UNIT 15   MARGINAL COSTING

Structure

15.0   OBJECTIVES

The aims of this unit are:

● to introduce you with the concept of marginal costing;

● to explain the income statement under marginal costing and how it differs from absorption costing; and

● to discuss the merits and limitations of marginal costing along with developing a marginal cost equation uses of marginal costing in managerial decisions.

15.1   INTROUDCTION

The elements of costs can be divided into fixed and variable costs. You have learnt these elements of cost in detail under Unit 2. You have also learnt that there are certain costs which are a combination of fixed and variable costs. These costs are called semi-variable costs. It is necessary to segregate the mixed costs into fixed and variable costs for managerial decisions.   In this unit you will study about different methods of segregating mixed costs, the concept of marginal cost and marginal costing and its managerial uses in decision making.

15.2   SEGREGATION OF MIXED COSTS

The elements of cost can be divided into two categories. Fixed and variable costs. Fixed costs are those costs which do not very but remain constant within a given period of time in spite of fluctuations in production Variable costs changes in direct proportion to the change in output. There are certain costs, which are a combination of fixed, and variable costs. It contains a fixed element as well as a unit cost for variable

expenses. Such costs increase with production but the change is less than the proportionate change in production. These costs are called semi-variable or semi-fixed or mixed costs. Example of these costs are depreciation, power, telephone etc. Rent of the telephone is fixed in a given period and per unit call charges is a variable component. For decision making, it becomes necessary to segregate the mixed costs into fixed and variable costs.

Methods of Segregating Mixed Cost

The following methods are applied to segregate the mixed costs into fixed costs and variable costs:

1) **Analytical Method :** A careful analysis of mixed cost is done to determine how far it varies with production. Some semi-variable costs may have 60 percent variability while other have 40 percent variability. Accuracy of this method depends upon the knowledge, experience and judgement of the analyst. This method is simple but not scientific.

2) **High Low Method :** This technique was developed by J.H. William. In this method, the difference in two production levels i.e. highest and lowest, are compared out of the various levels. Since the fixed cost component remains constant, any increase or decrease in total semi-variable cost must be attributed to the variable portion. The variable cost per unit can be determined by dividing difference in total semi-variable cost with the difference in production units at two levels.

Illustration 1

From the following information, find out the fixed and variable components.

Production (in units)	Semi-Variable Costs Rs.
100	1500
200	2000
250	2250
300	2500

Highest production is 300 units, then semi-variable costs is Rs. 2500. Lowest production is 100 units, then semi-variable costs is Rs. 1500.

$$\text{Variable cost per unit} = \frac{\text{Difference in Costs}}{\text{Difference in Volume}}$$

$$= \frac{\text{Rs. 2500} - \text{Rs. 1500}}{300 - 100}$$

$$= \frac{\text{Rs. 1000}}{200} = \text{Rs. 5}$$

Total semi-variable costs = Fixed cost + Variable costs per unit production

$$2500 = F + \text{Rs. } 5 \times 300 \text{ units}$$

$$F = \text{Rs. } 1000$$

High-low method is based on observations of extreme data, hence the result may not be very accurate as it is based on extreme points and may not be true for normal situation.

Scatter Diagram Method

In this method, production and semi-variable cost data are plotted on a graph paper and tentative line of best fit is drawn. The following steps are involved :

● Volume of production is plotted on x-axis and semi-variable costs on y-axis.

● Corresponding semi-variable costs of each volume of production are plotted on a graph.

● A line of best fit is drawn through the points plotted. The point where this line intersects with y-axis, depicts the fixed cost.

● Variable cost can be determined at any level by subtracting the fixed cost element. The slope of the total cost curve is the variable cost per unit
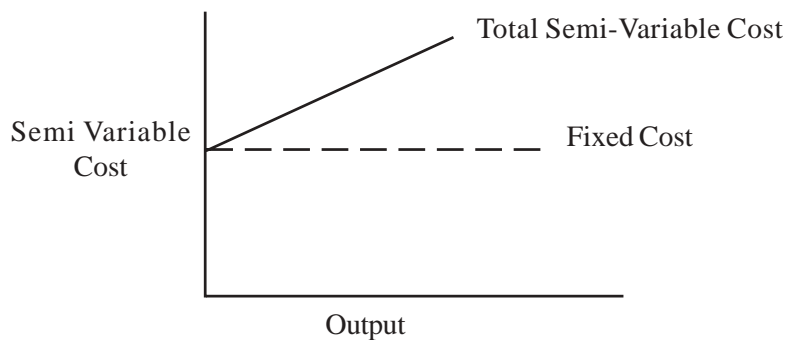
The accuracy of line of best fit, depends upon the judgement and experience of the analyst. One may draw slightly up or slightly down, the intercept on y-axis will change or two analyst may draw a line having different slopes. This method involves analyst's subjectivity and may not give accurate results.

Method of Least Square :

This method is based on econometric technique, in which line of best fit is drawn with the help of linear equations.

The equation of a straight line is

$$y = a + b x$$

Where 'a' is the intercept on y-axis and 'b' is the slope of the line. Hence 'a' is the fixed cost component and 'b' is the slope or tangent of the line or variable cost per unit. From the above equation, two equation can be drawn.

$$\Sigma y = na + b \Sigma x$$

$$\Sigma xy = a \Sigma x + b \Sigma x^2$$

Solving the equations, will give us the value of 'a' (fixed cost) and 'b' (variable cost per unit).

Illustration 2

From the following semi-variable cost information, compute the fixed cost and variable cost components.

Production (Units)	Semi-variable (Rs.)
100	1200
200	1350
150	1250
190	1380
180	1375

Solution

Month	Production X	Semi-variable Y	X^2	XY
April	100	1200	10000	120000
May	200	1350	40000	270000
June	150	1250	22500	187500
July	190	1380	36100	262200
August	180	1375	32400	247500
Total	$\Sigma X = 820$	$\Sigma Y = 6555$	ΣX^2 141000	$\Sigma XY = 1087200$

$$\Sigma Y = na + b\Sigma X$$

$$\Sigma XY = a\,\Sigma X + b\,\Sigma X^2$$

Solving these equations

$$6555 = 6\,a + 820\,b$$

$$1087200 = 820\,a + 141000\,b$$

$$a = Rs.\ 1004.632$$

$$b = Rs.\ 1.868$$

After segregating the mixed costs into fixed cost and variable costs, the fixed component is added to fixed costs and variable component to variable costs. Now we have only two costs i.e. fixed costs and variable costs.

15.3   CONCEPT OF MARGINAL COST AND MARGINAL COSTING

The term '*Marginal Cost*' is defined as the amount at any given volume of output by which the aggregate costs are changed if the volume of output is increased or decreased by one unit. In this context a unit may be single article, a batch of articles or an order. It is the variable cost of one unit of a product or a service. For example, the cost of 100 articles is Rs. 50,000 and that of 101 articles is Rs. 50,450, the marginal cost is Rs. 450 (i.e., Rs. 50,450 –50,000).

