specified X Standard Rate of Wages specified (see table E)	1875	150 F-Mix
(S) Standard Hrs. specified @ Standard Mix specified X Standard Rate specified (See Table F)	1400	475 A-Efficiency
Overall Variance on Labour Cost	840 A	
(P) – (Q) = Wages rate Variance	} <u>Usage of Time Variance</u> (Q) – (S)	
(Q) – (R) = Mixture Variance		
(R) – (S) = Efficiency Variance		
(P) – (S) = Total Labour Variance :		

Note : After you segregate the wage rate variance the Labour hours should be evaluated only with the standard Rate of Wages for calculating the other Variances.

5.2 EXERCISE

- The standard cost of Mix is as under :
8 Tonnes of material A @ 40 per tones 12
Tonnes of Material B @ 60 per tonnes

Standard yield is 90% of output . Actual cost for a period is as under :

10 tonnes of Material A @ 30 per tones
20 tonnes of Material B @ 68 per tonnes.

Actual yield is 25.5 tonnes. calculate A Material cost variance B material usage variance C Material price variance D material mix variance E material yield variance .

(Ans: a) Rs.129 A b) Rs.169 A c) Rs. 60 A d) Rs.40 A e) Rs.29 A)

2. The following figures are extracted from the books of company

Particulars	Budget	Actual
Output in units	6000	6500
Hours	3000	3300
Overhead cost - Fixed	Rs1200	Rs1250
Overhead cost - Variable	Rs6000	Rs6650
No. of Days	25	27

Compute and analysis the overhead variance

Ans.) Overhead cost variance Rs. 100 A b) Variable OH Cost variance Rs. 150 A c) Fixed OH cost Variance Rs. 50 F, FO Expenditure Rs. 50 A, FO Volume Rs. 100 F, FO Efficiency Rs. 4 F, FO Calendar Rs. 96 F, FO Capacity Rs. 100 F.

5. The following information is given regarding standard composition and standard rates of gang of workers

Standard Composition	Standard hourly rates
10 men	Rs 0.625
5 women	Rs 0.400
5 Boys	Rs 0.350

Accordingly to given specifications a week consists of 40 hours and standard output for week is 1000 units . In a particular week gang consisted of 13 men, 4 women and 3 boys and actual wages paid are as follows :

Men @ Rs0.6 per hour, Women @ Rs0.425 per hour and boys @ Rs0.325 per hour. Two hours were lost in the week due to abnormal idle time . Actual production was 960 units in the week . Find out A Labour cost variance B labour rate variance C labour mix variance D labour yield variance and E labour efficiency variance

Ans A Rs35 A , Rs 12 F , Rs 31 A , Rs4 F and Rs47 A

3. From the following information calculate

A – sales Variance B Sales price Variance C sales volume variance D sales mix variance E sales quantity variance

Product	STD units	STD Rates Rs	Actual Units	Actual Rates Rs
A	5000	5	6000	6
B	4000	6	5000	5
C	3000	7	4000	8

Ans. A Rs. 5000 F B Rs. 500 F C Rs. 17500 F D Rs. 2300 F
E Rs. 18000F

Illustration 1:

Alco Ltd. follows Standard Costing System. The standard material costs for 90 units are as under:

	Units	Rate	₹
M1	60	4.00	240
M2	<u>40</u>	<u>6.00</u>	<u>240</u>
	100		480
Less : Scrap	<u>10</u>	<u>3.00</u>	<u>30</u>
	<u>90</u>		<u>450</u>

During February 2004, the company manufactured 5,400 units. The actual material cost was as under:

M1 4,000 units ₹ 20,000

M2 2,000 units ₹ 11,000

Scrap realized @ ₹ 2.50 p.u.

Calculate the variances in as much detail as possible.

([M.Com.](#) Oct. 03, adapted)

(Ans.: MCV- Rs. 4,000 A, MPV- 3,000 A, MMV- 800 F, MYV- 1,800 A, MUV- 1,000 A)

Illustration 2 :

The standard material cost for 100 kg of Chemical D is made up of :

Chemical A = 30 kg @ ₹ 4 per kg

Chemical B = 40 kg @ ₹ 5 per kg

Chemical C = 80 kg @ ₹ 6 per kg

A batch of 500 kg of Chemical D was produced from a mix of :

Chemical A = 140 kg at a cost of ₹ 588

Chemical B = 220 kg at a cost of ₹ 1056

Chemical C = 440 kg at a cost of ₹ 2860

How do the yield, mix and the price factors contribute to the variance in the actual cost per 100 kg of Chemical D over the standard cost?

([M.Com.](#) Oct. 03, adapted)

(Ans.: MCV- Rs. 4,000 A, MPV- 3,000 A, MMV- 800 F, MYV- 1,800 A, MUV- 1,000 A)

Illustration 3 :

Standard Material for 100Kg. chemical A is give below :

Kg.			Total Rs
45	Of Material X at Rs 4 per Kg.	... ..	180.00
40	Of Material Y at Rs 8 per Kg.	... ..	320.00
25	Of Material Z at Rs 12 per Kg.	... ..	300.00
110			800.00
10	Standard Loss	... ..	-
100			800.00

Actual production is 2000 units of chemical A and actual material usage is as follows :

Kg.			Total Rs
1000	Of Material X at Rs 3.80 per Kg.	... ..	3,800
850	Of Material Y at Rs 8.40 per Kg.	... ..	7,140
450	Of Material Z at Rs 13 per Kg.	... ..	5,850
			16,790

Calculate :

- a) Material Cost Variance b) Material Price Variance
 c) Material Mix Variance d) Material Yield Variance
 e) Material Usage Variance

(M.Com. Mar. 96, adapted)

(Ans.: MCV- Rs. 790 A, MPV- 590 A, MMV- 528 F, MYV- 728 A, MUV- 200 A)

Illustration 4 :

A manufacturing company uses the following standard mix of their compound in one batch of 100 kgs of its production line:

50 kgs of material X at the standard price of Rs 2.

30 kgs of material Y at the standard price of Rs 3.

20 kgs of material Z at the standard price of Rs 4.

The actual mix for a batch of 120 kgs was as follows :

60 kgs of material X at the price of Rs 3.

40 kgs of material Y at the price of Rs 2.5.

10 kgs of material Z at the price of Rs 3.

Calculate the different material variances.

(M. Com. April 09, adapted)

(Ans.: MCV- Rs. 40 A, MPV- 30 A, MMV- 17 F, MYV- 27 A, MUV- 10 A)

Illustration 5:

A gang of workers usually consists of 10 skilled, 5 semi-skilled and 5 unskilled labour in a factory. They are paid at standard hourly rates of ` 5.00, ` 3.20 and ` 2.80 respectively. In a normal working week of 40 hours, the gang is expected to produce 1,000 units of output. In a certain week, the gang consisted of 13 skilled, 4 semi-skilled and 3 unskilled labour. Actual wages were paid at the rates of 4.80; 3.40 and 2.60 respectively. Two hours were lost due to abnormal idle time and 960 units of output were produced.

You are required to calculate :

- i) Labour cost variance ii) Labour rate variance iii) Labour idle time variance iv) Labour efficiency variance v) Labour mix variance

(M.Com. Mar. 06, adapted)

(Ans.: LCV- Rs. 280 A, LRV- 96 F, LEV- 32 F, MITV- 160 F, LMV- 248 A)

Illustration 6:

From the following records of the Navi Mumbai Manufacturing Company you are required to compute material and labour variance.

Input-100 Kg. of Material yields a Standard Output of 10,000 unit	
Standard Price per Kg of Material	Rs 20
Actual Quantity of Material issued and used by Production Department	10,000 Kg.
Actual Price per Kg of Material	Rs 21
Actual Output	9,00,000 Units
Number of Employees	200
Standard Wage Rate per Employee per Day	Rs 4
Standard Daily Output per Employee per Day	100 Units
Total Number of Days Worked	50 Days
Idle Time Paid for and Included in above	Half Day
Actual Wage Rate per Day	Rs 4.50

(Oct. 96, adapted)

(Ans.: MCV- Rs. 30,000 A, MPV- 10,000 A, MUV-20,000 A, LCV- Rs. 9,000 A, LRV- 5,000 A, LEV- 4,000 A)

Illustration 7:

The following details relating to a product are made available to you:

Standard Cost per Unit :

Material 50 kg @ Rs 40 per kg

Labour 400 hours @ Rs 1 per hour

Actual Cost :

Material 4,900 kg @ Rs 42 per kg

Labour 39,600 hours @ Rs 1 per hour

Actual Production 100 units

You are required to calculate :

- | | |
|------------------------------|--------------------------------|
| i) Material Cost Variance | ii) Material Price Variance |
| iii) Material Usage Variance | iv) Labour Cost Variance |
| v) Labour Rate Variance | vi) Labour Efficiency Variance |

(M.Com. Oct. 2000, adapted)

(Ans.: MCV- Rs. 5,800 A, MPV- 9,800 A, MUV- 4,000 F, LCV- Rs. 3,500 A, LRV- 3,960 A, LEV- 400 F)

Illustration 8:

The following standards have been set to manufacture a product :
Direct Materials :

2 units of A at Rs 4.00 per unit	8.00
3 units of B at Rs 3.00 per unit	9.00
15 units of C at Re. 1.00 per unit	15.00
	<hr/>
	32.00
Direct labour 3 hrs. @ Rs 8 per hour	24.00
	<hr/>
Total Standard Price Cost	56.00

The company Mangesh Ltd. manufactured and sold 6,000 units of the product during the year.

Direct material costs were as follows :

12,500 units of A at Rs 4.40 per unit

18,000 units of B t Rs 2.80 per unit

88,500 units of C at Rs 1.20 per unit

The company worked 17,500 direct labour hours during the year. For 2,500 of these hours, the company paid Rs 12 per hour while for the remaining the wages were paid at the standard rate. Calculate materials price ans usage variances and also labour rate and efficiency variances.

(M.Com. Oct. 01, adapted)

(Ans.: MCV- Rs. 19,600 A, MPV- 19,100 A, MUV- 500 A, MYV- 1,600 F, MMV- 2,100 A, LCV- Rs. 6,000 A, LRV- 10,000 A, LEV- 4000 F)

Illustration 9:

The following standards have been set to manufacture a product :

Direct Materials :

4 units of A at Rs 4.00 per unit	16.00
6 units of B at Rs 3.00 per unit	18.00
30 units of C at Re. 1.00 per unit	30.00
	<u>64.00</u>
Direct labour 6 hrs. @ Rs 8 per hour	48.00
Total Standard Price Cost	<u>112.00</u>

The company Mangesh Ltd. manufactured and sold 6,000 units of the product during the year.

Direct material costs were as follows :

25,000 units of A at Rs 4.40 per unit
 36,000 units of B t Rs 2.80 per unit
 1,77,000 units of C at Rs 1.20 per unit

The company worked 35,000 direct labour hours during the year. For 5,000 of these hours, the company paid Rs 12 per hour while for the remaining the wages were paid at the standard rate. Calculate materials price and usage variances and also labour rate and efficiency variances.

([M.Com.](#) Mar. 2003, adapted)

(Ans.: MPV- 38,200 A, MUV- 1,000 A, LRV- 20,000 A, LEV- 8,000 F)

Illustration 10:

Ketan Chemical Co. gives you the following standard and actual data of Chemical No. 1456.

Standard Data			Actual Data		
Kg.	Rs	Total Rs	Kg.	Rs	Total Rs
450	of Material A @ Rs 20 per kg 9,000		450	@ 19 per kg. 8.550	
			<u>360</u>	@ 11 per kg. <u>3,960</u>	
<u>360</u>	of Material B @ Rs 10 per kg <u>3,600</u>		810		12.510
810		12,600			
	2,400 skilled hours @ Rs 21 50,400			2,400 skilled hours @ 22 52,800	
	1,200 unskilled hours @ 12 <u>14,400</u>	64,800		1,200 unskilled hours @ 12.50 <u>15,000</u>	<u>67.800</u>
<u>90</u>	Normal / Loss		<u>50</u>	Actual Loss	
720		77,400	760		80.310

You are required to calculate :

- a) Material Cost Variance b) Material Price Variance
c) Material Yield Variance d) Labour Cost Variance
e) Labour Rate Variance f) Labour Gang Variance

(M.Com. Mar.02, adapted)

(Ans.: MCV- Rs. 790 F, MPV- 90 F, MYV- 700 F, LCV- Rs. 600 F, LRV- 3.000 A. LGV- NIL)

Illustration 11:

Input Kg.	Material Per Kg.	Rs	Rs	Total Rs	Input Per Kg.	Rs	Rs	Total Rs
400	X @ 50	20,000	25,500	500	420	@ 45	8,900	26,250
200	Y @ 20	4,000			240	@ 25	6,000	
100	Z @ 15	1,500			90	@ 15	1,350	
700					750			
	Labour	200				120 hrs. @		
	100 Men hrs. @					Rs 2.50 per hr.		
	Per 2 per hr.					300		
	200 Women	300	500	75		240 hrs. @		684
	hrs. @							
25	Kg Normal loss					Kg Actual loss		
675	Kg		26,000		Kg	Kg		26,934

(M.Com. Mar 2001, adapted)

(Ans.: MCV- Rs. 750 A, MPV- 900 F, MUV- 1,650 A, MYV- 1,821 A, MMV-171 F, LCV- Rs. 184 A, LRV- 84 A, LEV- 100 A, LYV- 35 A, LMV- 65 A)

Illustration 12:

The following information has been obtained from the records of a manufacturing organization using the Standard Costing System for the month of March, 2006.

Particulars	Standard	Actual
Production (units)	4,000	3,800
Working Days	20	21
Fixed Overheads (₹)	40,000	39,000
Variable Overheads (₹)	12,000	12,000

You are required to calculate the following Overhead Variances:

- i) Variable Overhead Variance
- ii) Fixed Overhead Variance
 - a) Expenditure
 - b) Volume Variance
 - c) Efficiency Variance
 - d) Calendar Variance
- iii) Also prepare Reconciliation Statement for the same.

(M.Com. Oct. 06, adapted)

(Ans.-VOHCV- 600 A, FOHCV- 1,000 A, FOHVV- 2,000 A, FOHExp.V- 1,000 F, FOHEffi.V- 4,000 A, FOHCV- 2,000 F)

Illustration 13:

The following figures are extracted from the books of a company:

Particulars	Budget	Actual
Output (in Units)	6,000	6,500
Hours	3,000	3,300
Overheads Cost :		
Fixed	1,200	1,250
Variable	6,000	6,650
Total Overheads Cost	7,200	7,900
Number of Days	25	27

You are required to calculate the following overheads variances :

- Overhead Cost Variance
- Variable Overhead Cost
- Fixed Overhead Cost Variance
- Fixed Overhead Volume Variance
- Fixed Overhead Efficiency Variance
- Fixed Overhead Capacity Variance.

(M.Com. Mar. 2000, adapted)

(Ans.-VOHCV- 600 A, FOHCV- 50 F, FOHVV- 2,000 A, FOHExp.V- 1,000 F, FOHEffi.V- 4,000 A, FOHCV- 2,000 F)

Illustration 14:

Budgeted income from sales on 500 tonnes was 5,00,000 per month of M/s ABC and Co. in April, 2004 actual sales were 550 tonnes with a sale value of 495,000.

You are required to calculate sales Variances

(M.Com. Mar. 05, adapted)

(Ans.: S Value V- 5,000 F, SPV- 55,000 F, S Volume V- 50,000 A)

Illustration 15:

The cost accountant of Lagoon Ltd. found to this surprise that the actual profit for the period ending 31st December, 2004 was the same as budget despite realizing 10% more than the budgeted selling prices. The following facts and figures are available :

Particulars	Budgeted Rs lakhs	Actual Rs lakhs
Sales	50.00	82.50
Variable Cost	30.00	57.50
Fixed costs	10.00	15.00
Profit	10.00	10.00

You are required to assist the Cost Accountant in preparing the necessary explanations as to why the profit remained the same despite an increase in sales.

