Subject: Cost and Management Accounting – II

Semester: IV

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Topic: Marginal Costing

Some Important Definition:

- ❖ **Marginal Cost:** Marginal Cost is the additional cost incurred for increase in one additional unit of output. Marginal cost is nothing but the variable cost.
- ❖ **Marginal Costing:** Marginal Costing is the method of ascertaining marginal cost and it evaluates the effect of fixed and variables costs on profit due to change in volume of production.
- ❖ **Distinguish features of Marginal Costing are:**
  (a) Only variable costs are charged to the cost unit. Fixed costs are recovered from contribution;
  (b) All costs including semi variable costs are divided into two parts, fixed and variable;
  (c) Closing inventories are valued at variable cost only;
  (d) Break-even Analysis and Cost-volume-profit Analysis are integral parts of this costing technique.
- ❖ **Marginal Costing technique is having many advantages, such as:**
  (a) It provides useful data for managerial decision- making;
  (b) It is a very effective tool of profit planning;
  (c) Its facilities control over variable costs by avoidance of arbitrary apportionment or allocation of fixed costs;
  (d) Problems on computation of accurate fixed factory overhead rate can be avoided as fixed overheads are charged against contribution;

(e) It provides the management with many useful techniques for decision – making like Break – even Analysis, etc.

❖ **Limitations of Marginal Costing are:**

(a) It assumes the semi- variables costs can be segregated into two parts, fixed and variable elements. In practice, however, such segregation of semi-variable costs is very difficult;

(b) It excludes fixed cost for decision – making, which sometimes may lead to wrong conclusion;

(c) It fails to reflect the impact of increased fixed costs due to development of technology on production costs;

(d) Variable cost technique cannot be successfully applied in "Cost plus contract".

❖ **Cost-volume-profit (CVP) Analysis** examines the relationship of costs and profit to the volume of production to maximize profit of the firm. The method of studying the relationship between the cost, volume of production, sales and their impact on profit is called as 'Cost-volume-profit Analysis'. CVP Analysis is a logical extension of marginal costing and is used as a very powerful tool by the management in the process of budgeting and profit planning.

❖ **Objectives of CVP Analysis are:**

(a) It helps to forecast profit fairly and accurately;

(b) It acts as an effective tool of profit planning to the management;

(c) It helps in ascertaining break-even point of the product produced and sold.

(d) It is very much useful in setting up flexible budget;

(e) It assists the management in the process of performance evaluation for the purpose of control;

(f) It helps in formulating price policies by projecting the effect of different price structures on costs and profits.

❖ **Underlying assumption of CVP Analysis are:**

(a) Total cost consists of two components – fixed cost and variable cost;

(b) Selling price per unit remains constant at different volume of sales;

(c) Only one product is sold by the concern or if it sells multiple product, the sales mix remains constant at different volume of sales;

(d) Volume of production is equal to the sales volume.

❖ In CVP Analysis, costs are classified in two parts – fixed cost and variable cost. Semi – variable cost is not separately recognized in CVP Analysis. Fixed portion of semi – variable cost is clubbed with the fixed cost and its variable portion is clubbed with the variable cost.

❖ **Elements of CVP Analysis are:**

✓ Marginal Cost Equation;

✓ Contribution;

✓ Profit – Volume Ratio;

✓ Break-even Point;

✓ Margin of Safety

❖ **Marginal Cost Equation** exhibits the relationship between the contribution, fixed cost and profit. It explains that the excess of sales over variable cost is the contribution towards fixed cost and profit, i.e. $S - V = F + P$.

❖ **Contribution** is the excess of sales over variable cost, i.e. $C = S - V$. This contribution is available towards fixed cost and profit, i.e. $C = F + P$.

❖ **Profit – Volume Ratio (P/V Ratio)** is the ratio of contribution and sales. It is generally expressed in percentage. It exhibits % of contribution included in sales, i.e. P/V Ratio = C/S x 100. It indicates the effect on profit for a given change in sales.

- ❖ **Break - even Point (BEP)** is that level of sales where there is no profit or no loss. At break – even point, total sales revenue is equal to total cost. Any sales above this BEP, a concern earns profit, whereas any sales below this BEP, the concern suffers loss. At BEP, total fixed cost and variable cost up to that level of sales have been recovered from sales. Generally, at any other point of sales, contribution from sales is available towards fixed cost and profit. But as there is no profit or loss at BEP, Contribution from sales at BEP is available towards fixed cost only, i.e. at BEP, C = F.