Thus, the total cost is the aggregate of fixed cost and variable cost and if production is increased by one more unit, its cost can be computed as follows:

$TC_n = FC + vQ$ ………….. (1)

$TC_{n+1} = FC + v\,(Q+1)$ ………….. (2)

$\therefore MC = v$ (Subtracting 1 from 2)

Marginal costing may be defined as "the ascertainment of marginal costs and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable costs". The concept of marginal costing is based on the behaviour of costs that vary with the production level. In marginal costing, costs are classified into fixed and variable costs. Even semi-variable costs are analysed into fixed and variable. The stock of work-in-progress and finished goods are valued at marginal cost. Marginal cost is equal to the increase in total variable cost because within the existing production capacity, an increase in variable one unit of production will cause an increase in variable costs only. The fixed costs remain same. In marginal costing, only variable costs are considered in calculating the cost of product, while fixed costs are treated as period cost which will be charged against the revenue of the period. The revenue generated from the excess of sales over variable costs is called contribution. Mathematically,

Total sales – Variable costs   =   Contribution

Sales = Variable cost + Contribution

Sales – Variable cost   =   Fixed cost ± profit/loss

Contribution – Fixed costs   =   Profit

For example, the selling price of a product is Rs. 30 per unit and its variable cost is Rs. 20, the contribution per unit is Rs. 10. Let us take the following illustration how the profit is determined by using marginal costing technique.

Illustration 3

From the following particulars find out the amount of profit earned during the year using the marginal costing technique :

Product	A	B	C
Output (units)	10,000	20,000	60,000
Selling Price (per unit)	Rs. 10	Rs. 10	Rs. 5
Variable cost (per unit)	Rs. 6	Rs. 7.50	Rs. 4.50

Total Fixed Cost Rs. 80,000.

Solution

Statement of Cost and Profit (Marginal Costing)

Product

	A Rs.	B Rs.	C Rs.	Total Rs.
Sales Revenue	100,000	200,000	300,000	600,000
Marginal Costs	60,000	150,000	270,000	480,000
Contribution	40,000	50,000	30,000	120,000
Fixed Costs	—	—	—	80,000
Profit	—	—	—	40,000

Thus the technique of marginal costing assumes that the difference between the aggregate value of sales and the aggregate value of variable costs or marginal costs, provides a fund (called contribution) to meet the fixed costs and balance is the profit. The concept of contribution is a very useful tool to management in managerial decisions making.

15.4 INCOME STATEMENT UNDER MARGINAL COSTING AND ABSORPTION COSTING

In marginal costing, the stock of work-in-progress and finished goods are valued at marginal cost not including the fixed costs. Whereas under full costing or absorption costing, the cost of product is determined after considering both fixed and variable costs.

Let us explain the difference in the two methods with the help of an illustration given below :

Illustration 4

Given

Production	= 100,000 units

Sales 90,000 units @ Rs. 3 per unit

Variable manufacturing costs	= Rs. 2 per unit
Fixed overheads	= Rs. 50,000
Selling and distribution costs	= Rs. 10,000 of which Rs. 4000 is variable

Prepare the income statement under absorption costing and marginal costing.

Solution

<div align="center">

Income Statement
(Under Absorption Costing)

</div>

		Rs.
Sales 90,000 units @ Rs. 3		2,70,000
Less: Manufacturing costs :		
Variable costs	Rs.	
100,000 units @ Rs. 2	200,000	
Fixed overheads	50,000	
	2,50,000	
Less : Closing stock 10,000 units	25,000	2,25,000

$$\left[\frac{2,50,000 \times 10,000}{100,000}\right]$$

		Rs.
Gross margin (Rs. 2,70,000 – Rs. 2,25,000)		45,000
Less : Selling and distribution costs		10,000
Profit (Rs. 45,000 – Rs. 10,000)		35,000

<div align="center">

Income Statement
(Under Marginal Costing)

</div>

		Rs.
Sales 90,000 units @ Rs. 3 per unit		2,70,000
Less : **Marginal Costs**		
Variable manufacturing costs :	Rs.	
100,000 units @ Rs. 2 per unit	200,000	
Less : Closing inventory of 10,000 units @ Rs. 2	20,000	
	1,80,000	
Add : Variable selling and distribution costs	4,000	1,84,000
Contribution		86,000
(Sales Rs. 2,70,000 – Variable Cost Rs. 1,84,000)		
Less Fixed Costs :		
Fixed overheads	50,000	
Fixed selling and distribution	6,000	56,000
Profit (Rs. 86,000 – Rs. 56,000)		30,000

The profit computed under marginal costing is Rs. 5000 less in comparison to full costing. The closing stock under absorption costing is valued at Rs. 2.50 per unit (fixed and variable cost) whereas under marginal costing it is Rs. 2 per unit (only variable cost). The difference is of Rs. 0.50 per unit on a closing inventory of 10,000 units which amounts to Rs. 5,000.

We can draw the following inferences:

1) When all costs are variable costs, then both the methods will report the same net income.

2) When sales and production are in balance (no opening or closing stock) both the methods will again report the same profit.

3) When there is a closing stock (and no opening stock) the net income reported under absorption costing will be higher than that reported under marginal costing. Thus the technique of absorption costing may lead to odd results particularly for seasonal business in which stock level fluctuates widely from one period to another.

4) When there is a opening stock (and no closing stock), the profit under marginal costing will be more than the profit reported under absorption costing.

5) When the closing stock is more than the opening stock (presuming that both opening and closing stocks are valued at same price), profit reported under marginal costing will be less than the profit reported under full costing or absorption costing.

The technique of absorption costing may also lead to rejection of a profitable business. An order at a price which is less than the total cost may be refused, though this order may be profitable. Look at the following illustration:

Illustration 5

XYZ Ltd. has a capacity to production 100,000 units and company is presently operating at 70% capacity. The company is selling its product at Rs. 120 each. The cost information is as follows.

	Per Unit	Total
Variable Cost	Rs. 60	Rs. 42,00,000
Fixed Costs	Rs. 30	Rs. 21,00,000
Total	Rs. 90	Rs. 63,00,000

The company has received an order for 20,000 units at Rs. 70 per unit. Should the order be accepted or rejected.

Solution

Under absorption costing, cost includes both fixed as well as variable cost. Thus the cost per unit is Rs. 90 and the order at Rs. 70 per unit be rejected. Under marginal costing, only variable costs are considered. When company will supply extra 20,000 units, only variable cost will increase and fixed cost will remain same.

The fixed cost of Rs. 21,00,000 is already recovered by operating at 70% installed capacity. Thus the order will increase the profit.