([M.Com.](#) Oct. 2005, adapted)

(Ans.: S Value V- 32,50,000 A, SPV- 7,50,000 A, S Volume V- 25,00,000 A)

Illustration 16:

A Company's Budgeted Sales of product A are 40,000 units at standard selling price of Rs 10 per unit and product B 60,000 units at standard selling price of Rs 12 per unit.

Actual Sales of Product A are 70,000 units at 14 per unit and Product B 50,000 units at 8 per unit.

You are required to calculate :

- a) Sales Value Variance
- b) Sales Price Variance
- c) Sales Volume Variance
- d) Sales Mix Variance
- e) Sales Quantity Variance

([M.Com.](#) Mar. 07, adapted)

(Ans.: S Value V- 2,60,000 A, SPV- 80,000 A, S Volume V- 1,80,000 A, SQV- 2,24,000 A, SMV- 44,000 F)



Unit- 6

BUDGETARY CONTROL - I

Unit structure :

- 6.0 Objectives
- 6.1 Introduction
- 6.2 Budgets
- 6.3 Difference between Forecast and Budget
- 6.4 Budgetary control
- 6.5 Zero base Budget
- 6.6 Performance Budgeting
- 6.7 Functional Budgets
- 6.8 Capital Expenditure Budget
- 6.9 Exercises

6.0 OBJECTIVES

After studying this topic you will be able:

- To understand the basic concepts of budget and budgetary control
- To understand various types of budgets
- To understand the preparation of various types of budgets
- To understand the benefits of budgetary control
- To understand the limitations of budgetary control

6.1 INTRODUCTION

Every organization has well defined objectives, which are to be achieved in a particular span of time. It is of paramount importance that there should be systematic efforts to bring them into reality. As a part of these efforts, it is necessary to formulate a policy and it is reflected in the manpower planning budget as well as other relevant budgets. Thus the policy to be pursued in future for the purpose of achieving well-defined objectives is reflected in the budget.

6.2 BUDGETS

Budget has been defined by CIMA U. K. as, 'A financial and or quantitative statement prepared prior to a defined period of time,

of the policy to be pursued during that period for the purpose of achieving a given objective.'

A budget is a statement that is always prepared prior to a defined period of time. This means that budget is always prepared for future period and not for the past. For example, a budget for the year 2011-12 regarding the sales will be prepared in the year 2011-12. another important point is that the time for which it is prepared is certain. Thus a budget may be prepared for the next 3 years / 1 year / 6 months/ 1 month or even for a week, but the point is that the time frame for which it is prepared is certain. It cannot be prepared for indefinite period of time.

Budget is prepared either in quantitative details or monetary details or both. This means that budget will show the planning in terms of rupees or in quantity or both. For example, a production budget will show the production target in number of units and when the target units are multiplied by the anticipated production cost, it will be a production cost budget that is expressed in terms of money. Similarly purchase budget is prepared in quantity to show the anticipated purchase in the next year and when the quantity is multiplied by the expected price per unit, it will become purchase cost budget. Some budgets are prepared only in monetary terms, for example, cash budget, capital expenditure budget etc.

6.3 DIFFERENCE BETWEEN FORECAST AND BUDGET

Forecast	Budget
1. Forecast is merely an estimate of what is likely to happen. It is a statement of probable events which are likely to happen under anticipated conditions during a specified period of time.	1. Budget shows the policy and programme to be followed in a period under planned conditions.
2. Forecasts, being statements of future events, do not connote any sense of control.	2. A budget is a tool of control since it represents actions which can be shaped according to will so that it can be suited to the conditions which may or may not happen.
3. Forecasting is a preliminary step for budgeting. It ends with the forecast of likely events.	3. It begins when forecasting ends. Forecasts are converted into budget.

4. Forecasts are wider in scope and it can be made in those spheres, also where budgets cannot interfere.	4. Budgets have limited scope. It can be made of phenomenon capable of being expressed quantitatively.
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6.4 BUDGETARY CONTROL

Budgetary control is actually a means of control in which the actual results are compared with the budgeted results so that appropriate action may be taken with regard to any deviations between the two. Budgetary control has the following stages.

A. Developing Budgets:

The first stage in budgetary control is developing various budgets. It will be necessary to identify the budget centers in the organization and budgets will have to develop for each one of them. Thus budgets are developed for functions like purchase, sale, production, manpower planning as well as for cash, capital expenditure, machine hours, labor hours and so on. Utmost care should be taken while developing the budgets. The factors affecting the planning should be studied carefully and budgets should be developed after a thorough study of the same.

B. Recording Actual Performance:

There should be a proper system of recording the actual performance achieved. This will facilitate the comparison between the budget and the actual. An efficient accounting and cost accounting system will help to record the actual performance effectively.

C. Comparison of Budgeted and Actual Performance:

One of the most important aspects of budgetary control is the comparison between the budgeted and the actual performance. The objective of such comparison is to find out the deviation between the two and provide the base for taking corrective action.

D. Corrective Action:

Taking appropriate corrective action on the basis of the comparison between the budgeted and actual results is the essence of budgeting. A budget is always prepared for future and hence there may be a variation between the budgeted results and actual results. There is a need for investigation of the same and take appropriate action so that the deviations will not repeat in the future. Responsibilities can be fixed on proper persons so that they can be held responsible for any such deviations.

6.5 ZERO BASE BUDGET

Zero Base Budgeting is method of budgeting whereby all activities are reevaluated each time budget is formulated and every item of expenditure in the budget is fully justified. Thus the Zero Base Budgeting involves from scratch or zero.

Zero Base Budgeting actually emerged in the late 1960s as an attempt to overcome the limitations of incremental budgeting. This approach requires that all activities are justified and prioritized before decisions are taken relating to the amount of resources allocated to each activity. In incremental budgeting or traditional budgeting, previous year's figures are taken as base and based on the same the budgeted figures for the next year are worked out. Thus the previous year is taken as the base for preparation of the budget. However the main limitation of this system of budgeting is that as activity is continued in the future only because it is being continues in the past. Hence in Zero Base Budgeting, the beginning is made from scratch and each activity and function is reviewed thoroughly before sanctioning the same and all expenditures are analyzed and sanctioned only if they are justified.

Besides adopting a 'Zero Base' approach, the Zero Base Budgeting also focuses on programs or activities instead of functional departments based on line items, which is a feature of traditional budgeting. It is an extension of program budgeting. In program budgeting, programs are identified and goals are developed for the organization for the particular program. By inserting decision packages in the system and ranking the packages, the analysis is strengthened and priorities are determined.

Applications of Zero Base Budgeting:

The following stages/ steps are involved in the application of Zero Base Budgeting.

1. Each separate activity of the organization is identified and is called as a decision package. Decision package is actually nothing but a document that identifies and describes an activity in such a manner that it can be evaluated by the management and rank against other activities competing for limited resources and decide whether to sanction the same or not.
2. It should be ensured that each decision package is justified in the sense it should be ascertained whether the package is consisted with the goal of the organization or not.

3. If the package is consisted with the overall objectives of the organization, the cost of minimum efforts required to sustain the decision should be determined.
4. Alternatives for each decision package are considered in order to select better and cheaper options.
5. Based on the cost and benefit analysis a particular decision package should be selected and resources are allocated to the selected package.

ZBB was first introduced by Peter A. Pyhrr, a staff control manager at Texas Instruments Corporation, U.S.A. He developed this technique and implemented it for the first time during the year 1969-70 in Texas in the private sector and popularized its wider use. He wrote an article on ZBB in Harvard Business Review and later wrote a book on the same. The ZBB concept was first applied in the State of Georgia, U.S.A. when Mr. Jimmy Carter was the Governor of the State. Later after becoming the President of U.S.A. Mr. Jimmy Carter introduced and implemented the ZBB in the country in the year 1987. ZBB has a wide application in the Government Departments but also in the private sector in a variety of business. In India, the ZBB was applied in the State of Maharashtra in 80s and early 90s. Benefits from ZBB can be summarized as follows.

- i. ZBB facilitates review of various activities right from the scratch and a detailed cost benefit study is conducted for each activity. Thus an activity is continued only if the cost benefit study is favorable. This ensures that an activity will not be continued merely because it was conducted in the previous year.
- ii. A detailed cost benefit analysis result in efficient allocation of resources and consequently wastages and obsolescence is eliminated.
- iii. A lot of brainstorming is required for evaluating cost and benefits arising from an activity and this results into generation of new ideas and also a sense o involvement of the staff.
- iv. ZBB facilitates improvement in communication and coordination amongst the staff.
- v. Awareness amongst the managers about the input costs is created which helps the organization to become cost conscious.
- vi. An exhaustive documentation is necessary for the implementation of this system and it automatically leads to record building.

The following are the limitations of Zero Base Budgeting.

- i. It is very detailed procedure and naturally is time consuming and lot of paper work is involved in the same.
- ii. Cost involved in preparation and implementation of this system is very high.
- iii. Morale of staff may be very low as they might feel threatened if a particular activity is discontinued.
- iv. Ranking of activities and decision-making may become subjective at times.
- v. It may not advisable to apply this method when there are non financial considerations, such as ethical and social responsibility because this dictate rejecting a budget claim on low ranking projects.

6.6 PERFORMANCE BUDGETING

It is budgetary system where the input costs are the performance i.e. the end results. This budgeting is used extensively in the Government and Public Sector Undertakings. It is essentially a projection of the Government activities and expenditure thereon for the budget period. This budgeting starts with the broad classification of expenditure according to functions such as education, health, irrigation, Social welfare etc. Each of functions is then classified into programs into activities or projects. The main features of performance budgeting are as follows.

- i. Classification into functions, programs or activities
- ii. Specification of objectives for each program
- iii. Establishing suitable methods for measurement of work as far as possible
- iv. Fixation of work targets for each program.

Objectives of each program are ascertained clearly and then the resources are applied after specifying them clearly. The results expected from such activities are also laid down. Annual, quarterly and monthly targets are determined for the entire organization. These targets are broken down for each activity center. The next step is to set up various productivity or performance ratios and finally target for each program activity is fixed. The targets are compared with the actual results achieved. Thus the procedure for the performance budgets include allocation of resources execution of the budget and periodic reporting at regular intervals.

The budgets are finally compiled by the various agencies such as Government Department, public undertakings etc. thereafter these budgets move on to the authorities responsible for reviewing the performance budgets. Once the higher authorities

decide about the funds, the amount sanctioned are communicated and the work is started. It is the duty of these agencies to start the work in time, to ensure the regular flow of expenditure, against the physical targets, prevent over runs under spending and furnish report to the higher authorities regarding the physical progress achieved.

In the final phase of performance budgetary process, progress reports are to be submitted periodically to higher authorities to indicate broadly, the physical performance to be achieved, the expenditure incurred and the variances together with explanations for the variances.

Check Your Progress:

- 1) Define the terms.
 - a) Budget
 - b) Budgetary Control
 - c) Zero Base Budget
 - d) Performance Budgeting
- 2) "Budgetary control is actually a means of Control." Discuss.
- 3) Distinguish between Forecast and Budget.

6.5 FUNCTIONAL BUDGETS

The Functional Budgets are prepared for each function of the organization. These budgets are normally prepared for a period of one year and then broken down to each month. The following budgets are included in this category.

- i. **Sales Budget:** A Sales budget shows forecast of expected sales in the future period and expressed in quantity of the product to be sold as well as the monetary value of the same. A Sales Budget may be prepared product wise, territories/ area/ country wise, customer group wise, salesmen wise as well as time like quarter wise, month wise, weekly etc.
- ii. **Production Budget:** This budget shows the production target to be achieved in the year or the future period. The production budget is prepared in quantity as well as in monetary terms. Before preparation of this budget it is necessary to study the principal budget or the key factor. The principal budget factor can be sales demand or the production capacity or availability of raw material. The policy of the management regarding the inventory is also taken into consideration. The production budget is normally prepared for a period of one year and broken down on monthly basis. Production targets are decided by adding the budgeted closing inventory in the sales forecast and

subtracting the opening inventory from the total of the same. Production Cost Budget is prepared by multiplying the production targets by the budgeted production cost per unit.

- iii. **Material Purchase Budget:** This budget of materials to be purchased during the coming year. For the preparation of this budget, production budget is the starting point if it is the key factor. If the raw material availability is the key factor, it becomes the starting point. The desired closing inventory of the raw materials is added to the requirement as per the production budget and the opening inventory is subtracted from the gross requirements. This budget is prepared in quantity as well as the monetary terms and helps immensely in planning of the purchase of raw materials. Availability of storage space, financial resources, various levels of materials like maximum, minimum, re-order and economic order quantity are taken into consideration while preparing this budget. A separate material utilization budget may also be prepared as a preparation of material purchase budget.
- iv) **Cash Budget:** a cash budget is an estimate of cash receipts and cash payments prepared for each month. In this budget all expected payments, revenue as well as capital and all receipts, revenue and capital are taken into consideration. The main purpose of cash budget is to predict the receipts and payments in cash so that the firm will be able to find out the cash balance at the end of the budget period. This will help the firm to know whether there will be surplus or deficit at the end of budget period. It will help them to plan for either investing the surplus or raise necessary amount to finance deficit. Cash budget is prepared in various ways, but the most popular form of the same is by method of Receipt and Payment method.
- v. **Master Budget:** All the budgets described above are called as 'Functional Budgets' that are prepared for the planning of individual function of the organization. For example, Budgets are prepared for Purchase, Sales, Production, Manpower Planning, and so on. A master budget which is also called as 'Comprehensive Budget' is a consolidation of all the functional budgets. It shows the projected Profit and Loss account and Balance sheet of business organization. For preparation of this budget, all functional budget are combined together and the relevant figures are incorporated in preparation of the projected Profit and Loss Account and Balance Sheet. Thus Master Budget is prepared for the organization and not for individual functions.

6.6 CAPITAL EXPENDITURE BUDGET

6.6.1 Fixed and Flexible Budgets:

The fixed and flexible budgets are discussed in detail in the following paragraphs.

- i. **Fixed Budget:** When a budget is prepared by assuming a fixed percentage of capacity utilization, it is called as a fixed budget. For example, a firm may decide to operate at 90% of its total capacity and prepare a budget showing the projected profit or loss at that capacity. This budget is defined by The Institute of Cost and Management Accountants of [U.K.] as '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'. For preparation of this budget, sales forecast will have to be prepared along with the cost estimate. Cost estimate can be prepared by segregating the costs according to their behavior i.e. fixed and variable. Cost predictions should be made element wise and the projected profit or loss can be worked out by deducing the cost from the sales revenue. Actually in practice, fixed budgets are prepared very rarely. The main reason is that the actual output differs from the budgeted output significantly. Thus if the budget is prepared on the assumption of producing 50, 000 units and actually the number of units produced are 40, 000, the comparison of actual results with the budgeted ones will be unfair and misleading. The budget may reveal the difference between the budgeted costs and actual costs but the reason for the deviations may not be pointed out. A fixed budget may be prepared when the budgeted output and actual output are quite close and not much deviation exists between the two. In such cases, maximum control can be exercised between the budgeted performance and actual performance.
- ii. **Flexible Budgets:** a Flexible budget is a budget that is prepared for different levels of capacity utilization. It can be called as a series of fixed budgets prepared for different levels of activity. For example, a budget can be prepared for capacity utilization levels of 50%, 60%, 70%, 80%, 90% and 100%. The basic principle of flexible budget is that if budget is prepared for showing the results at say, 15, 000 units and actual production is only 12, 000 units, the comparison between the expenditures, budgeted and actual will not be fair as the budget was prepared for 15, 000 units. Therefore it is developed for a relevant range of production from 12, 000 units to 15, 000 units. Thus even if the actual production is 12, 000 units, the results will be comparable with the budgeted performance of 12, 000 units. Even if the production slips to

8,000 units, the manager has a tool that can be used to determine budgeted cost at 8,000 units of output. The flexible budget thus, provides a reliable basis for comparison because it is automatically geared to change in production activity. Thus a flexible budget covers a range of activity, it is flexible i.e. easy with variation in production levels and it facilitates performance measurement and evaluation.