- ❖ **Margin of Safety (MS)** is the level of sales made above the break – even point. In other words, Margin of Safety is the excess of actual sales over BEP sales. Generally, at any point of sales, contribution from sales is available towards fixed cost and profit. But as the total fixed cost has already been recovered at break – even point, contribution from sales at margin of safety is available towards profit only, i.e. at MS, C = P.

- ❖ CVP Analysis is popularly known as **Break – even Analysis,** although there exists a narrow difference between these two terms. CVP Analysis refers to the study of the effect on profit due to changes in cost and volume of output, whereas BE Analysis refers to the study of determination of that level of activity where total sales is equal to the total cost and also the study of determination of profit at any level of activity. However, the technique of BE Analysis is so popular for studying CVP Analysis that these two terms are generally used synonymously.

- ❖ **Break – even Chart (BE Chart)** is the graphical presentation of Break – even Analysis. It depicts the relationship between costs, sales and profits. BE Chart graphically shows the profit or loss at various levels of activity and also shows the level of activity where there is no profit no loss (i.e. total cost equals total sales)

❖ **Angle of Incidence** is the angle formed by intersection of sales line and total cost line at break – even point in the break – even chart. This angle exhibits the rate at which profits are being earned by a concern after reaching the break – even point. It shows the profit earning capacity of a concern. Wider angle of incidence exhibits higher profit earning capacity of the concern or vice – versa.

Income Statement under Marginal Costing:

	Rs.
Sales	xxxx
Less: Variable Cost	xxx
Contribution	**xxxxx**
Less: Fixed Cost (Operating)	xxx
Profit (EBIT)	**xxxxx**

Formula:

1. Contribution **(C)** = Sales – Variable Cost = Fixed Cost + Profit
2. Profit – Volume Ratio (P/V Ratio) = Contribution / Sales * 100

     = {(Change in profit) / (Change in sales)} * 100
3. BEP Sales (in value) = Fixed Cost / (P/V Ratio)

   BEP Sales (in units) = Fixed Cost / Contribution per unit
4. Margin of Safety (MOS) = Actual Sales – BEP sales

     = Profit / (P/V ratio)
5. Required Sales (in value) = (Fixed Cost + Profit) / Contribution per unit

   Required Sales (in units) = (Fixed Cost + Profit) / (P/V Ratio).

Model Problems:

Q1. X Ltd. Made sales during a certain period for Rs. 1,00,000. The net profit for the same period was Rs. 10,000 and the fixed overheads were Rs. 15,000.

Find out:

    (i)   P/V Ratio.

    (ii)   Required sales to earn a profit of Rs. 15,000.

    (iii)   Net Profit from sales of Rs. 1,50,000.

    (iv)   Break – even point sales.

Solution:

    (i)   P/V Ratio = {(F+P) / S} x 100

         Here, F = Rs. 15,000, P = Rs. 10,000 and S = Rs. 1,00,000.

         ∴ P/V Ratio = [(15,000 + 10,000) / 1,00,000] x 100

         ∴ P/V Ratio = 25%.

    (ii)   P/V Ratio = {(F+P) / S} x 100

         Here 25 = {(15,000+15,000) /S}x100   [∵ Given Profit = ₹ 15,000]

         Or, S = (30,000/25) x 100

         ∴ Sales = ₹1,20,000

         ∴ Sales required to earn a profit of ₹15,000 = ₹1,20,000.

    (iii)   When Sales =₹1,50,000, Then Profit = ?

         P/V Ratio ={(F+P) / S} x 100

         Here, 25 = [(15,000+P)1,50,000] x 100   [∵Given Sales=₹1,50,000]

         Or, 15,000 + P = 1,50,000 x 25 / 100

         Or, 15,000 + P = 37,500

         ∴ Profit = 37,500 – 15,000 = ₹22,500

         ∴ Net Profit from sales of ₹1,50,000 = ₹22,500.

(iv)   We know, at BEP –

P/V Ratio = F+ BEP Sales x 100

Or, 25 = (15,000 / BEP Sales) x 100

Or, BEP Sales = (15,000 / 25) x 100 = 60,000

∴ Break – even Point Sales = ₹60,000.

Q2. DB Ltd furnished the following information:

Particulars	2004-2005 ₹	2005-2006 ₹
Sales (₹ 10/ unit)	2,00,000	2,50,000
Profit	30,000	50,000

You are required to compute:

(a) P/V Ratio.

(b) Break-even point.