	Before Order Rs.	Order Rs.	After Order Rs.
Sales 70,000 @ Rs. 120	84,00,000	14,00,000 (20,000 × Rs.70)	98,00,000
Variable costs @ Rs. 60	42,00,000	12,00,000	54,00,000
Contributions	42,00,000	200,000	44,00,000
Fixed costs	21,00,000	—	21,00,000
Profit	21,00,000	200,000	23,00,000

Accepting the order enhances the profit by Rs. 200,000.

The difference between absorption costing and marginal costing arises mainly due to recovery of fixed overheads and valuation of inventory.

Valuation of Stocks

In absorption costing, stocks of work-in-progress and finished goods are valued at works cost or cost of production, which includes fixed costs also. Where as in marginal costing, stocks are valued at marginal cost or variable cost only. This method does not result in carrying over of fixed cost of one period to another, as it happens in the case of absorption costing. In other words, valuation of stock is done at a lower price in marginal costing, thus profit will differ under two methods of costing.

Absorption of Overheads

In absorption costing, both fixed and variable overheads are charged to production while in marginal costing only variable overheads are charged to production. Thus under absorption costing, there will be either over-absorption or under absorption of fixed overheads, where as in marginal costing, the actual amount of fixed overheads is wholly charged to contribution. Hence profit will differ.

Let us see following illustration how the profit fluctuates under both these methods when there is opening and closing stock of inventory:

Illustration 6

XYZ Ltd. produces one product. Its quarterly budget of sales, cost of sales and production is as follows:

Quarterly Budget		Total Rs.	Per Unit Rs.
Sales 40,000 units @ Rs. 3		1,20,000	3
Cost of Sales :	Rs.		
Variable Manufacturing Costs	60,000		1.50
Fixed Manufacturing Costs	12,000		0.30
Total Cost		72,000	1.80
Gross Profit		48,000	1.20
Less Selling and Distribution Costs (Fixed)		28,000	0.70
Net Operating Profit		20,000	0.50

The actual production and sales on a quarterly basis is as follows:

(units)

	Quarter I	Quarter II	Quarter III	Quarter IV
Opening Inventory	0	0	9,000	2,000
Production	40,000	45,000	35,000	38,000
Sales	40,000	36,000	42,000	40,000
Closing Inventory	0	9,000	2,000	0

Prepare quarterly income statement under absorption costing and marginal costing.

Solution

Income Statement
(under Absorption Costing)

	Quarter I Rs.	Quarter II Rs.	Quarter III Rs.	Quarter IV Rs.
Sales	1,20,000	1,08,000	1,26,000	1,20,000
Manufacturing Costs :				
Opening inventory*	0	0	16,200	3,600
Variable Costs	60,000	67,500	52,500	57,000
(Rs. 1.50 per unit)				
Fixed overheads	12,000	12,000	12,000	12,000
Cost of goods	72,000	79,500	80,700	72,600
Less Closing Stock*	0	16,200	3,600	0
Cost of Sales	72,000	63,300	77,100	72,600
Gross Profit (Sales – Cost of Sales)	48,000	44,700	48,900	47,400
Less Fixed Selling Costs	28,000	28,000	28,000	28,000
Profit	20,000	16,700	20,900	19,400

*Opening and closing stock is valued at full cost i.e. fixed and variable which is
 $0.30 + 1.50$ respectively = Rs. 1.80.

Income Statement
(Under Marginal Costing)

	Quarter I	Quarter II	Quarter III	Quarter IV
Sales	1,20,000	1,08,000	1,26,000	1,20,000
Costs of Sales :				
Cost of opening inventory*	0	0	13,500	3,000
Variable Mfg. Exp.	60,000	67,500	52,500	57,000
Cost of good available for sale	60,000	67,500	66,000	60,000
Less Closing Stock*	0	13,500	3,000	0
Cost of Sales :	60,000	54,000	63,000	60,000
Contribution				
(Sales – Cost of Sales)	60,000	54,000	63,000	60,000
Less Fixed Costs :				
Fixed Mfg. Cost	12,000	12,000	12,000	12,000
Fixed Selling Exp.	28,000	28,000	28,000	28,000
Net Profit	20,000	14,000	23,000	20,000

*Opening stock and closing stock is valued at marginal cost i.e. Rs. 1.50 per unit.

The main features of marginal costing are:

1) All costs are classified in fixed and variable costs. Variable cost per unit remains same and fixed costs remain same in total regardless of the changes in production.

2) Fixed costs are considered period costs and variable costs are considered as product costs. Hence fixed costs are not included in product cost.

3) Stock of work-in progress and finished goods are valued at marginal costs or variable costs.

4) The difference in the value of opening stock and closing stock does not affect the unit cost of production as all the product costs are variable costs.

Direct Costing and Marginal Costing are used inter-changeably. As both the techniques are more or less same. In direct costing, costs are classified into direct and indirect costs. Direct costs are those which can be directly allocated to cost unit or cost centre while indirect costs can not be allocated to cost unit or costs centre directly. The only difference between the two is that some fixed cost could be considered to be direct costs under certain circumstances.

15.5 MARGINAL COSTING EQUATION AND CONTRIBUTION MARGIN

In full costing or absorption costing, all costs are classified into three broad classes-manufacturing, administrative and selling. In the income statement, manufacturing costs are deducted from the sales revenue to get the gross margin or gross profit then administrative and selling expenses are deducted from gross margin to arrive at net operating income. Under marginal costing, costs are clarified into fixed and variable expense. All variable costs, whether they are manufacturing, administrative or selling are deducted from sales revenue. The difference is called contribution margin or marginal income. All fixed costs are recovered from the contribution and balance is profit or loss.

Illustration 7

Two companies A Ltd. and B Ltd. sell the same type of product. Their income statement are as follows:

	A Ltd.	B Ltd.
	Rs.	Rs.
Sales	2,40,000	2,40,000
Less Variable Cost	96,000	1,20,000
Fixed Costs	64,000	40,000
Profit	80,000	80,000

State which company is likely to earn greater profit if there is: (i) heavy demand, (ii) poor demand for its products.

Solution

	A Ltd.	B Ltd.
	Rs.	Rs.
Sales	2,40,000	2,40,000
Variable Cost	96,000	1,20,000
Contribution	1,44,000	1,20,000
P/V Ratio (Contribution ÷ Sales)	0.60	0.50

In case of A Ltd., every sale of Rs. 100 gives a contribution of Rs. 60 whereas in case of B Ltd. every sale of Rs. 100 provides a contribution of Rs. 50. In case of heavy demand, profit of A Ltd. will rise much faster in comparison to B Ltd. During poor demand or decline in sales of Rs. 100 will lead to decline in contribution in A Ltd. and B Ltd. by Rs. 60 and Rs. 50 respectively.