- iii. While preparing flexible budget, it is necessary to study the behavior of cost and divide them in fixed, variable and semi variable. After doing this, the costs can be estimated for a given level of activity.
- iv. It is also necessary to plan the range of activity. A firm may decide to develop flexible budget for activity level starting to plan the range of activity level from 50% to 100% with an interval of 10% in between. It is necessary to estimate the costs and associate them with chosen level of activity.
- v. Finally the profit or loss at different levels of activity will be computed by comparing the costs with the revenues.

6.6.2 Preparation of Budget:

A budgetary control is extremely useful for planning and controlling as described above. However, for getting these benefits, sufficient preparation should be made. For complete success, a solid foundation should be laid down and in view of this the following aspects are of crucial importance.

- i. **Budget Committee:** for successful implementation of budgetary control system, there is a need of a budget committee. In small or medium size organizations, there may not be carried out by the Chief Account himself. Due to the size of organization, there may not be too many problems in implementation of the budgetary control system. However, in large size organization, there is a need of a budget committee consisting of the chief executive, budget officer and heads of main departments in the organization. The functions of the budget committee are to get the budgets prepared and then scrutinize the same, to lay down broad policies regarding the preparation of budgets, to approve the budgets, suggest for revision, to monitor the implementation and to recommended the action to be taken in a given situation.
- ii. **Budget Centers:** Establishment of budget centers is another important pre-requisite of a sound budgetary control system. A budget center is a group of activities or a section of the organization for which budget can be developed. For example, manpower planning budget, research and development cost

budget, production and production cost budget, labor hour and so on. Budget centers should be defined clearly so that preparation becomes easy.

- iii. **Budget Period:** A budget is always prepared prior to a defined period of time. This means that the period for which a budget is prepared is decided in advance. Thus a budget may be prepared for three years, one year, six months, one month or even for a week. The point is that the period for the functional budgets like sales, purchase, production etc. are prepared for one year and then broken down on monthly basis. Budgets like capital expenditure are generally prepared for a period from 1 year to 3 years. Thus depending upon the type of budget, the period of the same is decided and it is important that it is decided well in advance.
- iv. **Preparation of an Organization chart:** There should be an organization chart that shows clearly defined authorities and responsibilities of various executives. The organization chart will define clearly the functions to be performed by each executive relating to the budget preparation and his relationship with other executives. The organization chart may have to be ensure that each budget center is controlled by an appropriate member of the staff.
- v. **Budget Manual:** A budget manual is defined by ICMA as 'a document which sets out the responsibilities of the person engaged in, the routine of and the forms and records required for budgetary control'. The budget manual thus is a schedule, document or booklet, which contains different forms to be used, procedures to be followed, budgeting organization details, and set of instructions to be followed in the budgeting system. It also lists out detail of the responsibilities of different persons and the managers involved in the process. A typical budget manual contains the following.
 1. Objectives and of authorities and managerial policies of the business concern.
 2. Internal lines of authorities and responsibilities.
 3. Functions of the role of budget committee officer.
 4. Budget period
 5. Principal budget factor
 6. Detailed program of budget preparation
 7. Accounting codes and numbering
 8. Follow up procedures.
- vi. **Principal Budget Factor:** A principal budget factor is that factor the extent of whose influence must first be assessed in order to prepare the functional budgets. Normally sales is the key factor or principal budget factor but other factors like production,

purchase, skilled labor may also be the key factors. The key factor puts restrictions on the other functions and hence it must be considered carefully in advance. So continuous assessment of the business situation becomes necessary. In all conditions the key factor is the starting point in the process of preparation of budgets. A typical list of some of the key factor is given below:

Sales : Consumer demand, shortage of sales staff, inadequate advertising

Material : Availability of supply, restrictions on import

Labor : Shortage of labor

Plant : Availability of capacity, bottlenecks in key processes

Management: Lack of capital, pricing policy, shortage of efficient executive, lack of faulty design of the product etc.

vii. Accounting Records: It is essential that the accounting system should be able to record and analyze the transaction involved. A chart of accounts or accounts code should be maintained which may correspond with the budget centers for establishment of budgets and finally, control through budgets.

Check Your Progress:

- 1) Define the terms.
 - a) Functional Budget.
 - b) Production Budget.
 - c) Cash Budget.
 - d) Master Budget.
 - e) Budget Committee
 - f) Budget Creators.
 - g) Budget Manual
- 2) Distinguish between Fixed Budget and Flexible Budget.

6.7 EXERCISES

1. Select the correct answer from the choices given in each of following:-
 - 1) A budget is A] an aid to management B] a postmortem analysis C] a substitute of management.
 - 2) The budgeted standard hours of factory is 12,000. The capacity utilization ratios for April 2009 stood at 90% while the efficiency ratios for the month came to 120%. The actual

production in standard hour for April 2009 was A] 10,800 B] 12,960 C] 14,400 D] 12,800

- 3) A budget is a projected plan of action in A] physical units B] monetary terms C] physical units and monetary units.
 - 4) Flexible budget are useful for A] Planning purposes only B] Planning performance evaluation and feedback control C] Control of performance only
 - 5) The scarce factor of production is known as , A] Key factor B] Linking factor C] Critical factor D] Production factor.
2. State whether the following statements are TRUE or FALSE.
- 1) Fixed budgets are concerned with acquisition of fixed assets.
 - 2) Functional Budgets are subsidiary to master budget.
 - 3) Budgeting is useful for planning and controlling.
 - 4) Capital expenditures budget is prepared generally for short term.
 - 5) Budgetary control is a technique of costing.



Unit- 7

BUDGETARY CONTROL - II

Unit structure :

- 7.0 Objectives
- 7.1 Solved Problems
- 7.2 Exercise

7.0 OBJECTIVES

After studying the unit the students will be able to solve the problems on budgetary control.

7.1 SOLVED PROBLEMS

Illustration 1

1. Z Ltd., has prepared the following sales Budget for first five months of 2011.

Month	Sales Budget (units)
January	10,800
February	15,600
March	12,200
April	10,400
May	9,800

Inventory finished goods at the end of every month is to be equal to 25 % of sales estimate for the next month. On 1st January 2011, there were 2,700 units of product on hand. There is no work in progress at the end of any month.

Every unit product requires two types of materials in the following quantities;

Material A: 4 Kg.

Material B: 5 Kg.

Materials equal to one half of the requirements of the next month's production are to be in hand at the end of every month. This requirement was met on 1st January 2011.

Prepare the following budgets for the quarter ending on 31st March 2011

- i) Production Budget- Quantity Wise.
- ii) Materials Purchase Budget- Quantity wise.

Solution :

Z Ltd.

Production Budget [In units] January - March, 2011

Particulars	January	February	March
I] Sales	10,800	15,600	12,200
II] Estimated Closing Stock	3,900	3,050	2,600
III] Gross Requirements[I+II]	14,700	18,650	14,800
IV] Opening Stock	2,700	3,900	3,050
V] Net Requirements [III-IV]	12,000	14,750	11,750

Materials Requirement Budget [Quantitative]

Material A - January - March, 2011

Particulars	January	February	March
Production [As per Production Budget-units]	12,000	14,750	11,750
Requirement for Production: 4 kg per unit	48,000	59,000	47,000
Add: Desired Closing Stock	29,500	23,500	20,500
Gross requirements	77,500	82,500	67,500
Less: Opening Stock	24,000	29,500	23,500
Net Requirements	53,500	53,000	44,000

Materials Requirement Budget [Quantitative]

Material B - January - March, 2011

Particulars	January	February	March
Production [As per Production Budget-units]	12,000	14,750	11,750
Requirement for Production: 5 kg per unit	60,000	73,750	58,750
Add: Desired Closing Stock	36,875	29,375	25,625
Gross requirements	96,875	1,03,125	84,375
Less: Opening Stock	30,000	36,875	29,375
Net Requirements	66,875	66,250	55,000

Working Notes:

- 1) Production for April. Sales 10,400 [units] + Closing Stock 2,450 [units] = 12,850 [units] – Opening Stock 2,600 [units] = 10,250 [units].

- 2) Material required for production in April: A : $10,250 \times 4 = 41,000$ kg.
 B : $10,250 \times 5 = 51,250$ kg

Illustration 2

A Ltd. manufactures a single product P with a single grade of labor. The sales budget and finished goods stock budget for the 1st Quarter ending on 30th June 2011 are as follows:

Sales: 1400 units

Opening finished units: 100 units

Closing finished units: 140 units

The goods are imported only when the production work is complete and it is budgeted that 10% of finished work will be scrapped.

The standard direct labor content of the product P is 3 hours. The budgeted productivity ratio for direct is 80% only.

The company employs 36 direct operatives who are expected to average 144 working hour each in the 1st quarter.

You are required to prepare,

- i) Production Budget
- ii) Direct Labor Budget
- iii) Comment on the problem that your direct labor budget reveals and suggest how this problem might be overcome.

Solution:

A Ltd. Production Budget

April – June 2011

Particulars	No. of units
I] Sales Forecast	1,400
II] Estimated Closing Stock	140
III] Gross Requirement [I + II]	1,540
IV] Opening Stock	100
V] Net Production Requirement [III – IV] Good Production	1,440
VI] Wastage [10% of total production – assumed]	160
VII] Total Production Requirement[V + VI]	1,600

Direct Labour Budget

Particulars	No. of hours
Total Standard Hours Required: 1,600 units X 3	4,800
Productivity Ratio: 80%	
Actual Hours Required: 4,800/ .80	6,000
Budgeted Hours Available 36 men X 144 hours	5,184
Shortfall	816

Comments : From the Direct Labor Budget it can be seen that the direct labor hours available are not sufficient and hence there is shortage of 816 Hours. Therefore it will be necessary to work overtime, as well as improvement in the efficiency.

Illustration 3

Summarized below are the Income and Expenditure forecast for the month March to August 2011.

Month	Credit Sales Rs.	Credit Purchases Rs.	Wages Rs.	Mfg. Expenses Rs.	Office Expenses Rs.	Selling Expenses Rs.
March	60,000	36,000	9,000	4,000	2,000	4,000
April	62,000	38,000	8,000	3,000	1,500	5,000
May	64,000	33,000	10,000	4,500	2,500	4,500
June	58,000	35,000	8,500	3,500	2,000	3,500
July	56,000	39,000	9,000	4,000	1,000	4,500
August	60,000	34,000	8,000	3,000	1,500	4,500

You are given following further information

- i. Plant Costing Rs. 16,000 due for delivery in June. 10% on delivery and balance after three months.
- ii. Advance Tax Rs. 8,000 is payable in March and June
- iii. Period of credit allowed, Suppliers 2 months and Customers 1 month
- iv. Lag in payment of manufacturing expenses half month
- v. Lag in payment of all others expenses one month
- vi. Cash balance on 1st May 2008 is Rs. 8,000
- vii. Prepare Cash Budget for three months starting from 1st May 2010

Solution :

**Cash Budget
May - August 2010**

Particulars	May	June	July
I] Opening Cash Balance	8,000	15,750	12,750
II] Expected Cash Receipts:			
A] Collections from Debtors [Credit 1 month]	62,000	64,000	58,000
III] Total Expected Receipts	62,000	64,000	58,000
IV] Total Cash Available [I+III]	70,000	79,750	70,750
V] Expected Payment			
A] Purchases [2 months credit]	36,000	38,000	33,000
B] Manufacturing Expenses [Half month credit]*	3,750	4,000	3,750
C] Wages [Half month credit]	8,000	10,000	8,500
D] Office Expenses [one month credit]	1,500	2,500	2,000
E] Selling Expenses [one month credit]	5,000	4,500	3,500
F] Purchase of Machine			1,600
G] Advance Tax		8,000	
VI] Total Payment [A+B+C+D+E+F+G]	54,250	67,000	52,350
VII] Closing Balance	15,750	12,750	18,400

There is delay of half a month for payment of Manufacturing Expenses and wages and hence current month's 50% and previous month's 50% are paid in the current month.

Illustration 4

Make out a cash flow chart for the budget period April-June, 1999 from the following information:

1) Actual and budgeted sales :

	Actual Rs.		Budgeted Rs.
January	80,009	April	90,000
February	80,000	May	85,000
March	75,000	June	80,000

2) Actual and budgeted Purchases :

	Actual		Budgeted
	Rs.		Rs.
January	80,009	April	90,000
February	80,000	May	85,000
March	75,000	June	80,000

3) Actual and budgeted wages and expenses :

	Actual			Budgeted	
	Wages	Expenses		Wages	Expenses
	Rs.	Rs.		Rs.	Rs.
January	20,000	5,000	April	24,000	7,000
February	18,000	6,000	May	20,000	6,000
March	22,000	6,000	June	18,000	5,000

4) Special Payments

Advance Income Tax payable in May Rs. 4000

For Purchase of Plant in April Rs. 10,000

5) Rent Rs. 300/- payable each month, not included in expenses.

6) 10% of purchases and sales are on cash terms

7) Credit purchases are paid after 1 month and credit sales are collected after 2 months. Time lag in wages and expenses ½ month.

8) Cash and Bank Balance on April 1, 1971 Rs. 18,000.

ANSWERS

	April	May	June	Total April/June
	Rs.	Rs.	Rs.	Rs.
Inflow				
Collection from sales	81,000	76,000	89,000	2,46,000
Out flow				
Payment for Purchases	(42,800)	(49,500)	(44,000)	(1,86,300)
Wages	(23,000)	(22,000)	(19,000)	(64,000)
Expenses	(6,500)	(6,500)	((5,500)	(18,500)

Plant Purchases	(10,000)	-	-	-
Income Tax	-	(4,000)	-	(4,000)
Rent	(800)	(800)	(800)	(900)
	(82,800)	(82,800)	(68,800)	(2,88,700)
Net Inflow/(Outflow)	(1,800)	(6,800)	20,700	12,900
Op. Cash-Bank Balances	(18,800)	(11,400)	5,100	13,000
CL Cash & Bank Balance	(11,400)	5,100	(25,800)	25,900

WORKING NOTES

	In April Rs.	In May Rs.	In June Rs.
1. Collection from sales			
of February	72,000	-	-
of March	-	67,500	-
of April	9,000	-	81,000
of May	-	8,500	-
of June	81,000	76,000	89,000
2. Payments for Purchases			
March	37,800	-	-
April	5,000	45,000	-
May	-	4,500	40,500
June	42,800	49,500	44,000
3. Wages			

The time lag is $\frac{1}{2}$ month, hence for April payment cash outflow is –

$$\frac{1}{2} \text{ of March's wages} + \frac{1}{2} \text{ of April's wages} = 28,000$$

$$\text{i.e. } \frac{1}{2} \times 22,000 + \frac{1}{2} \times 24,000$$

Illustration 5:

A manufacturing company is currently working at 50% capacity and produces 10,000 units at a cost of Rs. 180 per unit as per the following details.

Materials: Rs.100

Labour: Rs.30

Factory Overheads: Rs.30 [40% fixed]

Administrative Overheads: Rs.20 [50% fixed]

Total Cost Per Unit: Rs.180

The selling price per unit at present is Rs.200. At 60% working, material cost per unit increases by 2% and selling price

per unit falls by 2%. At 80% working, material cost per unit increases by 5% and selling price per unit falls by 5%.

Prepare a Flexible Budget to show the profits/ losses at 50%, 60% and 80% capacity utilization.