(c) Total variable cost for 2004-2005 & 2005-2006.

(d) Sales required to earn a profit of ₹60,000.

(e) Profit/Loss when sales are ₹1,00,000.

(f) Margin of Safety when Profit is ₹80,000.

(g) During 2006-2007, due to increase in cost, variable cost is expected to rise to ₹7/unit and fixed cost to ₹55,000. If selling price can not be increased, what will be the amount of sales to maintain the profit of 2005-2006?

Solution

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

Here, P/V Ratio = [(50,000–30,000) / (2,50,000–2,00,000)] x100 = 40%

(b) P/V Ratio = {(F+P) / S} x 100

In the year 2005-2006 –

P/V Ratio = [(F + 50,000) / 2,50,000] x 100

Or, 40 = (F + 50,000) 2,500

Or, F + 50,000 = 1,00,000

∴ Fixed Cost = ₹50,000

Now, BEP Sales = Fixed Cost / P/V Ratio x 100

∴ BEP Sales = (50,000 /4) x 100 = ₹1,25,000.

(c) P/V Ratio = {(S – V) / S} x 100

In the year 2004-2005 –

40 = {(2,00,000 – V) / 2,00,000} x 100

Or, 80,000 = 2,00,000 – V

Or, V = 2,00,000 – 80,000

∴ Total Variable Cost for 2004-05 = ₹ 1,20,000.

In the year 2005-06 –

40 = {(2,50,000 – V) / 2,50,000} x 100

Or, 1,00,000 = 2,50,000 – V

Or, V = 2,50,000 – 1,00,000

∴ Total Variable Cost for 2005-06 = ₹ 1,50,000.

(d) P/V Ratio = {(F + P) / S} x 100

Here, 40 = {(50,000 + 60,000) / S} x 100

Or, S = (1,10,000 / 40) x 100

∴ Required Sales = ₹ 2,75,000.

(e) P/V Ratio = {(F + P) / S} x 100

Here, 40 = {(50,000 + P) / 1,00,000} x 100

Or, 40,000 = 50,000 + P

∴ P = (10,000)

∴ Loss = ₹ 10,000.

(f) MS = P / (P/V Ratio)

Here, MS = 80,000 / 0.40

∴ Margin of Safety = ₹ 2,00,000.

(g) New contribution per unit = ₹ 10 - ₹ 7 = ₹ 3

∴ New P/V Ratio = C/S x 100 = 3/10 x 100 = 30%

Desired Profit = ₹ 50,000

Now, P/V Ratio {(F + P) / S} x 100

Here, 30 = {(55,000 + 50,000) / S} x 100

∴ S = 1,05,000 / 30 x 100 = ₹ 3,50,000

∴ Required sales to maintain desired profit = ₹ 3,50,000.

Solved Previous Year Question:

Q1. The particulars of two plant producing an identical product with the same selling price are as under:

Capacity utilization	Plant A 70% (₹ lacs)	Plant B 60% (₹ lacs)
Sales	150	90
Variable Cost	105	75
Fixed Cost	30	20

It has been decided to merge Plant B with Plant A. The additional fixed expenses involved in the merger amount to 2 lacs.

You are required to find out – (a) the break even point of Plant A and Plant Bbefore merger and the break -even point of the merged plant and (b) the capacity utilization of the integrated plant required to earn a profit of ₹ 18 lacs.

[C.U.B.Com. (Hons.) 2008 / C.A. (Final) May 1978 / C.A (Inter) May 1983 / I.C.W.A (Final) June 1981]

Solution

(a) BEP before merger of Plant

Particulars	Plant A (70%) (₹ lacs)	Plant B (60) (₹ lacs)
Sales	150	90
Less: V.C	105	75
Contribution	45	15
P/V Ratio [$\frac{C}{S}$ x 100]	$\frac{45}{150}$ x 100 = 30%	$\frac{15}{90}$ x 100 = 16.67%
BEP [$\frac{FC}{P/V}$]	$\frac{30\ lac}{30\%}$ = 100 lacs	$\frac{20\ lac}{16.67\%}$ = 120 lac (approx)

BEP after merger of Plant

Particulars	Plant A	Plant B	Merged Plant (100%) (A + B)
Sales [$\frac{150}{70}$ x 100]	214.285	150	364.285
Less: V.C.[$\frac{105}{70}$ x 100] $[\frac{75}{60}$ x 100]	150	125	275.000
Total Contribution			89.285