Mathematically,

$$\text{Sales} = \text{Variable cost} + \text{Fixed cost} \pm \text{Profit}.$$

$$\text{Sales} - \text{Variable cost} = \text{Fixed Cost} \pm \text{Profit}$$

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

$$\text{Contribution} - \text{Fixed cost} = \pm \text{Profit}$$

To make profit, contribution should be greater than fixed cost. Further, to maximize profit, contribution should be maximized. When contribution is equal to fixed cost, then a firm is at 'no profit no loss point' called break even point which you will study in detail under Unit 16.

15.6 PROFIT-VOLUME RATIO

Profit volume ratio or contribution to sales ratio is a relationship between contribution and sales. It is the ratio between contribution per product to turnover of the product. Mathematically,

$$\text{P/V Ratio} = \frac{\text{Sales} - \text{variable cost}}{\text{Sales}}$$

$$= \frac{\text{Contribution}}{\text{Sales}}$$

$$= 1 - \frac{\text{Variable cost}}{\text{Sales}}$$

$$= \frac{\text{Fixed cost} + \text{profit}}{\text{Sales}}$$

$$= \frac{\text{Change in contribution}}{\text{Change in sales}}$$

$$= \frac{\text{Change in Profit}}{\text{Change in sales}}$$

Profit-volume ratio depicts the soundness of the company's product. Profit volume analysis is used to determine break even for a product, a group of products and to know how the profit changes if changes are made in price, volume, costs or any combination of these. But P/V graph does not show how cost varies with the change in the level of production. The profit volume ratio and contribution has a direct relationship. The profit volume ratio can be improved by improving the contribution and contribution can be improved by :

i)   increasing the selling price

ii)   decreasing the marginal or variable costs.

iii) putting more emphasis on those products which have higher profit volume ratio.

Profit Volume Graph

For preparing the profit volume graph, following steps are involved :

l Sales are depicted on x-axis and profit and loss on y-axis.

l X-axis divides the graph into two parts. The lower area of the x-axis depicts loss and upper area depicts the profit. When sales is zero, loss is equal to fixed cost.

l At a particular level of sales volume, the profit is depicted on y-axis. Both the points are joined by a straight line called profit line.

l The point where profit line inter-sects the x-axis is called the break even point.

l The angle between sales line and profit line is called angle of incidence.

Illustration 8

Construct profit volume graph with the help of the following data:

XYZ Ltd. reports the following results on 31st March, 2004 :

Sales @ Rs. 3 each	Rs. 3,00,000/-
Variable cost Rs. 2 each	Rs. 2,00,000/-
Fixed cost	Rs. 50,000/-

Construct the P/V chart.

Solution

$$P/V \text{ ratio} = \frac{\text{Contribution}}{\text{Sales}}$$

Contribution = Sales – Variable Cost

= Rs. 3,00,000 – Rs. 2,00,000

= Rs. 1,00,000.

Profit-Volume Graph
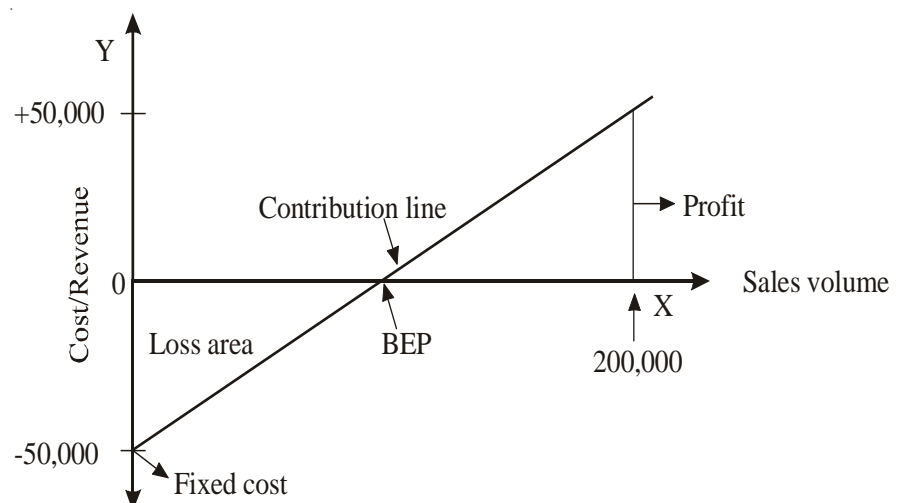
On X-axis, OX represents sales volume, on Y-axis OY represents profit while OY' loss. OFC represents fixed cost. The line FCP represents Fixed cost and profit as well as total contribution. BE is the break-even point. The area BEX represents margin of safety while XBEP profit area. PBEX is the angle of incidence. You will be acquainted with all these terms in detail in Unit 16.

Where a company is manufacturing more than one product of varying profitability, the profit-volume graph can be constructed as follows :

Illustration 9

XYZ ltd. produces three products X, Y and Z. The cost data is as follows:

Fixed Cost   Rs. 25,000

	X Rs.	Y Rs.	Z Rs.
Sales	50,000	25,000	30,000
Variable Costs	20,000	20,000	18,000

You are required to

i)   Calculate the Profit-Volume ratio of each products, and

ii) Prepare a profit-volume ratio chart.

Solution

	X Rs.	Y Rs.	Z Rs.	Total Rs.
Sales	50,000	25,000	30,000	105,000
Variable Costs	20,000	20,000	18,000	58,000
Contribu0tion	30,000	5,000	12,000	47,000
Profit-volume ratio	3/5 or 0.60	5/25 or 0.20	12/30 or 0.40	47/105 or 0.45

The sequence should be X, Z and Y. (Descending order of P/V Ratio)