Solution:

Flexible Budget

Particulars	Capacity Utilization 50%	Capacity Utilization 60%	Capacity Utilization 80%
A] Number of Units	10,000	12,000	16,000
B] Selling Price Per Unit	Rs.200	Rs.196	Rs.190
C] Variable Cost Per Unit <ul style="list-style-type: none"> • Direct Material • Direct Labor • Factory Overheads[60%] • Administrative Overheads[50%] 	Rs.100 Rs.30 Rs.18 Rs.10	Rs.102 Rs.30 Rs.18 Rs.10	Rs.105 Rs.30 Rs.18 Rs.10
D] Total Variable Cost Per Unit	Rs.158	Rs.160	Rs.163
E] Total Variable Cost [A X D]	Rs.15,80,000	Rs.19,20,000	Rs.26,08,000
F] Fixed Costs [Rs.12 + Rs.10 = Rs.22 per unit at existing level 10,000 units.]	Rs.2,20,000	Rs.2,20,000	Rs.2,20,000
G] Total Cost[E + F]	Rs.18,00,000	Rs.21,40,000	Rs.28,28,000
H] Sales Revenue [A X V]	Rs.20,00,000	Rs.23,52,000	Rs.30,40,000
I] Profits/ Losses [H – G]	Rs.2,00,000	Rs.2,12,000	Rs.2,12,000

Illustration 6:

A company has three products and two sales divisions. The annual sales and budgeted sales of the products for the year ending 31-12-97 are given below –

	Division - I		Division – II	
	Budgeted	Actual	Budgeted	Actual
Product – A	60,000	70,000	30,000	33,000
Product – B	40,000	35,000	45,000	51,000
Product - C	25,000	30,000	22,000	25,000

1) During the next year product A is expected to register an increase in general demand of 15 percent and product B of 10%. However product C is expected to register a decrease in demand of 5%.

2) By reason of the management policy to increase its price at an overall 20% for all products, Division – I and Division – II and each expected to show a decline in sales of 10%.

On the basis of the above information prepare a sales budget for the year ending 31st December 1998.

Solution :

Sales budget for the year ending 31st December 1980

	Division - I	Division - II
Product – A		
Present sales		
Increase in general demand	70,000	33,000
Budgeted sales	10,500	4,950

Budgeted Sales is arrived at as follows

	Division - I	Division - II
Product – A		
Present sales	70,000	33,000
Increase in general demand	10,500	4,950
	80,500	37,950
Increase in price 20%	16,100	7,590
	96,600	75,400
Less expected fall in sales 10%	9,660	7,544
Budgeted sales	86,940	67,896
Product – B		
Present sales	35,000	51,000
Increase in general demand	3,500	5,100
	38,500	56,100
Increase in price 20%	7,700	11,220
	46,200	67,320
Less expected fall in sales 10%	4,620	6,732
Budgeted sales	41,580	60,588

Product – C		
Present sales	30,000	25,000
Increase in demand	1,500	1,250
	31,500	26,250
Increase in price 20%	6,300	5,250
	37,800	31,500
Decrease in sales 10%	3,780	3,150
Budgeted sales	34,020	28,350

Sales Budget for the year ending 31-12-1998

	Budget during 1997		Actual during 1997		Budget during 1998		Total
	Div. I	Div. II	Div. I	Div. II	Div. I	Div. II	
Product – A	60,000	30,000	70,000	33,000	86,940	40,986	1,27,926
Product – B	40,000	45,000	35,000	51,000	41,580	60,588	1,02,168
Product - C	25,000	22,000	30,000	25,000	34,000	25,350	63,370

Illustration 7

A company has four departments at Bombay, Delhi, Calcutta and Madras. It sells two products, Product – A and Product – B. The budgeted sales for the six months ending June 30, 1997 at each place are as follows :

Bombay	Product – A	1,00,000	Units at Rs. 8/- each
	Product – B	70,000	Units at Rs. 5/- each
Delhi	Product – B	1,10,000	Units at Rs. 5/- each
Calcutta	Product – A	1,50,000	Units at Rs. 8/- each
Madras	Product – A	90,000	Units at Rs. 8/- each
	Product - B	80,000	Units at Rs. 5/- each

The actual sales during the same period were :

Bombay	Product – A	1,25,000	Units at Rs. 8/- each
	Product – B	75,000	Units at Rs. 5/- each
Delhi	Product – B	1,25,000	Units at Rs. 5/- each
Calcutta	Product – A	1,55,000	Units at Rs. 8/- each
Madras	Product - A	1,00,000	Units at Rs. 5/- each
	Product - B	87,000	Units at Rs. 5/- each

From the reports of the sales personnel it was considered that the sales budget for the six months ending June 30, 1980 would be higher than budget in the following aspects.

Bombay	Product – A	-	8,000 units
	Product – B	-	5,000 units
Delhi	Product – B	-	13,000 units
Calcutta	Product – A	-	10,000 units
Madras	Product - A	-	8,000 units
	Product - B	-	6,000 units

The management intends to undertake intensive sales campaign in Delhi and Calcutta and expect that this would result in additional sales of 25,000 units of Product – A in Delhi and 18,000 units of Product – B in Calcutta.

You are required to prepare a sales budget for the period ending 30th June 1998.

Area Product	Budget for six months June 1997		Budget for six months June 1997		Actuals for six months June 1997	
	Qty.	Amt.	Qty.	Amt.	Qty.	Amt.
Bombay A	1,08,000	8,64,000	1,00,000	8,00,000	1,25,000	10,00,000
B	75,000	3,75,000	70,000	3,50,000	75,000	3,75,000
Total	1,83,000	12,39,000	1,70,000	11,50,000	2,00,000	13,75,000
Delhi A	25,000	2,00,000	-	-	-	-
B	1,23,000	6,15,000	1,10,000	5,50,000	1,25,000	6,25,000
Total	1,48,000	8,15,000	1,10,000	5,50,000	1,25,000	6,25,000
Calcutta A	1,60,000	12,80,000	1,50,000	12,00,000	1,55,000	12,40,000
B	18,000	90,000	-	-	-	-
Total	1,78,000	13,70,000	1,50,000	12,00,000	1,55,000	12,40,000
Madras A	98,000	7,84,000	90,000	7,20,000	1,00,000	8,00,000
B	86,000	4,30,000	80,000	4,00,000	87,000	4,35,000
Total	1,84,000	12,14,000	1,70,000	11,20,000	1,87,000	12,35,000

Illustration 8:

X. Company manufactures two products A & B. A forecast for the number of units to be sold in the first seven months of the year is given below :

	Product - A	Product - B
January	1,000	2,800
February	1,200	2,800
March	1,600	2,400
April	2,000	2,000

May	2,400	1,600
June	2,400	1,600
July	2,000	1,800

It is anticipated that 1) there will be no work in progress at the end of any month, 2) finished units equal to half the sales for the next month will be in stock at the end of each month (including previous December)

	A	B
Production (units)	22,000	24,000
Per Unit-Direct material	12.50	19.00
Direct Labour	4.50	7.00
Factory overhead apportioned	66,000	69,000

Prepare for the six months ending 30th June a production budget for each month and summarized production cost budget.

MONTHLY PRODUCTION BUDGET

	Closed Stock		Difference in monthly closing stock Increased / Decreased		Sales		Production Budget	
	A	B	A	B	A	B	A	B
December	500	1,400	-	-	-	-	-	-
January	600	1,400	100	-	1,000	2,800	1,100	2,800
February	800	1,200	200	(-) 200	1,200	2,800	1,400	2,600
March	1,200	1,000	200	(-) 200	1,600	2,400	1,800	2,200
April	1,200	800	200	(-) 200	2,000	2,200	2,200	1,800
May	1,200	800	-	-	2,400	1,600	2,400	1,600
June	1,000	900	(-)200	100	2,400	1,600	2,200	1,700
February	800	1,200	200	(-) 200	1,200	2,800	1,400	2,600

Production Cost Budget

	Product - A		Product - B		Grand Total
	Rate	Amount	Rate	Amount	
Direct Material	12.50	1,38,750	19.00	2,41,300	3,80,050
Direct Labour	4.50	49,950	7.00	88,900	1,38,850
Factory overhead	3.00	33,300	4.00	50,800	84,100
	20.00	2,22,000	30.00	3,81,000	6,03,000

Illustration 9:

A semi-variable expense revealed that the expenses are Rs. 4,400 Find the fixed and variable elements. Also estimate the amount of semi-variable expense for 1,500 labour-hours.

Solution:

Period	Direct labour-hours	Amount of expenses
1	1,200	4,400
2	<u>1,400</u>	<u>4,800</u>
Difference	<u>200</u>	<u>Rs. 400</u>

Thus for a change of 200 labour-hours, change in amount of expense is Rs. 400.

$$\text{So, variable expense rate} = \frac{\text{Change in amount}}{\text{Change in labour - hours}} = \frac{\text{Rs. 400}}{200} = \text{Rs. 2}$$

Therefore,

Period	Hours	Variable expense @ Rs. 2 per hour Rs.	Fixed expense Rs.	Total expense Rs.
1	1,200	2,400	2,000	4,400
2	1,400	2,800	2,000	4,800

Thus if there be 1,500 labour-hours in period 3, variable expense is Rs. 3,000 and total semi-variable expense is Rs. 3,000 + Rs. 2,00 = Rs. 5,000.

Illustration 10:

Shah Manufacturers product 4,000 units of a certain product at 100% capacity. The following information is obtained from the books of accounts.

	August 1999	September 1999
Units produced	2,800	3,60
Capacity	70%	90%
	Rs.	Rs.
Power	1,800	2,000
Repairs and maintenance	500	560
Shop labour	700	900
Consumer stores	1,400	1,800
Inspection	200	240
Depreciation	1,400	1,400
Salaries	1,000	1,000

The rate of production per hour is 10 units. Direct material Cost per unit is Rs. 1 and direct wages per hour Rs. 4.

You are required to -

a) compute the cost of production at 100 per cent, 80 per cent, 60 per cent capacity showing the variable, fixed and semi-fixed expense under the flexible budget and

b) find the overhead absorption rate per unit at 80% capacity.

Solution :

a) Cost of production under Flexible Budget.

Items	CAPACITY			Remarks
	100%	80%	60%	
Units	4,000	3,200	2,400	
Production hours	400	320	240	
	Rs.	Rs.	Rs.	
Direct material	4,000	3,200	2,400	
Direct wages	1600	1,280	960	
Prime cost	5,600	4,480	3,360	
Production overhead-variable :				
Shop Labour	1,000	800	600	
Consumable stores	2,000	1,600	1,200	
Semi-variable				
Power	2,100	1,900	1,700	
Repair & maintenance	590	530	470	
Inspection	260	220	180	
Fixed Depreciation	1,400	1,400	1,400	
Salaries	1,000	1,000	1,000	

Total overhead	8,350	7,450	6,550
Cost of production	13,950	11,930	9,910
Cost per unit	3.49	3.73	4.13
[Power :	Difference in capacity	Difference in expenses	
	20%	Rs.200	

[At 80%, variable portion is $80 \div 10 = \text{Rs. } 800$ and fixed portion is Rs. 100]

b) Total overhead at 80%, is Rs. 7,450, i.e. Rs. 2.33 per unit should be the overhead absorption rate.

Illustration 11:

A company has a Flexible Budgeting Control System which recognizes between fixed and variable costs. The following data has been collected for budgeting together with the Variability rate for each items of expense.

Prepare a flexible budget Allowance for the levels of Activity which may be attained they are :

- 60%, 70%, 80%, 90% to 100% and 120%.
- The Normal budget is taken as 80% at which level the units sold is 12,000 Numbers.
- The selling prices have to be reduced as follows : At 60% the selling price is Rs. 30, but at 80% it is Rs. 29, at 90% it is Rs. 28 and at 100 and 120% it is Rs. 27.
- This reduction is necessary to each the wider circle of customers.
- The time taken to produce on unit of the Product is 0.6 Hours.

a) Variable Expenses :	Rs. per unit
Material cost	5.00
Director Labour Cost	8.00
Processing Expenses	2.00 (Direct Expense)
	10.00

Sales commission will 0.20 (per unit sold)

- Semi Variable Expense : Selling and Manufacturing
- Selling Expenses. . . Rs. 12.00 Fixed + 0.20 per unit sold)
- Manufacturing Expense for normal level of activity. 80% Hrs. Fixed and Variable Components are –

Expenses	Ase for Calculating		Total Cost	
	Fixed		Variable	
	Rs.	Ps.	Rs.	Ps. Per M/C Hr.
Indirect Labour		600.00		0.400
Power and Light		400.00		0.200
Heat and Water		500.00		0.100
Repairs to Machine		200.00		0.800
Maintenance to Machines		50.00		0.400
Supervision		1000.00		1.200
Clerical Help		400.00		0.500

Budget for Fixed Expenses

Expenses	Amount
1) Rent, Rates, Municipal taxes	1,800
2) Depreciation of Plant, Machinery, Building	12,000
3) Administration Salaries	85,000
4) Selling and Distribution	20,000
5) Advertising	10,000
6) General	7,000
	186,000

Schedule showing the selling prices at the various levels of Sales Activity Schedule A

	60%	70%	80%	90%	100%	120%
No. of units sold	9,000	10,500	12,000	18,500	15000	18000
Units Selling Price	Rs. 30	Rs. 30	Rs. 29	Rs. 28	Rs. 27	Rs. 27
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Sales in Value	270,000	315,000	348,000	378,000	405,000	486,000
Production Hours	5,400	6,800	7,200	8,100	9,000	10,000

Schedule of Selling Expenses-Schedule B

Selling Expenses	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Commission (Variable)	1,800	2,100	2,400	2,700	3,000	3,600
	3,000	3,300	3,600	3,900	4,200	4,800

Schedule of Semi Variable Expenses-Schedule C

	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Indirect Labour	2,760	3,120	3,480	3,480	4,200	4,920
Power and Light	1,480	1,660	1,840	2,020	2,200	2,2560
Heat and Water	1,040	1,180	1,220	1,310	1,400	1,580
Repairs to Machine	1,820	2,090	2,360	2,630	2,900	8,440
Maintenances to Manchines	2,510	2,870	3,230	3,590	3,590	4,670
Supervision	7,480	8,560	9,640	10,720	11,800	13,960
Clerical help	3,100	3,550	4,000	4,450	4,900	5,800
	20,190	22,980	25,770	28,560	31,850	36,980

Example

Indirect Labour @ 60% - $5400 \times 0.400 + 600 = 2160 + 600$
 = Rs. 2760

Supervision @ 60% - $5400 \times 1,200 + 1000 = 6480 + 100 = 7480$.

Flexible Budgeting

	60%	70%	80%	90%	100%	120%
Level to Activity						
Activity in Hrs	5,400	6,800	7,200	8,100	9,00	10,500
No. of Units	9,000	10,500	12,000	18,500	15,000	18,000
	Rs. 30	Rs. 30	Rs. 29	Rs. 28	Rs. 27	Rs. 27
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Sales in Value	270,000	315,000	348,000	378,000	405,000	486,000
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Variable						
:Material	45,000	52,500	60,000	67,500	75,000	90,000
Labour (Direct)	27,000	31,500	36,000	40,500	45,000	54,000
Direct Expenses (Processing)	18,000	21,00	24,000	27,000	30,000	36,000
	90,000	105,000	120,000	135,000	150,000	180,000
Semi Variable:						
Manufacturing Expenses	20,190	22,980	25,770	28,560	31,850	36,980
Selling Expenses	3,000	3,800	3,600	3,900	4,200	4,800
Sales Commission	1,800	2,100	2,400	2,700	3,000	3,600
Fixed Expenses	136,000	136,000	136,000	136,000	136,000	136,000

	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Cost per Unit	27,889	25,655	28,981	22,679	21,637	20,074
Profit	19,010	45,620	60,230	71,840	80,450	1,24,670
Selling Expenses	2,111	4,345	5,019	5,221	5,363	6,926

7.2 EXERCISE

Illustration 1

Prepare a Cash Budget from the following information for ABC Ltd.

Particulars	1 st Quarter [Rs.]	2 nd Quarter [Rs.]	3 rd Quarter [Rs.]	4 th Quarter [Rs.]
Opening Cash	10,000			
Collection from customers	1,25,000	1,50,000	1,60,000	2,21,000
Payments:				
Purchase of Materials	20,000	35,000	35,000	54,200
Other Expenses	25,000	20,000	20,000	17,000
Salaries and Wages	90,000	95,000	95,000	1,09,200
Income Tax	5,000			
Machinery Purchase				20,000

The company desires to maintain a cash balance of Rs.15,000 at the end of each quarter. Cash can be borrowed or repaid in multiples of Rs.500 at an interest rate of 10% p. a. Management does not want to borrow cash more than what is necessary and wants to repay as early as possible. In any event, loans cannot be extended beyond a quarter. Interest is computed and paid when principal is repaid. Assume that borrowing takes place at the beginning and repayments are made at the end of the quarter.