Total P/V ratio = $\frac{Total\ Contribution}{Total\ Sales}$ x 100

$$= \frac{89.285}{364.285} \times 100$$

$$\text{BEP} = \frac{Total\ FC}{PV\ Ratio} = \frac{(30L + 20L + 2L)}{24.5\%} = 212.244\ lac$$

(b) Required Sale $= \frac{FC + P}{PV\ Ratio}$

$$= \frac{52L + 18L}{24.5\%} = 285.714\ lac$$

% of Capacity utilization $= \frac{Required\ Sale}{Total\ Sale} \times 100$

$$= \frac{285.714}{364.285} \times 100 = 78.43\ \%$$

Q2. For a manufacturing concern, when volume of production is 3,000 units, average cost is ₹4 per unit and when volume of production is 4,000 units, average cost is ₹ 3.50 per unit. If the break-even point is reached at 5,000 units of production and sale, find out the P/V Ratio.

[C.U.B.Com.(Hons.) 2010]

Solution

Quantity (Unit)	Average Cost or Cost p.u.	Total Cost
3,000	x 4	= 12,000
4,000	X 3.5	= 14,000
Increase in Quantity = 1,000 units		Increase in Total Cost = 2,000

∵ Variable Cost per unit $= \frac{2,000}{1,000} = ₹2$

Total Cost = Fixed Cost + Variable Cost

At 3,000 units,

12,000 = FC + (3,000 x 2)

12,000 = FC + 6,000

∵ Fixed Cost = 6,000

Now, BEP Point = 5,000 units (given)

Or, $\dfrac{FC}{Contribution\ per\ unit} = 5,000$

Or, $\dfrac{6,000}{Contribution\ per\ unit} = 5,000$

Or, Contribution per unit x 5,000 = 6,000

Or, Contribution p.u. $= \dfrac{6,000}{5,000} = 1.2$

Or, S.P p.u. – V.C. p.u = 1.2

Or, S.P p.u – 2 = 1.2

Or, S.P p.u = 1.2 +2 = 3.2

∵ P/V Ratio $= \dfrac{C}{S} \ x \ 100$

$= \dfrac{1.2}{3.2} \ x \ 100$

$= 37.5\%$

Q3. Rainbow Ltd. Sold goods for ₹ 30,00,000 in a year. In that year, the variable cost is 60% of sales and profit is ₹ 8,00,000.

Find out: (i) P/V Ratio, (ii) Fixed Cost, (iii) Break-even sales, (iv) Break-even sales if selling price was reduced by 10% and fixed costs were increased by ₹ 1,00,000.

[C.U.B.Com. (Hons.) 2011]

Solution

Sales	= 30,00,000
Less: Variable Cost (60% of Sales)	= 18,00,000
Contribution	= 12,00,000
Less: Fixed Cost	*
Profit	= 8,00,000

∵ Profit = C – FC

8,00,000 = 12,00,000 – FC

∵ FC = 4,00,000…………….. (ii)

P/V Ratio = $\frac{C}{S}$ x 100 = $\frac{12,00,000}{30,00,000}$ x 100 = 40%............(i)

BEP = $\frac{FC}{PV\ Ratio}$ = $\frac{4,00,000}{40\%}$ = 10,00,000………………(iii)

iv….. Required Statement

Sales (30,00,000 ÷ 10%) = 27,00,000

Less: V.C   = 18,00,000

Contribution   = 9,00,000

Revised P/V Ratio = $\frac{C}{S}$ x 100

$= \frac{9,00,000}{27,00,000}$ x 100 = $\frac{1}{3}$ x 100 = $33\frac{1}{3}$ %

Revised BEP $\frac{FC}{PV\ Ratio}$ = $\frac{4,00,000+1,00,000}{33\frac{1}{3}\%}$ = ₹15,00,000

Q4. The sales and profits of J.K. Ltd. During two years were as given below:

Year	Total Sales (₹)	Total Cost (₹)
2010	3,00,000	2,60,000
2011	3,40,000	2,90,000

You are required to compute:

(i)P/V Ratio; (ii) Break-even Point; (iii) Sales required to reach a profit of ₹ 40,000; (iv) Profit made when sales amount is ₹ 2,50,000; (v) Margin of Safety when sales are ₹ 2,50,000.