Product	Sales	Variable Cost	Contribution	Cumulative Contribution	Fixed Costs	Cumulative Profit	Cumulative Sales
X	50,000	20,000	30,000	30,000	25,000	5,000	50,000
Z	30,000	18, 000	12,000	42,000	25,000	17,000	80,000
Y	25,000	20,000	5,000	47,000	25,000	22,000	105,000
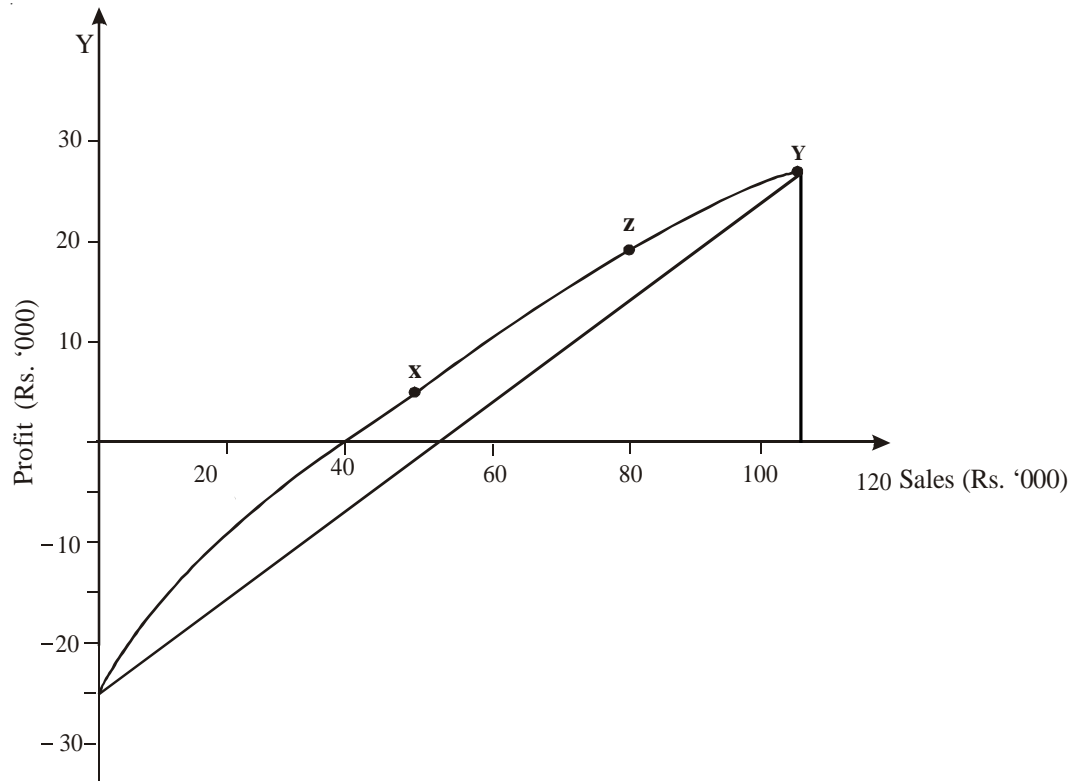
15.7 MANAGERIAL USES OF MARGINAL COSTING

Marginal Costing is a useful tool to management in taking various policy decisions, profit planning and cost control. Following are a few of the managerial problem where marginal costing is helpful in decision making:

1) Price Fixation

2) Accepting Special Order and Exploring Additional Markets

3) Profit Planning

4) Key Factors or Limiting Factor

5) Sales Mix Decisions

6) Make or Buy Decisions

7) Adding or Dropping Decisions

8) Suspension of Activities

1) **Price Fixation**

Under marginal costing, fixed costs are ignored and price is determined on the basis of variable costs (marginal). In normal business conditions, the price fixed must cover full costs otherwise firm will incur losses. In certain circumstances like trade depression, dumping, seasonal fluctuation in demand, highly competitive market etc. pricing is fixed with the help of marginal costing rather than full costing.

During trade depression, the price may go down even below the full cost of the product. In such case, the management has to decide whether to close down the production activities until the recession is over or continue the production activities. In case, the production activities are closed down, the firm will incur loss equal to its fixed

cost or un-escapable costs. The main emphasis of management is to minimise its losses. The firm should continue its production activities so long as the selling price is more than the marginal costs because any contribution earned will help in recovery of the fixed costs which results in reduction of loss.

Dumping means selling the product in foreign market at a price less than its total cost. The firm recover its fixed cost from the domestic market and marginal cost of the product becomes the basis for price fixation. Similarly if the firm produces product of seasonal demand or perishable goods marginal costing is more useful technique than full costing.

Suppose the marginal cost of a product is Rs. 50 per unit and fixed cost is Rs. 200,000 per annum. Selling price of the product is Rs. 55 per unit and 10,000 units can be sold at this price.

	Per Unit **Rs.**	**Total** **Rs.**
Marginal Cost	50.00	500,000
Fixed Cost	20.00	200,000
Total Cost	70.00	700,000

The selling price is less than the total cost of the product, yet is beneficial to continue the production activity. The contribution earned is Rs. 5 per unit and total contribution is Rs. 50,000. This will reduce the loss by Rs. 50,000. If the firm discontinue production activity, then loss will be Rs. 200,000 (Fixed Cost). Hence the firm should continue production activity.

If the selling price is less than marginal cost, loss will be more than the fixed costs. Hence the firm should fix the price equal to or above the marginal cost in special circumstances. Production should be discontinued if the price obtained is below the marginal cost so that the loss may not be more than fixed costs.

2) Accepting Special Order and Exploring Additional Markets

In case of spare capacity, a firm can increase its total profits by accepting an special order above the marginal cost and at a price lower than its regular selling price. The additional contribution earned from the special order will be the additional profit to the firm. When additional order is accepted at a price below prevailing price to utilise idle capacity, it should be carefully seen that it will not affect the normal market and goodwill of the company. The special order from a local dealer should not be accepted as it will affect the relationship with other dealers.

Illustration 10

The company is operating at 60% of the installed capacity (total capacity of 10,000 units per month). Its monthly fixed expenses is Rs. 6 lakhs per month. The other costs are:

Direct Material	Rs. 55 per unit
Direct Labour	Rs. 10 per unit
Variable Expenses	Rs. 25 per unit

The company has invested Rs. 1 crore in the business and is currently earning a return of 7.2 per cent per annum before taxes. The managing director is prepared to accept new business at any price which will raise the return on investment to 20 per cent before taxes. A special offer was received for 4000 units every month if the product is supplied at Rs. 120 per unit. Would you advise the company to accept the offer?

Solution

Total Capacity	=	10,000 units per month
Present Production	=	6000 units per month
Fixed Cost	=	Rs. 6 lakhs per month
Marginal Cost	=	Rs. 90 per unit
Return on Investment	=	7.2 per cent
Annual Profit	=	Rs. 7,20,000
Profit per month	=	Rs. 60,000

The selling price per unit will be

	Output 6000 units	
	Per Unit (Rs.)	Total (Rs.)
Direct Cost	90	5,40,000
Fixed Cost	100	6,00,000
Total Cost	190	11,40,000
Profit	10	60,000
Selling Price	200	12,00,000

The total cost of the product is Rs. 190 per unit. The company has received the offer at Rs. 120 per unit. It appears that if the offer is accepted, the company will loose Rs. 70 per unit. Hence the offer be rejected. But this analysis is fallacious as fixed cost will not change when production is increased. Here only variable cost which changes. Thus the selling price should be compared with the marginal cost which is Rs. 90 per unit. If the order is accepted each unit will provide Rs. 30 contribution towards profit. If the order is accepted then the profit position will be as follows:

Output	Present 6000 units		Order 4000 units		10,000 units
	Per Unit Rs.	Total Rs.	Per Unit Rs.	Total Rs.	Total Rs.
Sales	200	12,00,000	120	4,80,000	16,80,000
Variable Cost	90	5,40,000	90	3,60,000	9,00,000
Contribution	110	6,60,000	30	1,20,000	7,80,000
Fixed Costs	100	6,00,000	-–	—	6,00,000
Profit	10	60,000	30	1,20,000	1,80,000

$$\text{Return on Investment} = \frac{1,80,000 \times 12 \times 100}{1 \text{ crore}} = 21.6\%$$

The above statement provides that if the company accepts the offer, it will earn additional Rs. 1,20,000 per month. The return on investment is enhanced from 7.2 per cent to 21.6%. Before accepting the offer, following factors must be evaluated :

l   The lower selling price for this offer, should not affect adversely the regular customers and goodwill of the company.

l   Decrease in price should not create a doubt in the customer's mind about the quality of the product.

l   No possibility of any other more profitable use of unutilised capacity.