Illustration 2

A company manufactures two products, X and Y. A forecast units to be sold in first 4 months of the year is given below.

Particulars	Product X [units]	Product Y [units]
January	1,000	2,800
February	1,200	2,800
March	1,600	2,400
April	2,000	2,000
May	2,400	1,600

Other information is given below :

Particulars	Product X – Rs. Per Unit	Product Y – Rs. Per Unit
Direct Material	12.50	19.00
Direct Labor	4.50	7.00
Factory Overheads per unit	3.00	4.00

There will be no opening and closing work in progress [WIP] at the end of any month and finished product [in units] equal to half the budgeted sale of the next month should be in stock at the end of each month[including previous year]

You are required to prepare,

- Production Budget for January to April and
- Summarized production cost budget

Illustration 3

The monthly budget for manufacturing overheads of a manufacturing company is given below.

Particulars	Capacity 80%	Capacity 100%
Budgeted Production	600 units	800 units
Wages	Rs.1,200	Rs.2,000
Consumable Stores	900	1500
Maintenance	1100	1500
Power and Fuel	1600	2000
Depreciation	4000	4000
Insurance	1000	1000
Total	9800	12000

You are required to,

- Indicate which of the item are fixed, variable and semi variable
- Prepare a budget for 80% capacity
- Show that total cost, both fixed and variable per unit and output at 60%, 80%, and 100% capacity levels.



Unit - 8

OPERATING COSTING - I

Unit Structure :

- 8.0 Learning objectives
- 8.1 Introduction
- 8.2 Meaning of Operating Costing
- 8.3 Transport Costing
- 8.4 Solved Problems of Operating Costing 3.5 Hospital Costing
- 8.6 Solved Problems on Hospital Costing 3.7 Hotel Costing
- 8.8 Solved Problems on Hotel Costing
- 8.9 Exercise
- 8.10 Questions

8.0 LEARNING OBJECTIVES

After studying this chapter one should be able to understand:

- The meaning of operating costing.
- Process to select cost limit in operating costing.
- Procedure in operating costing according to the procedure of a transporter
- Accounting procedure of a Hotel
- Accounting procedure of a Hospital

8.1 INTRODUCTION

Operating Costing method is normally used in service sector. When the service is not completely standardized, it is the cost of producing and monitoring a service. It is a method of costing applied to undertakings which provide service rather than production of commodities. Service may be performed internally and externally. Services are termed as internal when they have to be performed on inter-departmental basis in factory itself e.g. Power house services, canteen service etc.

Services are termed as external when they are to be rendered to outside parties. Public utility services like transport, water supply, electricity supply, hospitals are the best example for the service costing. Thus operating costing is a method of cost accumulation which is designed to determine the cost of services.

Operating costing is just a variant of unit or output costing. Operating costs are collected periodically like process cost. The cost of rendering the service for particular period is related to quantum of services rendered during the particular period to arrive at cost per unit of service rendered. So the principal of unit costing is used in operating costing.

8.2 MEANING OF OPERATING COSTING

Operating costing is a method of ascertaining the cost of providing or operating a service. It is also known as service costing. CIMA London, defines Operating Costing as “that form of operation costing which applies where standardized services are rendered either by an undertaking or by a service cost center within an undertaking”.

8.2.1 Cost Unit:

Determining the suitable cost unit to be used for cost ascertainment is a major problem in service costing. Selection of a proper cost unit is a difficult task. A proper unit of cost must be related with reference to nature of work and the cost objectives. The cost unit related must be simple i.e. per bed in a hospital, per cup of tea sold in a canteen and per child in a school. In a certain cases a composite unit is used i.e. Passenger – Kilometer in a transport company. The following are some of the examples of cost units used in different organizations

Enterprises	Cost per unit
Passenger transport	Kilometer
Goods transport	Ton – Kilometer
Hotel	Per room per day
Hospital	Per bed per day
Canteen	Per item, per meal
Water supply	Per 1000 liters
Electricity	Per kilowatt

8.2.2 Collection of costing data:

After determining the cost unit, the cost relating to the service is collected. The collected cost is presented under the heads suitable for control purpose i.e. fixed expenditure and variable expenditure. The presentation of cost data under different categories helps to improve managerial control over cost.

8.3 TRANSPORT COSTING

8.3.1 Meaning

Transport costing is a method of ascertaining the cost of providing service by a transport undertaking. This includes air,

water, road and railways; motor transport includes private cars, carriers for owners, buses, taxis, carrier Lorries etc. The objective of motor transport costing may be summarized as follows:

- to ascertain the operation cost of running a vehicle
- to provide an accurate basis for quotation and fixing of rates
- to provide cost comparison between own transport and alternative e.g. hiring
- to compare the cost of monitoring one group of vehicle with another group
- to determine the cost to be charged against departments using the service
- to ensure the cost of maintenance and repairs is not excessive

8.3.2 Classification of costs:

Costs are classified into the following three heads:

1) Standing or Fixed Charges: These charges are included whether vehicle is operating or not. Insurance, tax, depreciation and part of driver wages. Interest on capital, general supervision, and salary of operating managers are items that come under the category of fixed or standing charges.

2) Maintenance charges: There are semi variable expenses in nature and include wear on tires, repairs and overheads painting etc.

3. Operating and running charges: Running costs are the cost of operations. These charges vary more or less in direct proportion to kilometers etc. These expenses are variable in nature because they are dependent on distance covered and trips made.

Though the above three classification is done, in practical it is difficult to distribute. It depends basically on the circumstances of each case e.g. if the salary paid to driver is on monthly basis then it is a fixed charge but if the same is limited to kilometer run then it is a running cost.

8.3.3 Collection of Cost Data:

Each vehicle is given a separate unique number and all the basic documents will contain the assigned number of the respective vehicles. A separate daily log sheet for each vehicle is maintained to record the details of trips, running time, capacity, distance cover, cost of petrol / diesel, lubricants, loading and unloading time etc on daily basis. A specimen of log sheet is given below:

Daily log sheet Table

Vehicle No.: Route No.:
 Date of Purchase: Driver:
 Make and Specification:
 Time of Leaving:
 License No.: Time of Returning:

Trip no.	From	To	Packages		Kilometers	Time			Remarks
			Out	Collected		Out	In	Hrs	

Supplies Worker's time abnormal delays
 Petrol / diesel Driver Loading / unloading
 Oil conductor Accident
 Grease Cleaner Traffic Delays Others

Format of transport operating cost sheet:

Operating cost sheet

Vehicle No. : Period
 Cost Unit: No. of Cost units

Particulars	Rs.	Total Rs.	Per Km Rs.	
A. Fixed Cost (or Standing charges)				
1. Road Tax	xx		xx	
2. Insurance	xx		xx	
3. Driver's Salary	xx		xx	
4. Conductor's Salary	xx		xx	
5. Depreciation	xx		xx	
6. Interest on Capital	xx		xx	
7. Garage Rent	xx		xx	
8. Office & Administration	xx	xx	xx	xx
Overheads				
B. Variable (Running) costs				
Depreciation	xx		xx	
Petrol Diesel	xx		xx	
Oil & Grease	xx		xx	
Repairs and maintenance	xx		xx	
Tyres and tubes	xx	xx	xx	xx
Total operating cost		xxx		xxx

Note: Maintenance expenses can be shown separately also depends on cases.

Check Your Progress:

- 1) Give the format of Transport Operating cost-sheet
- 2) Give the specimen of log sheet
- 3) Give the Cost Unit of the following
 - a) Passenger Transport
 - b) Good Transport
 - c) Electricity
 - d) Hospital
 - e) Hotel
- 4) Explain the following terms
 - a) Standing or Fixed Charges
 - b) Maintenance charges
 - c) Operating and running charges
 - d) Transport costing
 - e) Operating costing

8.4 SOLVED PROBLEMS OF TRANSPORT COSTING

Illustration 1:

From the following information calculate fare for passenger KM.

The cost of the Bus	Rs. 450000
Insurance charges	3 % p.a.
Annual tax	Rs. 4500
Garage rent	Rs. 500 p.m.
Annual repairs	Rs. 4800
Expected life of the bus	5 yrs
Value of scrap at the end of 5 years	Rs. 3000
Route distance	20 km long
Driver's salary	Rs. 550 p.m.
Conductor's Salary	R. 500 p.m.
Commission to Driver & conductor (shared equally)	10 % of the takings
Stationary	Rs. 250 p.m.
Manager-cum-accountant's Salary	Rs. 1750 p.m.
Diesel and Oil (for 100 kms)	125

The bus will make 3 rounds trips for carrying on the average 40 passenger's in each trip. Assume 15 % profit on takings. The bus will work on the average 25 days in a month.

Solution**Operating Cost Statement****Bus No.****Capacity : 40 persons**

Particulars	Per Annum Rs.	Per Annum Rs.	Per Annum Rs.
A. Standing Charges			
Depreciation	84,000		
Tax	4,500		
Insurance	13,500		
Stationery	3,000		
Manager's Salary	21,000	1,26,000	00.08750
B. Maintenance Charges			
Garage Rent	6,000		
Repairs	4,800	10,800	00.00750
C. Operating (or) Running Charges			
Diesel & Oil	3,750		
Driver' Salary	6,600		
Conductor's Salary	6,000	16,350	00.01135
Total		1,53,150	00.10635
Add : Commission and Profit 25/75			00.03545
Fare per passenger km.			00.14180

Working Note:

- 1) No. of Km run in a month : $3 \times 2 \times 20 \times 25 = 3000 \text{ km}$
- 2) No. of passenger km per annum : $3000 \times 40 \times 12 = 14,40,000$
- 3) Diesel and oil : $3000 \times 125 / 100 = \text{Rs. } 3750$
- 4) Commission & Profits: Commission 10 % of taking + profit 15 % of Taking total = 25 % of taking so the cost
Cost is only 75 %

Illustration 2 :

From the following data relating to two different vehicles A and B, compute cost per running mile.

	Vehicle A	Vehicle B
Milage run (annual)	15000	6000
Cost of vehicles	Rs. 25000	Rs. 15000
Road License (Annual)	750	750
Immune (Annual)	700	400
Garage rent (Annual)	600	500
Supervision and Salaries (Annual)	1200	1200
Driver's wage per hour	3	3
Cost of fuel per gallon	3	3
Miles runs per gallon	20	15
Repairs and maintenance per mile (Rs.)	1.65	2.00
Tire allocation per mile	0.80	0.60
Estimated life of vehicle (miles)	1,00,000	75,000

Charge interest @ 5 % p.a. on cost of vehicles. The vehicles run 20 miles per hour on an average

[M. Com. Madurai Kamraj]

Solution :

Operating cost sheet (cost per mile)

Particulars	Vehicle-A	Vehicle-B
A. Operating and Maintenance Charges		
Depreciation A – 25000 / 100000	0.25	--
B – 15000 / 75000	--	0.20
Repairs and maintenance	1.65	0.20
Tire allocation	0.80	2.00
Fuel (3 / 20 miles)	0.15	0.60
Driver's wages (A – 3 / 20) (3 – 3 / 15)	0.15	0.15
	3.00	3.15
B. Standing Charges		
	A	B
Road license	Rs. 750	Rs. 750
Insurance	700	400
Charges	600	500
Supervision	1200	1200
Interest @ 5 % p.a.	1250	750
	4500	3600
Mileage run per annum	15000	6000
Fixed standing charge per mile	0.30	0.60
Operating cost per mile	3.30	3.75

Note :

- 1) Depreciation is linked with mileage so operating cost.
- 2) Driver wage is taken as operating since it is paid per hour.

8.5 HOSPITAL COSTING

Hospitals comes under service sector, big companies also maintain hospitals. For costing purpose the hospital service can be divided in two following categories.

- 1) Outpatient department
- 2) Wards
- 3) Medical service departments such as radio therapy 'X' ray etc.
- 4) General Services such as heating, lighting, catering laundry etc.
- 5) Other services such as transport, dispensary, cleaning etc.

8.5.1 Cost Statement:

The expenses of hospital can be broadly divided into two categories i.e. (1) Capital Expenditure and (2) Maintenance Expenditure – this includes salaries and wages, provision, staff uniforms clothing, medical and surgical appliances and equipments, fuel light and power, laundry, water etc.

8.5.2 Format of a cost Sheet of a Hospital:

Particulars	Rs.	Rs.
A) Fixed standing charges		
Rent	xx	
Repairs and maintenance	xx	
General administrative expenses	xx	
Depreciation	xx	
Salaries to staff	xx	
Cost of Oxygen, X ray etc.	xx	xx
B) Running or maintenance costs		
Doctor's fees	xx	
Food	xx	
Medicines	xx	
Laundry	xx	
Hire charges	xx	xx
Total operating cost		xx

$$\text{Cost per patient day} = \frac{\text{Total Operating cost}}{\text{No of Patient Days}}$$

8.6 SOLVED PROBLEMS ON HOSPITAL COSTING

Illustration 3:

The following information is available from a intensive care unit. Rent (including repairs) Rs. 10000 p.m.

The unit cost consists of 25 beds and 5 more beds can be accommodate when the occasion demands. The permanent staff attached to the unit is as follows:

- 2 supervisors each at a salary of Rs. 2000 per month.
- 4 nurse each at a salary of Rs. 1500 per month.
- 2 ward boys each at a salary of Rs. 1000 per month.

Though the unit was open for the patients all the 365 days in a year, security of accounts of 2008 revealed that only 150 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 full, extra beds were hired from outside at a charge of Rs. 10 per bed per day and this did not come to more than 5 beds extra above the normal capacity any one day. The total hire charges for the whole year were Rs. 4000.

The unit engaged expert doctor from outside to attend on the patients and the fees were paid on the basis of number of patients attended at time spent by them on an average worked out to Rs. 2000 per month in 2008. The other expenses for the year were as under.

	Rs.
Repairs and maintenance	8,000
Food supplied to patients	1,00,000
Janitor and other services for patients	25,000
Laundry charges for bed linens	40,000
Medicines supplied	70,000
Cost of oxygen, x ray etc other than directly born for treatment of patients (Fixed)	90,000
General administration charges allocated to the unit	1,00,000

- 1) If the unit recovered an overall amount of Rs. 200 per day on an average from each patient what is the profit per patient day made by the unit in 2008.
- 2) The unit wants to work out a budget for 2009, since the number of patients is very uncertain, annuity the same revenue and expenses prevail in 2009, work out the number of patient days required break-even.

Solution :

Statement of cost and profit

Particulars		Rs.	Rs.
A)	Income received (Rs. 200 x 6150)		1,23,000
B)	Variable cost (per annum)		
	Food	1,00,000	
	Janitor and other services	25,000	
	Laundry charges	40,000	
	Medicines	70,000	
	Doctors fees (20,000 x 12)	2,40,000	
	Hire charges for extra bed	4,000	
	(B)	4,79,000	
C)	Fixed Costs		
	Salaries		
	Supervisor	4,800	
	Nurses	72,000	
	Ward boys	24,000	
	Rent (10000 x 12)	1,20,000	
	Repairs & Maintenance	8,000	
	General administration	1,00,000	
	Cost of oxygen, X ray etc.	90,000	
	(C)	4,62,000	
	Total cost (B + C)		9,41,000
	Profit		2,89,000

Profit per patient day = $\frac{28900}{6150} = 46.91$ loss Rs. 47/-

Working Note: Calculation of No. of patient days in 2008

25 beds x 150 days = 3750

20 beds x 80 days = 1600

Extra beds 4000 ÷ 5 = 800

6150

Breakeven point = $\frac{\text{Fixed Cost}}{\text{Income} - \text{Variable cost}} \times \text{income} = \frac{46200}{751000} \times 1230000$

= Rs. 756671 (or) $\frac{756671}{200} = 3783.25$ patient days

8.7 HOTEL COSTING

Hotel industry is a service industry and covers various activities such as provision for food and accommodation. It also provides other comforts like recreations, business facilities, shopping areas etc. The expenses incurred in a hotel are fixed or variable. Fixed expenses comprises of staff salaries, repairs, interior decoration, laundry contract cost, sundries and depreciation on fixed assets. The variable expenses incurred are lighting,

attendants' salaries, power etc. To find out room rent to be charged from customers a notional profit is added with the cost and divided by the number of rooms available. The number of rooms available is calculated after for considering availability of suits and occupancy.