[C.U.B.Com. (Hons.) 2012]

Solution

Year	Sale	Cost	Profit
2010	3,00,000	-2,60,000	= 40,000
2011	3,40,000	-2,90,000	= 50,000
Change in Sale	=40,000	Change in Profit	=10,000

i. P/V Ratio $= \frac{Change\ in\ Profit}{Change\ in\ Sale} \ x\ 100 = \frac{10,000}{40,000} = 25\%$

ii. P/V ratio $= 25\%$

Or, $\frac{C}{S} = 25\%$

Or, $\frac{C}{3,00,000} = 25\%$

$\therefore$ Contribution = 75,000

Or, FC + P = 75,000

Or, FC + 40,000 = 75,000

Or, FC = 75,000 – 40,000 = 35,000

$$BEP = \frac{FC}{PV\ Ratio} = \frac{35,000}{25\%} = 1,40,000$$

iii. Required Sale $= \frac{FC+P}{PV\ Ratio} = \frac{35,000+40,000}{25\%} = 3,00,000$

iv. Required Sale $= \frac{FC+P}{PV\ Ratio}$

Or, $2,50,000 = \frac{35,000+P}{25\%}$

Or, 35,000 + P = 62,500

Or, Profit = 27,500

v. Margin of Safety = Total Sale – BEP Sale

$$= 2,50,000 - 1,40,000$$

$$= 1,10,000$$

Q5. Fill in the blanks for each of the following independent information:

Situation	P	Q	R	S	T
Selling price per unit	? (a)	Rs. 50	Rs. 20	? (g)	Rs. 30
Variable cost as % of selling price	60	? (c)	75	75	? (i)
Number of units sold	10,000	4,000	? (e)	6,000	5,000
Contribution	Rs.20,000	Rs.80,000	? (f)	Rs. 25,000	Rs. 50,000
Fixed cost	Rs.12,000	? (d)	Rs.1,20,000	Rs.10,000	? (j)
Profit / Loss	? (b)	Rs.20,000	Rs.30,000	? (h)	Rs.15,000

[W.B.S.U.B. (Hons.)/C.U.B.Com. (Hons.) 2009, 2013]

Solution

** Product P & S is similar type.

Product P & S is similar type.

So here I have solved three products – P, Q & R

<u>Product P</u>

Income statement

Sales (10,000 * x)   = 10,000x

(-) VC (10,000x * 60%) =   6,000x

$$\overline{4,000x} = 20,000$$

Less : fixed cost   = 12,000

     Profit $\underline{8,000}$ ----------- Ans.(b)

4,000x = 20,000

x = 20,000/4,000 = 5

∴ selling price p. u = Rs.5 -------------Ans.(a)

<u>Product Q</u>

Income statement

	Qty.	P.u.	Total
Sales	4,000	50	20,000
(-) VC	*	*	*
Contribution			$\overline{80,000}$
(-) FC			*
Profit			$\underline{20,000}$

FC = 80,000 – 20,000 = 60,000 ---------------Ans.(d)

VC = 2,00,000 – 80,000 = 1,20,000

∴ % of VC = VC / sales * 100

= 1,20,000 / 2,00,000 *100

=60% -------------Ans. (c)

Product R

	Qty.	P.u.	Total

Sales   x   20   20x

(-) VC (75%)

     [20x * 75%]   15x
                             ___

Contribution   5x

(-) FC   1,20,000

Profit   30,000

$\because$ 5x-1,20,000 = 30,000

Or, 5x = 1,20,000 + 30,000

Or, 5x =1,50,000

Or, x = 30,000

$\therefore$ No. of units sold = 30,000 ---------------Ans.(e)

$\therefore$ Contribution = 5x

=5 * 30,000

= ₹1,50,000 -----------Ans.(f)

Q6. Fill in the blanks of each of the following independent situation:

Particulars	Products		
	X	**Y**	**Z**
No. of units sold	? (i)	10,000	5,000
Selling price per unit **(₹)**	20	? (ii)	30
Variable cost of sales **(%)**	75	75	? (iii)
Contribution **(₹)**	? (iv)	25,000	50,000
Fixed Cost **(₹)**	1,20,000	10,000	? (v)
Profit / Loss **(₹)**	30,000	? (vi)	15,000

[C.U.B.Com. (Hons.) 2014]

Solution

Already done

Similar to Q6.

Q7. Information for two successive years are given below:

Year	Units	Selling price	Average cost
2014	12,000	50	30
2015	15,000	50	28

Calculate: (i) P/V Ratio and Fixed cost; (ii)Break even sales; (iii) sales to earn profit of Rs. 12,000; (iv) selling price to earn profit of Rs. 1,50,000 by selling price 9,000 units; (v) Margin of safety when profit is Rs.30,000.