3) **Profit Planning**

Marginal costing is very helpful in determining the level of activity to achieve the planned profits. The separation of costs in to fixed and variable aid management further in planning and evaluating the profit resulting from a change in volume, a change in selling price, a change in fixed costs and variable costs.

Illustration 11

XYZ Ltd. is manufacturing and selling a product whose cost data is as follows:

	Per Unit Rs.	Total Rs.
Current Sale (20,000 units)	20	400,000
Variable Cost (20,000 units)	10	200,000
Fixed Cost		100,000
Profit		100,000

It is proposed to reduce the selling price due to competition by 10 per cent. How many units are to be sold to maintain the present profit level ?

Solution

New selling price after 10% reduction = Rs. 18

Contribution = Selling price – Variable Cost

= Rs.18 – Rs.10 = Rs. 8 per unit

Desired Contribution = Fixed Cost + Profit

= Rs. 100,000 + Rs.100,000 = Rs. 200,000

$$\text{Sales required to earn desired profit (units)} = \frac{\text{Desired Contribution}}{\text{Contribution Per Unit}}$$

$$= \frac{\text{Rs. } 2,00,000}{\text{Rs. } 8} = 25,000 \text{ units}$$

$$\text{Desired Sales (Value)} = \frac{\text{Fixed Cost + Desired profit}}{\text{P/V ratio}}$$

$$= \frac{\text{Rs. } 2,00,000 \times \text{Rs. } 18}{\text{Rs. } 8}$$

= Rs. 4,50,000

4) **Key Factors or Limiting Factor**

The marginal costing technique provides that the product with highest contribution per unit is preferred. This inference holds true so long as it is possible to sell as much as it can produce. But sometimes an organisation can sell all it produces but production is limited due to scarcity of raw material, labour, electricity, plant capacity or capital. These are called key factors or limiting factors. A key factor or limiting factor puts a limit on production and profit of the firm. In such situation, management has to take a decision whose production is to be increased, decreased or stopped. In such cases,

selection of the product is done on the basis of contribution per unit of scarce factor of production. The key factor or scarce factor should be utilized in such a manner that contribution per unit of scarce resource is the maximum.

Mathematically,

$$\text{Profitability} = \frac{\text{Contribution}}{\text{Key Factor}}$$

For example, if raw material is the limiting factor, the profitability of each product is determined by contribution per Kg of raw material. If machine capacity is a limiting factor then contribution per machine hour is calculated. It electricity is the limiting factor, then contribution per unit of electricity of each product is calculated.

Illustration 12

A company produces two products X and Y. The cost information is as follows:

Product	X	Y
Sale Price	Rs. 20	Rs. 15
Variable Cost	Rs. 10	Rs. 8
Required Machine hours per unit	2	1
Sales Potential (Units)	1000	1200
Available production hours	2000	

Calculate and find the best product mix.

Solution

Product	X	Y
Sale Price	Rs. 20	Rs. 15
Variable Cost	Rs. 10	Rs. 8
Contribution	Rs. 10	Rs. 7
Required machine hours per unit	2	1
Contribution per machine hour	Rs. 5	Rs. 7

Product Y gives the highest contribution per machine hours. The best solution would be to produce Y to the maximum extent that can be sold and remaining hours should be devoted for production of X. Hence 1200 units of Y be produced and remaining 800 hours be devoted to product X which means 400 units of X. Thus the optimum mix is 400 units of X and 1200 units of Y.

5) **Sales Mix Decision**

In marginal costing, profit is calculated by subtracting fixed cost from contribution. It means management should try to maximise the contribution. When a business firm produces variety of product lines, then problem of best sales mix arises. The best sales mix is that which yields the maximum contribution. The products which gives the maximum contribution are to be retained and their production should be increased keeping in view the demand. The products, which yield less contribution, should be reduced or closed down depending upon the situation.

Illustration 13

State which of the following sales mix you would recommend to the management?

Elements of cost	X Rs.	Y Rs.
Sale Price	200	150
Direct Material	100	80
Direct Labour	40	30
Variable Overheads	20	20

Fixed Overheads   : Rs. 100,000

Alternative Sales Mix :

a)   2000 units of X and 2000 units of Y

b)   3000 units of X and 1000 units of Y

c)   4000 units of X and Nil units of Y

Solution

Product	X Rs.	Y Rs.
Sale Price	200	150
Direct Material	100	80
Direct Labour	40	30
Variable Overheads	20	20
Contribution per unit	40	20

Choice of Sales Mix :

Sales Mix (1) :   Contribution on   Rs.

2000 units of X @ Rs. 40 per units   =   80,000

2000 units of Y @ Rs. 20 per units   =   40,000

Total Contribution   =   Rs. 120,000

Sales Mix (2) :   Contribution on   Rs.

3000 units of X @ Rs. 40 per unit   =   120,000

1000 units of Y @ Rs. 20 per unit   =   20,000

=   Rs. 140,000

Sales Mix (3) :   Contribution on

4000 units of X @ Rs. 40 per unit   =   Rs. 1,60,000

Sales mix 3 gives the highest contribution and is the best mix among the above alternatives.

6)   **Make or Buy Decision**

A particular component used in the main product may be purchased or may be manufactured in its own factory by utilising the idle capacity of the existing facilities. In such make or buy decision, the marginal cost of manufacturing in the unit is compared

with the purchase price from the market. If marginal cost is less than the purchase price, then the component should be manufactured in its own unit, otherwise it should be purchased from the market. Fixed expenses are not taken in the cost of manufacturing on the assumption that they have been already incurred, the additional cost involved is only variable cost.

Illustration   14

XYZ Ltd. produces a variety of products and components. Their cost information and purchase prices are as follows:

	X Rs.	Y Rs.	Z Rs.
Direct Material	12	4	2
Direct Labour	4	16	6
Variable Overhead	2	4	4
Fixed Cost	6	20	10
Bought out price	15	45	25

One of these products can be produced in the factory and rest two are to be bought from outside. Select the component which should be bought from outside ?

Solution

Comparative Cost Sheet

	X Rs.	Y Rs.	Z Rs.
Direct Material	12	4	2
Direct Labour	4	16	6
Variable Overhead	2	4	4
Marginal Cost	18	24	12
Bought out price	15	45	25
Saving (–) or increase (+)	—3	+21	+13

It is clear from the above statement that Y should be produced in its own unit as its marginal cost is much lower than the purchase price and other two components i.e., X and Z be purchased from the market.