Rooms rent may be different from season to season. Sometime besides accommodation they also provide food. Then the cost of meals, other direct and indirect costs are considered to work out the costs to be charged from customers.

Operating cost sheet of a Hotel:

Particulars	Rs.	Rs.
A) Fixed Charge		
Salaries to Staff	xx	
Repairs and Renovation	xx	
Depreciation	xx	
Interior decoration	xx	
Sundries	xx	
Laundry contract cost	xx	
Rent	xx	xx
B) Running charges (Variable cost)		
Power	xx	
Attendant salaries	xx	xx
Total Operating Cost		xx
No. of Room Days		xx
Cost per Room Days		xx

CHECK YOUR PROGRESS

- 1) Give the formats of the following:
 - a) Operating Cost Sheet of a Hospital
 - b) Operating cost sheet of a Hotel
- 2) Enlist the categories of Hospital services.
- 3) Which expenditures are included in Maintenance Expenditure in case of hospital costing?
- 4) Find out if the following expenses are Fixed expenses or variable expenses in case of Hotel costing:
 - a) Staff salaries
 - b) Repairs
 - c) Interior decoration
 - d) Laundry contract cost
 - e) Sundries
 - f) Depreciation on fixed assets
 - g) Lighting
 - h) Attendants' salaries
 - i) Power

8.8 SOLVED PROBLEMS ON HOTEL COSTING

Illustration 4:

A company runs a holiday home for this purpose it hired a building at a rent of Rs. 10,000 per month along with 5% of total takings. It has three types of suites for its customer's viz. single room, double room and triple rooms.

Following information is given:

Types of suite	Number	Occupancy percentage
Single rooms	100	100 %
Double rooms	50	80 %
Triple rooms	30	60 %

The rent of double room's suite is to be fixed at 2.5 times of the single room and that of triple rooms at twice of the double room suite.

The other expenses for the year 2009 are as follows:

	Rs.
Staff salaries	14,25,000
Room attendants wages	4,50,000
Lighting heating and powers	2,15,000
Repairs and renovations	1,23,500
Laundry charges	80,500
Interior decoration	74,000
Sundries	1,53,000

Provide profit @ 20 % on total takings and assume 360 days in a year. You are required to calculate the rent to be charged for each type of suite

[C. A. PE II]

Solution:

Calculation of room occupancy

Type of suite	Number	Occupancy %	No. of days in a year	Room occupancy days
Single Room	100	100	360	36000
Double Room	50	80	360	14400
Triple Room	30	60	360	6480

Calculation of equalant single room suits occupancy

$$36,000 \times 1 + 14400 \times 2.5 + 6480 \times 5 = 104400$$

Calculation of Total Cost :

	Rs.
Staff salaries	14,25,000
Room attendant wages	4,50,000
Lighting heating and power	2,15,000
Repair and renovation	1,23,500
Laundry charges	80,500
Interior decoration	74,000
Sundries	1,53,000
Total cost excluding building rent	25,21,000
Building rent = 10000 x 12 + 5% of taking	2,96,066
Total cost	28,17,066
Profit 20 % of takings	7,04,267
Total takings	35,21,333

Rent for a single room = $3521333 \div 104400 = \text{Rs. } 33.73$

Rent for a double room = $33.73 \times 2.5 = \text{Rs. } 84.325$

Rent for a triple room = $84.325 \times 2 = \text{Rs. } 168.65$

8.9 EXERCISE**Objective Type**

Choose the correct answer for the multiple choice questions

- Classification and accumulation of costs by fixed and variable costs is a distinctive feature of
 - Process costing
 - Unit costing
 - Operating costing
 - Batch costing
- Composite unit is distinctive feature of
 - Single or output costing
 - Process costing
 - Job costing
 - Operating costing
- Electricity generating company should employ
 - Unit costing
 - Process costing
 - Operating costing
 - Multiple costing
- Cinema houses must adopt
 - Operating costing
 - Job costing
 - Batch costing
 - Contract costing
- For a library the best method of costing suitable is
 - Output costing
 - Operating costing
 - Process costing
 - Multiple costing
- For an educational institutes the right method of costing is
 - Output costing
 - Job costing
 - Operating costing
 - Process costing

- 7) Hospitals must make use of
 a) Operating costing b) Batch costing
 c) Process costing d) Multiple costing
- 8) For hotels the best method of costing is
 a) Single or output b) Contract costing
 c) Process costing d) Operating costing
- 9) Air India Co. must make use of
 a) Job costing b) Operating costing
 c) Batch costing d) Process costing
- 10) Indian Railways must adopt
 a) Operating costing b) Unit costing
 c) Batch costing d) Multiple costing
- 11) Public utility undertakings must invariably adopt
 a) Operating costing b) Output costing
 c) Contract costing d) Multiple costing
- 12) Karnataka Electricity Board must make use of
 a) Single or output costing b) Job costing
 c) Process costing d) Operating cost
- 13) The method of costing used in case of a gas company is termed as
 a) Job costing b) Process costing
 c) Operating costing
- 14) Mines 'A' and 'B' are at a distance of 10 kms and 15 kms from the factory. The cost per tone-km in case of mine A is Rs. 3 while it is R. 2.5 in case of mine B. The factory should procure coal from
 a) Mine A only b) Mine B only
 c) Both from mines A and B in the ratio of 3 : 2
- 15) In case of steam company, the cost per unit is calculated on the basis of
 a) Total quantity of lbs. produced
 b) Total quantity of kwh. generated
 c) Total quantity of tones produced.

Answers: 13(c), 2(d), 3(c), 4(a), 5(b), 6 (b), 7(a), 8(d), 9(b), 10(a), 11(d), 12(a) (c), 14 (a), 15(a)

8.10 QUESTIONS

Simple Questions

1. Define operating cost
2. Define operating costing
3. Distinguish between operating cost and operating costing
4. What do you mean by a composite unit?
5. List out any eight undertakings which makes use of operating costing.
6. Give the composite unit of the following undertakings :
 - a) Roadways carrying passenger
 - b) Railways carrying goods
 - c) Hospital and
 - d) College.
7. Mention the basis of classifying the cost under operating costing.
8. Mention the basis of classifying the costs under transport costing.
9. What is a log sheet?
10. What do you mean by cost summary performance statement?
11. What do you mean by absolute tone-kilometer?
12. What do you mean by a commercial tone-kilometer?
13. Distinguish between absolute tone-kilometer and commercial tone kilometer.
14. What do you mean by "kilometer run"?
15. What do you mean by "cost per hour" under operating costing?

State whether each of the following statement is 'True' or 'False'

1. Operating costing is used in case of service undertaking.
2. Log sheet is prepared in case of power house costing.
3. The unit of cost for production of steam may be per lb.
4. Per man show cost is calculated in case of Canteen costing.
5. Fare in case of taxis is generally based on cost per passenger, km

Answer : (1) True (2) False (3) True (4) False (5) False

Long answer type.

1. What is service costing? Mention the types of business in which the system would be suitable. Describe briefly a system of service costing which you would recommend for use by a passenger taxi service.
2. What are the main objects of motor transport costing? A company owns a fleet of vans and wishes to examine the cost of (a) each van, (b) the fleet as a whole. Prepare a report on the accounting arrangements that are needed and draft specimen of the forms that you recommend for presentation to the directors. Show separate rates for fixed and variable expenditure and state how these should be used.
3. Draw up a proforma cost statement for a canteen serving 1,000 workers in a factory. The canteen is subsidized by the factory.
4. What is "Operating Costing"? State the industries where it is to be used?
5. What is a "Log sheet"? Give its proforma.
6. Your client running a canteen tends to introduce costing system in his organization. How should he classify his costs for the purpose of preparing an Operating Cost Statement?



Unit - 9

OPERATING COSTING - II

Unit Structure :

- 9.0 Objectives
- 9.1 Problems and Solution
- 9.2 Exercise

9.0 OBJECTIVES

After studying the unit the students will be able to solve the problems on transport costing, Hospital costing and Hotel costing.

9.1 PROBLEMS AND SOLUTION

Illustration 1:

SAITRAVELS owns a bus and operates a tourist service on daily basis. The bus starts from New City to Rest village and returns back to New City the same day. Distance between New city and Rest village is 250 kms. This trip operates for 10 days in a month. The bus also plies for another 10 days between New city and Shivapur and returns back to New city the same day, distance between these two places is 200 kms. The bus makes local sightseeing trips for 5 days in a month, earning a total distance of 60 kms per day.

The following data are given.

Cost of bus	Rs. 3,50,000
Depreciation	25 5
Driver's salary	Rs. 1,200 p.m.
Conductor's Salary	Rs. 1,000 p.m.
Part time clerk's salary	Rs. 400 p.m.
Insurance	Rs. 1,800
Diesel consumption 4 kms per litre @	Rs. 8 per litre
Token tax	Rs. 2,400 p.m.
Permit fee	Rs. 1,000 p.m.
Lubricant oil	Rs. 100 for every 200 kms
Repairs and maintenance	Rs. 1,500 p.m.
Normal capacity	Rs. 50 persons

While playing to and for Rest village, the bus occupies 90% of the capacity and 80% when it plies between New city to Shivapur (both ways). In the city the bus runs full capacity passenger tax is 20 % of net takings of the "Travels" firm.

Calculate the rate to be charged to Rest village and Shivaupr from New city, per passenger, if the profit required to be earned is 33 % of net taking of firm.

[I.C.W.A., Intermediate]

Solution:

Operating cost statement for the month

	Rs.	Total Rs.	Per passenger km (total cost + 4,00,000) passenger km Rs.
Fixed charges			
Driver's salary	1,200		
Conductor's salary	1,000		
Clerk's salary	400		
Insurance (1,800 ÷ 12)	150		
Token Tax (2,400 ÷ 12)	200		
Permit fees	1,000		
Depreciation (25% of 3.5lakhs÷ 12)	7,292		
Repairs and Maintenance	1,500	12,742	0.03185
Running charges			
Diesel cost 9,300 km ÷4=2,325 liters @ Rs. 8		18,600	0.04650
Lubricant oil 9,300km÷200=45.5 liters@ Rs.100		4,650	0.01163
Total		35,992	0.08998
Add : 33 % profit on net taking or 49.25% on cost		17,726	0.04432
Net takings		53,718	0.13430
Add : 20 % for passenger tax		10,744	0.02686
Total		64,462	0.16116
		or say	0.161

Charges per passenger:

a) to Rest village from New city : 250×0.161 i.e. Rs. 40.25

b) to Shivapur from New city : 200×0.161 i.e. Rs. 32.20

* total kms covered p.m.

Rest village and back 2 x 250 x 10 days 5,000

Shivapur and back 2 x 200 x 10 days 4,000

Local trips @ 60 kms for 5 days 300

9,300

** Total effective passenger – km per month :

Rest village 2 x 250 x 90 % of 50 x 10 days = 2,25,000
passenger km

Shivapur 2 x 200 x 80 % of 50 x 10 days =1,60,000

Local Trips 5 x 60 x 50 =15,000

4,00,000

Illustration: 2:

(Service costing – use own / company cars or hire cars)

A company is considering three alternative proposals for conveyance facilities for its sales personal who have to do considerable travelling, approximately 20,000 kilometers every year. The proposals are as follows :

- 1) Purchase and maintain its own fleet of cars. The average cost of car is Rs. 1,00,000.
- 2) Allow the executive use his own car and reimburse expenses at the rate of Rs. 1.60 paise per kilometer and also bear insurance costs.
- 3) Hire cars from an agency at Rs. 20,000 per year per car. The company will have to bear costs of petrol, taxes and tyres.

The following further details are available :

Petrol Re. 0.60 per km.

Repairs and maintenance Re. 0.20 per km

Tyre Re. 0.12 per km

Insurance Rs. 1,200 per car annum;

Taxes Rs. 800 per car per annum

Life of a car : 5 years with Annual mileage of 20,000 kms. Resale value: Rs. 20,000 at the end of the fifth year.

Work out the relative costs of three proposals and rank them

[C.A., Inter]

Solution :**Alternative proposals**

	I Use of concern car		II Use of own car	III Use of hired car
	Rs. Per annum	Rs. Per km	Rs. Per km	Rs. Per km
Reimbursement (A)	--	--	1.60	1.00 @
Fixed cost (B)				
Per car per annum				
Insurance	1,200			
Taxes	800			
Depreciation (Rs.1,00,000–20,000÷ 5)	16,000			
Total	18,000			

Fixed cost per km (Rs.18,000 ÷ 20,000 km)		0.90	--	--
Running and maintenance cost (C)				
Per car per km				
Petrol		0.60	--	0.60
Repairs & Maintenance		0.20	--	--
Tyre		0.12	--	0.12
Total cost per km (A+B+C)		1.82	1.66	1.76
Cost of 20,000 km		Rs. 36,400	33,200	35,200
Ranking of alternating proposals		III	I	II

Decision II alternating i.e., use of own car will be the best alternative from company's point of view. III alternative i.e. hiring the card is 2nd best alternative. I alternative i.e. maintaining the fleet will be costliest alternative.

Rs. 1,200 ~ 20,000 kms = Re. 0.06; (Rs. 800 ~ 20,000 kms) = Re. 0.04 @ Rs. 20,000 ~ 20,000 kms = Re. 1/-

Illustration 3:

The Union Transport Company has been given a twenty kilometer long route to ply a bus. The bus costs the company Rs. 1,00,000. It has been insured at 3 % per annum. The annual road tax amounts to Rs. 2,000. Garage rent is Rs. 400 per month. Annual repair is estimated to cost Rs. 2,360 and the bus is likely to last for five years.

The salary of the driver and conductor is Rs. 600 and Rs. 200 per month respectively in addition to 10% of the taking as commission to be shared equally by them. The managers salary is Rs. 1,400 per month and stationery will cost Rs. 100 per month. Petrol and oil will cost Rs. 50 per 100 kilometers. The bus will make three round trips per day carrying on an average 40 passengers in each trip. Assuming 15% profit on takings and that the bus will ply on an average 25 days in a month.

Prepare operating cost statement on a full year basis and also calculate the bus fare to be charged from each passenger per kilometer

[C.A., Inter]

Solution:**Union Transport Company****Statement showing operating cost of the bus per annum****A. standing charges**

Managers salary (Rs. 1,400 x 12)	= Rs.	16,800
Driver's salary (Rs. 600 x 12)	= Rs.	7,200
Conductor's Salary (Rs. 200 x 12)	= Rs.	2,400
Road Tax	= Rs.	2,000
Insurance (3% of Rs. 1,00,000)	= Rs.	3,000
Garage rent (Rs. 400 x 12)	= Rs.	4,800
Stationery (Rs. 100 x 12)	= Rs.	1,200
Depreciation (Rs. 1,00,000 ÷ 5 years)	= Rs.	<u>20,000</u>
		57,400

B. Maintenance Cost – Repairs = Rs. 2,360

C. Running charges

Petrol and oil (36,000 km x Rs. 500) ÷ 100	= Rs.	<u>18,000</u>
Total costs (A + B + C)	= Rs.	77,760

Add : 10 % of takings for commission of driver & conductor = Rs.

15 % profit – desired on takings = Rs. 25,920

25 % on total takings = 33 – 1/30 of cost = Rs. 1,03,680

Calculation of bus fare to be charged:**Effective passenger kilometers:**

(2 x 20 km x 3 trips x 40 passengers x 25 days x 12 months) = 14,40,000

Rate to be charged per km from each passenger

Rs. 1,03,680 ÷ 14,40,000 = Re. 0.072

Calculation of total distance covered

(20 km 2 x 3 x 25 x 12) = 36,000 km per annum

Illustration 4: (Transport Costing)

Prakash Automobiles distributes its goods to a regional dealer using a single lorry. The dealers' premises are 40 kilometers away by road. The lorry has a capacity of 10 tons and makes the journey twice a day fully loaded on the outward journeys and empty on return journey. The following information is available for a four weekly period during the year 1990.

Petrol consumption	8 km per liter
Petrol Cost	Rs. 13 per liter
Oil	Rs. 100 per week
Driver's wages	Rs. 400 per week
Repairs	Rs. 100 per week
Garage Rent	Rs. 150 per week
Cost of Lorry (excluding tyres)	Rs. 4,50,000
Life of Lorry	80,000 kilometers
Insurance	Rs. 6,500 per annum
Cost of tyres	Rs. 6,250
Life of tyres	25,000 kilometers
Estimated sale value of lorry at end of its life	Rs. 50,000
Vehicle license cost	Rs. 1,300 per annum
The lorry operates on five day week	Rs. 41,600 per annum

Required:

- A statement to show the total cost of operating the vehicle for four-weekly period analyzed into running costs and fixed costs.
- Calculate the vehicle cost per kilometer and per ton kilometer
[C.A., Inter]

Solution:

- Before computing the total cost, it is necessary to find out the basic data s under :
 - Distance travelled in 4 week period; 40 km one way x 2 (return) x 2 trips x 5 days x 4 weeks = 3200 km
 - For tone km working = empty on return and as such for tone km = $3200 \div 2 = 1,600$
 - Total consumption in weeks = $3,200 \text{ km} \div 8 \text{ km} = 400 \text{ lt}$
 - Tyre cost = $(\text{Rs. } 6,250 \div 25,000 \text{ km}) \times 3,200 \text{ km} = \text{Rs. } 800$
 - Depreciation of lorry in 4 weeks
 $= (\text{Rs. } 4,50,000 - \text{Rs. } 50,000) \div 80,000 \times 3,200 = \text{Rs. } 16,000$

Operating cost statement f a lorry of M/s. Prakash Automobiles
(for the 4 week period)

Running costs	Rs.
Cost of petrol (400 liters x Rs. 13)	5,200
Oil (Rs. 100 per week x 4)	400
Drivers wages (Rs. 400 per week x 4)	1,600
Repairs (Rs. 100 x 4)	400
Cost of tyers (as at 4 above)	800
Depreciation (as at 5 above)	16,000
Total running costs – (i)	24,400
Fixed costs	Rs.
Garage ret (Rs. 150 x 4)	600
Insurance (Rs. 6,500 ÷ 52) x 4	500
License cost (Rs. 1,300 ÷ 52) x 4	100
Other overheads (Rs. 41,600 ÷ 52) x 4	3,200
Total fixed cost - (ii)	4,400
Total (i) + (ii)	28,800

(b) Cost per tone – km = Rs. 28,800 ÷ (1600 x 10 tons) Rs. 1.80

Illustration 5 :

A company presently brings coal to its factory from a nearby yard and the rate paid for transportation of coal from the yard located 6 kms. Away to factory is Rs. 50 per ton. The total coal to be handled in a month is 24,000 tones.

The company is considering proposal to buy its own trucks and has the option of buying either a 10 ton capacity or a 8 ton capacity trucks.

The following information is available:

	10 Ton Truck	8 Ton Truck
Purchase Price Rs.	10,00,000	8,50,000
Life (Years)	5	5
Scrap value at the end of 5 th year	Nil	Nil
KM Per liter of diesel	3	4
Repair and maintenance p.a. per truck (Rs.)	60,000	48,000
Other fixed expenses p.a. (Rs.)	60,000	36,000
Lubricants and sundries per 100 km (Rs.)	20	20

Each truck will daily make 5 trips (to and fro) on an average for 24 days in a month. Cost of diesel Rs. 15/- per liter. Salary of

driver Rs. 3,000/-, p.a. month. Two drivers will be required per truck. Other staff expenses Rs. 1,08,000 p.a.

Present a comparative cost sheet on the basis of above data showing transport cost per ton of operating 10 ton and 8 ton Truck at full capacity utilization.

[C.A. Final]

Solution :

Comparative statement of operating cost sheet :

	10 Ton Truck Rs.	8 Ton Truck Rs.
Fixed Charges (p.m.)		
Driver's Salary (working no. 1)	12,000	15,000
Staff expenses	9,000	9,000
Other fixed expenses	5,000	3,000
Operating & Maintenance Charges (p.m.)		
Depreciation (Note No. 2)	3,33,333	3,54,167
Diesel Cost (Note No. 3)	1,44,000	1,35,000
Lubricants & Sundries (Note No. 3)	5,760	7,200
Repairs & Maintenance	1,00,000	1,00,000
Total Cost (A)	7,17,093	7,58,367
Tons Carried (B)	24,000	24,000
Cost per ton (A/B)	29.87	31.59

Conclusion : A comparison of cost per ton by using 10 ton trucks is more economical. The cost paid for bringing coal per ton presently viz. Rs. 50/- is the highest.

Working Note :

	10 ton	8 ton
1 Total number o trucks and drivers required		
Coal brought to the factory per month (5 x 24 x 10)	1200	--
(5 x 24 x 8)		960
No. of truck required to bring 24,000 tons is	24000/1200=20	24000/960=25
Total number of drivers required	20 x 2 = 40	25 x 2 = 50

2	Total monthly depreciation		
	Depreciation per truck per annum	2,00,000	1,70,000
	Depreciation per truck per month	1,666.66	14,166.66
	Total depreciation	16666.66×20 $= 3,33,333$	14166.66×25 $= 3,54,167$
3	Diesel requires		
	Total Km run per truck p.m. (6 km x 10 trips x 24 days)	1440	1440
	Total KM run by all trucks	28800	36000
	Km per liter of diesel	3	4
	Diesel required liters	9600 (28800 / 3)	9000 (36000 / 4)

Illustration.6:

You are required to calculate a suggested fare per passenger – km from the following information for a mini bus.

- i) Length of route 30 km
- ii) Purchase price Rs. 4,00,000.
- iii) Part of above cost meet by loan, annual interest Rs. 10,000 p.a.
- iv) Other annual charges : Insurance Rs. 15,000, Garage Rent Rs. 9,000, Road Taxes Rs. 3,000, Repairs and Maintenance Rs. 5,000. Administrative charges Rs. 5000.
- v) Running expenses : Driver & Conductor Rs. 5000 p.m., Repairs / Replacement of tyre tube Rs. 3600 p.a. Diesel and Oil cost per Km Rs. 5/-
- vi) Effective life of vehicle is estimated at 5 years at the end of which it will have a scrap value of Rs. 10,000.
- vii) Mini Bus has 20 seats and is planned to make six two way trips for 25 days / p.m.
- viii) Provide profit @ 20 % of total revenue.

[C.A., Final]

Solution :

Particulars	Cost per Annum Rs.	Cost Per Month Rs.
Fixed Expenses :		
Insurance	15,000	
Garage Rent	9,000	
Road Tax	3,000	
Administrative charges	5,000	
Depreciation (4,00,000–10,000 ÷ 5 years)	78,000	
Interest on Loan	10,000	
Total	1,20,000	10,000

Running Expenses :		
Repairs & Maintenance	15,000	1,250
Replacement of tyre tube	3,600	300
Diesel and oil cost (9000 km x Rs. 5/-)		45,000
Driver & Conductor's Salary		5,000
Total Cost per month		61,550
Add : Profit 20 % of total Revenue 25 % Total cost		15,387.50
Total Revenue		76,937.50

Rate per passenger km :

Rs. 36937.50 / 1,80,000 passenger km = 0.4274305 or 0.43 paise

Workings:

Total distance travelled by mini bus in 25 days = 60 km x 6 trips x 25 days = 9000 km

Total passenger km = 9000 km x 20 seats = 1,80,000 passengers km

Illustration 7 :

Krishna Transport Ltd. Charges Rs. 150 per ton for its 10 ton lorry load from city A to city B. the charges for the return journey are Rs. 140 per ton. No concession is made for any delivery of goods at intermediate station 'C' in January 2008. The truck made 10 outward journeys for city B with full load of which 2 ton were unloaded twice at city 'C'. The truck carried a load of 12 ton in its return journey for 4 times but once caught by police and Rs. 1500 was paid as fine. For the remaining trips it carried full load out of which all the goods on load were unloaded once at city 'C'. The distance from city A to city A and city 'B' are 150 km and 250 km respectively. Annual fixed cost are Rs. 1,20,000 and maintenance cost is Rs. 15,000. Running charges spent during January 2008 are Rs. 3500.

Calculate the cost per tone-kilometer and the profit for January 2008.

Solution :

Operating Cost and Profit Statement of Krishna Transport Ltd.

Particulars	Rs.
1. Fixed cost (12000 / 12)	
2. Maintenance charges 15000 / 12	
3. Running charges	
Total operating cost	
Cost per ton km	
Net revenue received (working note)	
Less : Total operating cost	
Profit	

(1) Tone km on outward journeys

From city A to C—10 journeys x10 ton x 150 km	=	15,000	
From city C to B—8 journeys x 10 ton x 100 km	=	8,000	
2 journey x 8 ton x 100 km	=	1,600	
Total		<u>24,600</u>	Tone – km

(2) Tone km on return journey

From city B to A – 4 journeys x 250 km x 12ton	=	12,000	
From city B to A – 5 journeys x 250 km x 10ton	=	12,500	
From city B to C - 1 journey x 100 km x 10 ton	=	1,000	
Total		<u>25,500</u>	Tone – km

Total tone km = 24,600 + 25,500 = 50,100 ton- km

(3) Net revenue received

From city A to B—10 journeys x10 ton X Rs.150	=	15,000	
From city B to A—4 journeys x 12 ton X Rs. 140	=	6,720	
From city B to A -5 journeys x 10 ton X Rs. 140	=	7,000	
From city B to C -1 journeys x 10 ton X Rs. 140		<u>1,000</u>	
Total		29,720	Tone – km
Less : Fine Paid		<u>1,500</u>	
Net revenue received		28,220	

Illustration 8 :

Mr. Sampath owns a fleet of taxis and the following information is available from the records maintained by him.

- 1) Number of Taxis – 10
- 2) Cost of each Taxi – Rs. 2,00,000
- 3) Salary of manager Rs. 6000 p.m.
- 4) Salary of Accountant Rs. 5000 p.m

- 5) Salary of cleaner Rs. 3000 p.m.
- 6) Salary of Mechanic Rs. 4000 p.m.
- 7) Garage Rent Rs 7000 p.m.
- 8) Insurance premium 5 %
- 9) Annual Tax Rs. 6000 per taxi
- 10) Drivers Salary Rs. 4000 p.m.
- 11) Annual Repairs Rs. 15,000 per taxi

Total life of a taxi is about 2,00,000 kms. A taxi runs in all 3000 kms. in a month of which 25 % its runs empty. Petrol consumption is one liter for 10 kms @ Rs. 40 per liter. Oil and other sundries are Rs. 10 per 100 kms.

Calculate the cost of running a taxi per km.

Solution:

Operating cost sheet

Particulars	Amount per month Rs.	Cost per Km Rs.
Fixed Expenses (for the whole fleet)		
Salary of manager	6000	
Salary of accountant	5000	
Salary of Cleaner	3000	
Salary of mechanic	4000	
Garage Rent	7000	
Insurance premium 5 % on Rs. 2,00,000 x 10	8333	
Tax 6000 x 10 / 12	40000	
Total Fixed Expenses	5000	
Effective kilometer 3000x10x 75 % = 22,500		
Fixed expenses per km		3.48147
Running expenses (per taxi)		
Depreciation (2,00,000÷200000 x 10 x 3000)		1.33333
Repairs (15,000 x 10 ÷ 12)		0.55555
Petrol (3000 x 40) ÷ (10 x 22500)		0.53333
Oil and other sundries (10 x 3000) ÷ (100(22500)		0.13333
Cost per km		6.03701

Illustration 9:

A lodging home is being run in a small hill station with 50 single rooms. The home offers concessional rate during six off season months in a year. During this period, half of the full room rent is charged. The management profit margin is targeted at 20% of the room rent. The following are the cost estimates and other

details for the year ending 31st March, 1996 (assume a month to be of 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) | Rs. 2,75,000 |
| (ii) Repairs to buildings | Rs. 1,30,000 |
| (iii) Laundry and linen | Rs. 40,000 |
| (iv) Interior and tapestry | Rs. 87,500 |
| (v) Sundry expenses | Rs. 95,400 |
- c) Annual depreciation is to be provided for building at 5% and on furniture and equipments at 15% on straight line basis.
- d) Room attendants are paid Rs. 5/- per room-day on the basis of occupancy of the rooms in a month.
- e) Monthly lighting charges are Rs. 120 per room, except in four months of winter when it is Rs. 30 per room and this cost is on the basis of full occupancy for a month and
- f) Total investments in the home are Rs. 100 lakhs of which Rs. 80 lakhs relate to buildings 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.

[I.C.W.A., Intermediate

Solution:

Total estimated costs for the year ending 31.03.1996

Particulars	Total Rs.	Per room day (Rs.)
Salary	2,75,000	
Repairs	1,30,000	
Laundry and linen	40,000	
Interior decoration	87,500	
Depreciation: Rs.		
Building 5% on 80 lakhs =	4,00,000	
Furniture 15 % on 20 lakhs =	3,00,000	
	7,00,000	
Miscellaneous expenses	95,400	
Attendant's salary	54,000*	
Lighting charges	36,000**	
Total cost	14,18,400 / 9000 *** full room days	157.60
Add : Profit margin at 20% on rent or 25% of cost		197.00

During season room rent is Rs. 197 and during off-season room rent is Rs. 98.50

- * Attendant' salary
For 10,800 room days @ Rs. 5 per day = Rs. 54,000
- ** Total light bill
Light bill during 8 months at Rs. 120 per month or $120 \div 30 =$
Rs. 4 Per room day.
Light bill during 4 months of winter at Rs. 30 per month or $30 \div$
 $30 =$ Re. 1 per Room day.

Total light bill for full one year	Rs.
During season @ Rs. 4 for 7,200 days	28,800
During 2 months of off-season @ Rs. 4 for 1,200 days ($2 \div 6 \times 3,600$)	4,800
During 4 months of winter at Re. 1 For 2,400 days ($4 \div 6 \times 3,600$)	2,400
Total	36,000

- *** Number of room days in a year :
Seasons occupancy for 6 months @ 80% ($50 \times 0.8 \times 6 \times 30$) =
7,200 room days Off season's occupancy for 6 months @ 40 % (50
 $\times 0.4 \times 6 \times 30$) = 3,600 room days

Total room days during the Year	10,800
Total full room days in terms of rate Season	7,200
Off Season (in terms of 50 % rate on 3,600 days)	1,800
Total Full room days	9,000 per annum

Illustration 10:

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 specialty restaurant at the roof top. The following information is available:

- 1) Average occupancy : 75 % for 365 days of the year
- 2) Current costs are :

	Variable cost	Fixed cost
Single room	400	200
Double room	500	250
- 3) Average sales per day of restaurant Rs. 1, 00,000; contribution is at 30 %. Fixed cost Rs. 10, 00,000 per annum.
- 4) The sports centre / swimming pool is likely to be used by 50 non-residents daily; average contribution per day per nonresident is estimated at Rs. 50; fixed cost is Rs. 5,00,000 per annum.
- 5) Average contribution per month from the shopping arcade is Rs. 50,000; fixed cost is Rs. 6, 00,000 per annum.

You are required to find out:

- 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.

[C. A. Final]

Solution:

- (a) Statement for calculating the rent chargeable for single and double room per day.

	Occupancy days in a year Refer to working note (1)	Variable cost Rs / Days (2)	Fixed cost Rs / Days (3)	Total variable cost $4 = (1) \times (2)$	Total fixed cost (Rs.) $5 = (1) \times (3)$	Total cost (Rs.) $6 = (4) \times (5)$
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
Add : 20 % margin of safety on hire of room or 25 % of total cost						51,32,812
Total amount of room rent to be received						2,56,64,062

Rent per day of single room 9in Rs.)

756 (approx)

(Refer to working note 2)

(Rs. 2, 56,64,062 / 33,945)

Rent per day of double room (in Rs.)