7) **Adding and Dropping**

An organisation may have a number of product lines or departments. Certain product lines or departments may turn out to be unprofitable with the passage of time or due to technological developments. Production of such products or departments can be discontinued. The marginal costing approach assist in these situations to take a decision. It helps in the introduction of a new product line and work as a good guide for deciding the optimum mix keeping in mind the available resources and demand of the product. The contribution of different products or departments is to be compared and the product or department whose P/V ratio is the lowest is to be dropped out. The following illustration explains how marginal costing technique helps the management in decision making.

Illustration 15

A company manufactures three products whose cost data is given below.

Product	X (Rs.)	Y (Rs.)	Z (Rs.)
Selling Price	100	80	90
Direct Material	20	12	16
Direct Labour	16	16	16
Variable Overhead	16	12	15

The management wants to drop out Product Y as it is not profitable. What advice would you like to give the management ?

Solution

Comparative Cost Statement

Product	X (Rs.)		Y (Rs.)		Z (Rs.)	
Selling Price		100		80		90
Less Marginal Cost :						
Direct Material	20		12		16	
Direct Labour	16		16		16	
Variable Overhead	16	52	12	40	15	47
Contribution		48		40		43
P/v ratio	48%		50%		47.77%	

Product Y is the most profitable product line as its P/V ratio is the highest when compared to products X and Z.

8) Suspension of Activities

During trade recession and cut throat competition the demand of the product is not adequate to cover the fixed costs, management may consider to suspend the operations for the time being. If certain portion of fixed expenses is escapable e.g. salary of temporary staff then size of contribution should exceed the escapable fixed costs. In some units when production is restarted after suspension, some additional or special costs are incurred like overhauling of the plant and machinery. These costs are called additional costs of shut down. These costs are deducted from the escapable fixed costs and amount of contribution is compared with the net escapable fixed costs. If the contribution is greater than the net escapable fixed cost, the production should be continued and *vice versa.*

$$\text{Shut down point} = \frac{\text{Net Escapable Fixed Costs}}{\text{Contribution per unit}}$$

Net escapable fixed cost = Total fixed cost for the period – unescapable fixed costs + additional costs of shut down.

Illustration 16

XYZ Ltd. is manufacturing 200,000 boxes per annum when working at normal capacity. The cost information is as follows :

		Rs.
Direct Material	=	8.00
Direct Labour	=	2.00
Variable Overheads	=	3.00
Fixed Overheads	=	3.00
Total Cost	=	16.00

The selling price is Rs. 20 per unit. It is estimated that in the next quarter only 10,000 units can be produced and sold. Management plans to shut down the plant and estimating that fixed cost can be reduced to Rs. 80,000 for the quarter. The fixed overheads are incurred uniformly throughout the year. Additional cost of plant shut down is Rs. 10,000.

From the above information you are requested to decide the following:

a) Whether the plant should be shut down for a period of three month

b) Calculate the shut down point for three months.

Solution

		Rs.
a)	**Sale Price**	16

Marginal Costs :	Rs.	
Direct Material	8	
Direct Labour	2	
Variable Overheads	3	13
Contribution :		Rs. 3 per unit.

Fixed Overhead = Rs. $3 \times 200,000$ = Rs. 600,000 per annum

Fixed overheads for quarter $= \dfrac{Rs. 600,000}{4} =$ Rs. 1,50,000

If plant is operated, the loss is : Rs.

Total contribution on 10,000 units	= 30,000
(10,000 units $\times$ Rs. 3)	
Fixed Cost	= 150,000
Loss (Fixed cost – Contribution)	= 120,000

If plant is closed, then loss will be :

Unescapable fixed cost	= Rs. 80,000
Addition shut down cost	= Rs. 10,000
Total Loss	= Rs. 90,000

As is evident from the above calculations that the plant should be closed down for the quarter, so that the loss will be reduced by Rs. 30,000.

b) **Shut down point**

Net Escapable Fixed Cost = Total Fixed Cost for the period – Shut down costs + additional costs.

= Rs. 150,000 – Rs. 80,000 + Rs. 10,000 = Rs. 80,000

Shut down point $= \dfrac{\text{Net Escapable Fixed Cost}}{\text{Contribution Per Unit}}$

$= \dfrac{Rs. 80,000}{Rs. 3}$

= 26,667 units per quarter

For suspension of business activity, only costs should not be taken into consideration, there are other factors also like, employees interest, fear of plant obsolescence, loss of customers in future, government action, perishable raw material and company is having a huge stock of material, etc.

Check Your Progress

A) Fill in the blanks:

   i)   The technique of marginal costing is based on classification of costs in to
        _____ and _____.

   ii) Contribution is the sum of _____ and _____.

   iii) In marginal costing, closing stock is valued at _____.

   iv) Profit-volume ratio is the relationship between _____ and
        _____.

   v)   In absorption costing, closing stock is valued at _____.

B) State whether each of the following statement is True or False.

   i)   Fixed cost per unit remains constant.   [T   F]

   ii) Variable cost per unit remains constant   [T   F]

   iii) Absorption costing is not as suitable for decision making as
        marginal costing is   [T   F]

   iv) Semi-variable costs consists of fixed costs and factory costs [T   F]

   v)   Fixed costs are not taken in to consideration in valuation of
        work-in-progress in marginal costing   [T   F]

C) From the following choose the most appropriate answer

   1)   Contribution margin is also known as

        a)   Gross profit

        b)   Net profit

        c)   Earning before tax

        d)   Marginal income

   2)   Contribution is the difference between

        a)   Sales and variable cost

        b)   Sales and fixed cost

        c)   Sales and total cost

        d)   Factory cost and profit

3) When fixed cost is Rs. 20,000 and Profit volume ratio is 25 per cent, then break even point will occur at

    a) Rs. 5000

    b) 5000 units

    c) Rs. 80,000

    d) 80,000 units

4) Period cost means

    a) Variable cost

    b) Fixed costs

    c) Prime cost

    d) Factory cost

5) If profit-volume ratio is 25 per cent and sales is Rs. 100,000, the variable cost will be

    a) Rs. 25,000

    b) Rs. 50,000

    c) Rs. 75,000

    d) None of the above

6) The valuation of stock in marginal costing as compared to absorption costing is

    a) Higher

    b) Lower

    c) Same

    d) None of the above

15.8 LIMITATIONS OF MARGINAL COSTING

The marginal costing has the following limitations :

1) **Difficulty in cost Analysis :** Separation of costs into fixed and variable becomes very difficult under certain circumstances and in certain business situations. The accuracy of marginal costing results depends upon how accurately costs are classified.