907 (approx)

(Rs. 756 x 1.2 times)

b) Profitability of restaurant	Rs.
Total sales per annum 365 days x Rs. 1,00,000	3,65,00,000
Contribution per annum (30 % of Total Sales) : (A)	1,09,50,000
Fixed cost per annum : (B)	10,00,000
Profit [(A) – (B)]	99,50,000
Profitability of sports centre :	Rs.
Contribution of sports centre per day : (50 persons x Rs. 50)	2,500
Total contribution per annum (Rs. 2,500 x 365 days) : (A)	9,12,500
Fixed cost per annum : (B)	5,00,000
Profit : [(A) – (B)]	4,12,500
Profitability of shopping arcade :	Rs.
Contribution per annum (Rs. 50,000 x 12 months)	6,00,000
Less : Fixed Cost	6,00,000
Profit	Nil

Working Note :

- 1) Single room occupancy days in a year = 100 room x 365 days x 75 % = 27,375
 Double room occupancy days in a year = 20 rooms x 365 days x 75 %
 = 5,475
- 2) In terms of single room total room occupancy days in a year
 = 27,375 + 1.20 % x 5,475 = 27,375 + 6,570
 = 33,945

Illustration 11:

Following are the information given by an owner of a hotel. You are requested to advice him that what rent should be charge from his customers per day so that he is able to earn 25 % on cost other than interest.

- 1) Staff salaries Rs. 80,000 per annum
- 2) Room attendant's salary Rs. 2 per day. The salary is paid on daily basis and services of room attendant are needed only when the room is occupied. There is one room attendant for one room.
- 3) Lighting, heating and power. The normal lighting expenses for a room if it is occupied for the whole month is Rs. 50. Power is used only in winter and normal charge per month if occupied for a room is Rs. 20.
- 4) Repairs to building Rs. 10,000 per annum
- 5) Linen etc. Rs. 4,800 per annum
- 6) Sundries Rs. 6,600 per annum
- 7) Interior decoration and furnishing Rs. 10,000 annually
- 8) Cost of building Rs. 4,00,000; rate of depreciation 5 %
- 9) Other equipments Rs. 1,00,000; rate of depreciation 10 %
- 10) Interest @ 5% may be charged on its investment of Rs. 5,00,000 in the building and equipment
- 11) There are 100 rooms in the hotel and 80 % of the rooms are normally occupied in summer and 30 % of the rooms are busy in winter. You may assume that period of summer and winter is six month each. Normal days in a month may be assumed to be 30.

Solution :

Operating cost sheet
Rent per day

	Rs.	Per annum Rs.
1. Staff salaries		80,000
Room attendant's salaries		
Summer $2 \times (100 \times 80 \div 100) \times 30 \times 6$	28,800	
Winter $2 \times (100 \times 30 \div 100) \times 30 \times 6$	10,800	39,600
Lighting, heating and power		
Summer $50 \times 6 \times (100 \times 80 \div 100)$	24,000	
Winter $50 \times 6 \times 100 \times (30 \div 100)$	9,000	
Power $20 \times 6 \times 100 \times (30 \div 100)$	3,600	36,600
Repairs to building		10,000
Linen etc.		4,800
Sundries		6,600
Interior decoration and furnishing		10,000
Depreciation : Building	20,000	
Other equipments	10,000	30,000
Interest on investment (5% on Rs. 5,00,000)		25,000
		2,42,600
Add : 25 % profit on cost other than interest		
Rs. 2,42,600 – Rs. 25,000 interest = Rs.		
2,17,600		
Rs. $2,17,600 \times 25 \div 100$		54,400
Total cost		2,97,000

Rent per room for one day = Total Cost \div No. of room days
 $= 2,97,000 \div 19,800$
 $= \text{Rs. } 15 \text{ per day}$

Working Notes: Calculation of room days

No. of Rooms \times Percentage \times days in a month \times no. of months

Summer: $100 \times (80 \div 100) \times 30 \times 6$
 $80 \times 30 \times 6 = 14,400$

Winter: $100 \times (30 \div 100) \times 30 \times 6$
 $30 \times 30 \times 6 = \underline{5,400}$

Total room days $= \underline{19,800}$

9.2 EXERCISE

Practical problems

Illustration 1 :

A Mineral is transported from two mines – “A” and “B” and unloaded at plots in a Railway Station. Mine A is at a distance of 10kms. And B is at a distance of 15kms. from the mines. Records reveal that the lorries average a speed of 30 kms. per hour, when running and regularly take 10 minutes to unload at the railhead. At

mine "A" loading time averages 30 minutes per load while at mine "B" loading time averages 20 minutes per load.

Drivers' wages, depreciation, insurance and taxes are found to cost 9 per hour operated. Fuel, oil, tyres, repairs and maintenance cost 1.20 per km.

Draw up a statement, showing the cost per tonne-kilometer of carrying mineral from each mine.

([M.Com.](#) Oct. 01)

(Ans.: Cost per tonne Km. Mine A: Rs. 0.72, Mine B: Rs.0.66)

Illustration 2 :

A transport company maintains a fleet of bus as follows :

Number of Buses	Carrying Capacity
20	50 passengers each
10	40 passengers each

Each bus makes 5 trips a day, covering a distance of 10 Km. in each trip. On an average 80% of the seats are occupied in each trip and 5 buses are under repair every day. Assuming that the company operates its fleet daily, ascertain the operating cost per passenger-Km. from the following :

Wages of 30 Drivers	₹ 3,000 each per month
Wages of 30 Cleaners	₹ 1,000 each per month
Petrol	₹ 20,000 per month
Oil, Grease etc.	₹ 5,000 per month
Tyres, Tubes etc.	₹ 2,000 per month
Repairs	₹ 30,000 per year
Garage Rent	₹ 40,000 per year
Road Licences	₹ 20,000 per year
Taxes	₹ 5,000 per half year
Permit Fee	₹ 25,000 per year
Salary of Operating Manager	₹ 5,000 per month
Office Overheads	₹ 10,000 per year

([M.Com.](#), Oct 2000)

Ans: (Total Operating Cost: Rs. 19,59,000, Cost per passenger Km.: Rs.0.15)

Illustration 3 :

A company presently brings coal to its factory from a nearby yard which is located 6 kms. away to factory and the rate paid ` 50 per ton for transportation. The total coal to be handled in month in 24,000 tons.

The company is considering proposal to buy its own trucks and has the option of buying either a 10 ton or a 8 ton capacity trucks.

The flowing information is available :

Particulars		10 Ton Truck	8 ton Truck
Purchase Price (₹)	... ..	10,00,000	8,00,000
Life (Years)	... ..	5	5
Scrap value at end of 5 th year	... ..	Nil	Nil
Kms. per litre of diesel	... ..	3	4
Rep/Maint p.a. per Truck (₹)	... ..	60,000	48,000
Other Expenses fixed p.a. (₹)	... ..	60,000	36,000
Lubricants and Sundries per 100 km. (₹)	... ..	20	20

Each Truck will daily make 5 trips (to and fro) on an average for 24 days in a month.

Cost of Diesel ₹16 per litre.

Salary of Drivers ₹3,000 per month and two drivers will be required for a Truck.

Other staff expenses ₹1,08,000 p.a.

Present a Comparative Cost Sheet on the basis of above data showing transport cost per ton of operating 10 ton and 8 ton Truck at full capacity utilization.

([M.Com.](#) Mar. 02, adapted)

Ans: (Total Operating Cost: 10 Ton Truck: Rs. 49,635 8 Ton Truck Rs.41,381, Cost per Ton: 10 Ton Truck: Rs. 41.36, 8 Ton Truck: Rs.43.1 1)

Illustration 4 :

The following were the expenses incurred by CALL and MALL Company in operating two lorries (for the conveyance of Raw Materials) and a bus (for the conveyance of Staff) during the month of February, 2006 :

	Monthly Cost		
	Lorry C	Lorry M	Bus
Driver's Salaries	110	115	120
Cleaner's Wages	120	120	60
Diesel	170	240	110
Oil	18	25	20
Repairs	150	150	100
Depreciation	330	220	350
Office Overheads	70	70	70
Servicing Charges	130	110	75
Road and Wheel Tax	45	45	30
Sundry Expenses	35	40	20

The above vehicles carried the following Raw materials and Passengers during the month :

Lorry C 100 Tonnes of Raw Material
 Lorry M 120 Tonnes daily for 25 days

Respective mileage of the vehicles during the month :

Lorry C 3,000
 Lorry M 4,500
 Bus 2,000

From the above statistics prepare an Operating Cost Sheet in summary for the three vehicles. Also explain the unit of costing selected.

([M.Com.](#), April 06, adapted)

Ans: (Total Operating Cost: Lorry C: Rs. 1,178, Lorry M: Rs. 1,135, Bus: Rs. 955, Total Tonnes or Passenger Miles: Lorry C: 12,000, Lorry M: 21,600, Bus: 50,000)

Illustration 5:

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 the following further information is available :

Particulars		Rs.
Cost of Bus	...	3,00,000
Salary of Driver per month	...	1,050
Salary of Conductor	...	700
Fixed Office Overheads	...	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. Permit fee is payable on the cost of bus at 10% p.a.

([M.Com.](#) April 05)

Ans: (Total Operating Cost: Rs. 3,08,295, Total passenger Km.: 45,90,000)

Illustration 6 :

KKK Automobiles distributes its goods to a regional trader using a single lorry. The trader's premises are 40 kms away by road. The lorry has a capacity of 10 tonnes and makes the journey twice a day fully loaded on the outward journeys and empty on return journeys.

You are given data for 4 weekly periods during the year 2003.

Petrol consumption 8 kms per litre

Petrol cost Rs. 13 per litre

Oil Rs. 100 per week

Driver's wages Rs. 400 per week

Repairs Rs. 100 per week

Garage rent Rs. 150 per week

Cost of lorry Rs. 4,50,000 (excluding tyres)

Life of lorry 80,000 kms.

Insurance Rs. 6,500 p.a.

Cost of tyres Rs. 6,250

Life of tyres 2,500 kms

Estimated Scrap value of lorry at the end of its life ₹50,000

Vehicle licence cost Rs. 1,300 p.a.

Other overhead cost Rs. 41,600 p.a.

The lorry operates on a Five-day week

Required :

- a) A statement to show the total cost of operating the vehicle for the 4 weekly periods analysed into running costs and fixed costs.
- b) Calculate vehicle cost per km. and per tonne km.

([M. Com](#), Oct. 04, adapted)

Ans: (Total Operating Cost: Rs. 28,800, Effective Km- Tonne :16,000 Effective Km. 1600)

Illustration 7 :

A person owns a bus which runs between Delhi and Chandigarh and back for 10 days in a month. The distance between Delhi and Chandigarh is 150 kms. The bus completes the trip from Delhi and Chandigarh and back on the same day.

The bus goes to Agra for another 10 days. The distance between Delhi and Agra is 120 kms. The trip is also completed on the same day. For the rest 4 days of its operation, it runs in Delhi. The daily distance covered is 40 kms.

Calculate the charges to be made if a profit of $33\frac{1}{3}\%$ is to be earned on his takings.

The other available information given to you is :

Cost of the bus Rs. 60,000.

Depreciation 20% p.a.

Salary of Driver Rs. 350 p.m.

Salary of Conductor Rs. 350 p.m.

Salary of Cleaner Rs. 160 p.m.

Insurance Rs. 1,680 p.a.

Diesel consumption is 4 kms per litre. Diesel costs Rs. one per litre.

The token tax is Rs. 600 p.a.

Lubricants Rs. 10 per 100 kms; repairs and maintenance Rs. 300 p.m.; permit fee Rs. 284 p.m. and the normal capacity is 50 persons.

The bus generally has 90% of its capacity occupied when it goes to Chandigarh, 80% when it goes to Agra. It is always full when it runs within the city. Passenger tax is 20% of his net takings.

([M. Com](#), Oct. 04, adapted)

Ans: (Total Operating Cost per month: Rs. 4,580, Cost per passenger Km. Rs.0.034)

Illustration 8 :

A person owns a bus that runs between Mumbai and Lonavala and back, for 10 days in a month. The distance from

Mumbai to Lonavala is 150 kms. The bus completes the trip from Mumbai to Lonavala 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 out-station trips. The other information is given as follows :

Cost of the bus (Depreciation @ 20% p.a.; Normal Capacity : 50 persons) 6,00,000

Salary : Driver	5,000 per month
Salary : Conductor	5,000 per month
Fixed Office Overheads	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 Lonavala trip and 80% of its capacity while on Alibagh trip, but is fully occupied in its local journey.

([M. Com](#), April 08, adapted)

Ans: (Total Operating Cost: Rs. 72,656, Total Passenger Km. 2,39,000, Cost per passenger Km.: Rs.48.64)

Illustration 9

A transport company supplies the following details in respect of a truck of 5 tonne capacity which carries goods to an from the city covering a distance of 50 kms each way.

	Rs.
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 upto 20 percent 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 tone-km,
- ii) Rate per tone per trip that the company should charge if profit of 50 percent 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?

([M.Com](#) , April 09, adapted)

Ans: (Total Operating Cost: Rs. 8,250, Cost per Tonne Km.: Rs.1.100)

Illustration 10 :

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, 2008 :

- 1) Salaries of office staff Rs. 50,000 per month.
- 2) Wages of the room attendant: Rs. 20 per day per room when the room is occupied.
- 3) lighting, Heating and Power :
 - a) The normal lighting expenses for a room for the full month is Rs. 500, when occupied.
 - b) Power is used only in winter and the charges are 200 for a room, when occupied.
- 4) Repairs to Beds and other furniture: Rs. 30,000 per annum.
- 5) Repairs to Hotel building: Rs. 50,000 per annum.
- 6) Licence fees: Rs. 12,400 per annum.
- 7) Sundries: ` 10,000 per month.
- 8) Interior decoration and furnishing: Rs. 1,00,000 per annum.
- 9) Depreciation @ 5% p.a. is to be charged on Building costing 20,00,000/- and @ 10% p.a. on Equipments.
- 10) 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 of an average

([M. Com.](#) Oct. 08, adapted)

Ans: (Total Earnings: Rs. 33,18,000, Total Room Days: 40,800. Cost per Day: Rs. 81.32)

Illustration 11:

Relax Hotel has a capacity of 100 single rooms and 20 double rooms. The average occupancy of both single and double rooms is expected to be 80% throughout the year of 365 days. The rent for the double room has been fixed at 125% of the rent of the single room. The costs are as under:

Variable Costs	:	Single rooms Rs. 220 each per day
		Double rooms Rs. 350 each per day
Fixed Costs	:	Single rooms Rs. 120 each per day
		Double rooms Rs. 250 each per day

Calculate the rent chargeable for single and double rooms per day in such a way that the hotel earns on overall profit of 20% on hire charges of rooms.

([M. Com.](#) April 09, adapted)

Ans: (Total Earnings: Rs. 1,67,90,000, Total Room Days: Single room: 29,200 Double room : 5,840.)

Illustration 12:

A hospital is run by a Company. For this purpose it has hired a building at a rent of Rs. 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 a salary of Rs. 500 per month
- 4 Nurses each at a salary of Rs. 300 per month
- 2 Ward boys, each at a salary of Rs. 150 per month

Although the hospital is open for patients all the 365 days in a year, records for the year 2004 disclose that only for 120 days in the year, the unit had the full capacity of 25 patients per day and when the beds were full, extra beds were hired at a charge of ` 5 per bed 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 Rs. 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 Rs. 10,000 per month in 2004.

The other expenses for the year were as under:

Repair and Maintenance	Rs. 3,600
Food supplied to patients	Rs. 44,000
Sanitary and Other services for patients	Rs. 12,500
Laundry Charges	Rs. 28,000
Medicines supplied	Rs. 35,000

Cost of oxygen, X-ray, etc. other than directly borne for treatment of patients Rs. 54,000.

General Administration Charges allocated to hospital Rs. 49,550.

If the hospital recovered an amount of Rs. 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 2004.
([M. Com.](#) Oct.06, adapted)

Ans: (Total Earnings: Rs.61 ,350, Total Number of Patient days: 5000.)