2) **Inappropriate basis of pricing :** In marginal costing, there is a danger of too many sales being made at marginal cost or marginal cost plus some contribution, resulting in under recovery of fixed overheads. This situation will arise during depression or increasing competition.

3) **Under valuation of inventory :** In marginal costing, inventories are valued at variable costs. It may create problems in inter firm transfer of goods at marginal costs resulting in higher profits. Employees may demand higher salaries and other benefits. Exclusion of fixed costs from inventory cost seems to be against the accepted accounting procedure.

4) **Same marginal cost per unit :** This assumption is partly true within a limited range of activity. Scarcity of labour and material brings change in price, trade discount of bulk purchases, changes in the productivity of men etc. will influence the marginal cost per unit.

5) **Not suitable to all concerns :** This technique may not be suitable in those industries which have large stock of work-in-progress e.g. contact and ship building industry. If fixed expenses are not included in valuation of work-in-progress losses may occur in the initial years till the contract is completed. On completion of the contract, huge profit will be depicted.

6) **New Technology :** With the development of science and technology, new cost efficient machines are available resulting in reduction in labour costs and increased fixed costs. The system of costing, which ignores significant portion of cost i.e. fixed cost, can not be very effective.

15.9   LET US SUM UP

The elements of costs are material, labour and expenses. These elements of costs are broadly put into two categories: fixed and variable costs. The cost of product or process can be ascertained by absorption costing and marginal costing. In absorption costing or full costing, cost of a product is determined after considering both fixed and variable cost. Whereas in marginal costing only variable costs are considered in calculating the cost of product and fixed costs are charged against the revenue (consideration) of the period. Marginal costing is a definite improvement over the absorption costing.

Marginal costing involves computation of marginal cost. The marginal cost is also called variable costs. It comprises of direct material, direct labour and variable overheads. Marginal costing helps the management in taking various managerial decisions like price fixation, profit planning, add and drop decisions, make or buy decision, sales mix decision etc.

Marginal costing technique has some limitations. The categorisation of expenses into fixed and variable elements is tedious and complex task. The behaviour of per unit variable and total fixed cost is questionable as assumed in marginal costing. Inspite of these limitations, marginal costing is a useful technique for decisions making in several business decisions.

15.10   KEY WORDS

Absorption costing or full costing: A technique where all costs, fixed and variable, are allocated to cost unit.

Break Even Point: A level of production activity, where sales revenue is equal to variable cost and fixed cost or contribution equal to fixed cost. It is also called 'no profit, no loss' point.

Contribution: The difference between sale price and variable costs is called contribution.

Marginal Cost: It comprises of direct material, direct labour and variable overheads or cost of producing one additional unit.

Marginal Costing: It is a technique where only variable costs are considered while computing the cost of product. The fixed costs are met against the total contribution of all the products taken together.

15.11   ANSWERS TO CHECK YOUR PROGRESS

A) i)   Fixed and Variable,   ii) Fixed Cost and Profit,   iii)   variable cost, iv) contribution and sales,   v)   full cost

B) i) F,   ii) T,   iii) T,   iv) F,   v) T

C) 1) D,   2) A,   3) C,   4) B,   5) C,   6) D

15.12   TERMINAL QUESTIONS

1) Under what conditions, the income statement prepared under full costing or absorption costing and marginal costing will give similar results.

2) State the conditions, the income statement prepared with absorption costing and marginal costing will give different results.

3) Explain the application of marginal costing in managerial decision making.

4) How semi-variable costs or mixed costs can be segregated into fixed and variable components.

5) 'The profit is the product of the P/V ratio and the margin of safety'. Comment.

6) What are the limitations of marginal costing techniques?

7) A manufacturer produces a car component. The cost sheet of the component is as follows:

Material	4.00
Direct Labour	2.00
Variable Overheads	1.50
Fixed Overheads	2.50
	10.00

A foreign manufacturer who uses this car component offers to purchase 20,000 units at Rs. 13 per component against the usual price of Rs. 15 per unit. If this offer is accepted the fixed expenses will go up by Rs. 40,000 annually.

Would you accept this offer? Are there any other considerations, which may affect your decision?

(Yes, profit increases by Rs. 70,000)

8) The management of company worried about the performance of Department X and wants to close the department. The following data is supplied by the cost accountant.

	Department		
	X Rs.	Y Rs.	Z Rs.
Sales	40,000	60,000	1,00,000
Variable Costs	36,000	48,000	60,000
Fixed costs (apportioned on the basis of sales)	6,000	9,000	15,000
Total Cost	42,000	57,000	75,000
Profit or Loss	−2000	+3000	+2500

a) You are required to advise management in respect of closure of department X.

b) On the above, the specific fixed costs are ascertained as follows: X Rs. 2000; Y Rs. 13000; and Z Rs. 5000 and the balance of Rs. 10,000 is treated as general fixed overheads.

(Answer : (a) Continue X (b) Close Y,   Total Profit Rs. 26,000)

9) A Company manufacturers and markets three products X, Y and Z. All the three products are manufactured from the same set of machines. Production is limited

by machine capacity. From the data given below, indicate the priorities for product X, Y and Z with a view to maximising profits.

	X	Y	Z
Raw Material per unit	11.00	16.25	21.00
Direct Labour per unit	2.50	2.50	2.50
Variable Overheads	1.50	2.25	3.50
Selling Price	25.00	30.00	35.00
Machine time required per unit in minutes	40	20	20

(**Answer :** Y, Z and X. Contribution per unit : 0.225, 0.45, 0.4 respectively.)

9) XYZ Ltd. produces three products and cost data is as follows:

	X Rs.	Y Rs.	Z Rs.
Selling price per unit	100	75	50
P/V Ratio	0.10	0.20	0.40
Maximum sales potential (in units)	40,000	25,000	10,000
Raw material content as % of variable costs	50.00	50.00	50.00

The fixed expenses are estimated at Rs. 6,80,000. The company uses a single raw material in all the products. Raw material is in short supply and the company has a quota for the supply of raw materials to the extent of Rs. 18,00,000 per annum for the manufacture of its products to meet its sales demand.

a) Calculate the product mix which will give the maximum overall profits keeping the short supply of raw materials.

b) Compute the maximum profit.

[**Answer :** (a) Product mix of X, Y and Z are 10,000, 25,000 and 10,000 units respectively; (b) Profit Rs. 95,000]

Note : These questions will help you to understand the unit better. Try to write answers for them. But do not submit your answers to the University. These are for your practice only.

15.13   FURTHER READINGS

Kishore, Ravi M., *Management Accounting with Problems and Solutions,* Taxmann Allied Services Pvt. Ltd. New Delhi, 2000.

Horngren, C.T., Gary L. Sundem and Frank H. Selto, *"Management Accounting"*, Prentice Hall of India, New Delhi, 1994.

Kaplan, R.S., *"Advanced Management Accounting"*, Engle Wood Cliffs, NJ., Prentice Hall Inc.