[C.U.B.Com.   (Hons.) 2016]

Solution:-

1. **Quantity**   **Average cost**   **Total cost**

   12,000   30   3,60,000

   15,000   28   4,20,000

   <u>3000</u>   <u>60,000</u>

Variable cost P.u.   =60,000/3,000   =20/-

TC = FC + VC

At 12,000 units

3,60,000 = FC+(12,000*20)

3,60,000 = FC+24,000

Or, FC = 120000

3,60,000 = FC+(12000*20)

2. S.P. P.u.   = 50/-

Variable cost P.u.   =20/-

Contribution P.u.   =Rs.30/-

(i) P/V ratio = C/S*100 = 30/50*100 = 60%

Fixed cost = Rs.1,20,000

(ii) B.E.P = FC / P/v ratio = 1,20,000 / P/v ratio = 1,20,000/60%

(iii) Reqd. sales = FC+P / P/v ratio = 1,20,000+2,10,000/60% = 5,50,000

(iv) Reqd. sales = FC+P / P/v ratio = 1,20,000+1,50,000/60% = 4,50,000

∴ Cost p.u. will be = 4,50,000/9,000 units = 50/-

(v) Margin of safety = Profit / P/v = 30,000/60% = Rs.50,000.

Q8. Dingdong Ltd. manufacturing a particular product with a capacity to produce 5,000 units. The following particulars relate to the activities of the company for the year 2017 and 2018:

Particulars	2017 ₹	2018 ₹
Sales @ ₹ 50 per unit	75,000	1,50,000
Cost	₹	₹
Material	15,000	30,000
Labour	30,000	60,000
Productive Overhead	16,500	27,500
Administration Overhead	10,000	10,000
Selling Overhead	8,500	13,000
Total Cost	**80,000**	**1,40,000**

Calculate:

(a) BEP Sales (in volume and value)

(b) Budgeted net profit if 75% of the capacity is utilized in 2018

(c) Number of units to be sold to earn a net profit of ₹ 25,000 and

(d) The amount of sales to be made to achieve a target profit of 10% on sales in 2018.

Solution

(a) Nature of cost determination

Particulars	2017	2018	Per unit cost
Unit Produced	$\dfrac{75,000}{50} = 1500$	$\dfrac{1,50,000}{50}$ $= 3,000$	-
1.Material	15,000	30,000	$\dfrac{15,000}{1,500} = 10$ $\dfrac{30,000}{3,000} = 10$
2.Labour	30,000	60,000	$\dfrac{30,000}{1,500} = 20$ $\dfrac{60,000}{3,000} = 20$
3.Production Overhead	16,500	27,500	$\dfrac{16,500}{1,500} = 11$ $\dfrac{27,500}{3,000} = 9.17$
4. Selling Overhead	8,500	13,000	$\dfrac{8,500}{1,500} = 5.67$ $\dfrac{13,000}{3,000} = 4.33$
5.Administration Overhead	10,000	10,000	Not Required

Decision:

1. Material Cost is fully variable = ₹ 10/- p.u.

2. Labour Cost is fully variable = ₹ 20/- p.u.

3. Production Overhead is Semi-Variable

	2017	2018
	1,500 units	3,000 units
	₹ 16,500	₹ 27,500

Variable Overhead $= \frac{27,500-16,500}{3,000-1,500} = \frac{11,000}{1,500} = 7.33$

Fixed Overhead = 16,500 – (1,500 x 7.33) = 5,500/-

4. Selling Overhead is Semi-Variable

	2017	2018
	1,500 units	3,000 units
	₹8,500	₹ 13,000

Variable Overhead $= \frac{13,000-8,500}{3,000-1,500} = \frac{4,500}{1,500} = ₹\frac{3}{-p}.u.$

Fixed Overhead = 8,500 – (1,500 x 3) = ₹ 4,000

5. Administrative Overhead is fully fixed = ₹ 10,000/-

Income Statement

Particulars	2017		2018	
Unit Produced	1,500 units		3,000 units	
	₹	₹	₹	₹
Sales (1,500 x 50)		75,000		
(3,000 x 50)				1,50,000
Less: Variable Cost				
- Material (10 x 1,500)	15,000			
(10 x 3,000)			30,000	

- Labour Cost (20 x 1,500)	30,000			
(20 x 3,000)			60,000	
- Production Overhead				
(7.33 x 1,500)	11,000			
(7.33 x 3,000)			22,000	
- Selling Overhead				
(3 x 1,500)	4,500			
(3 x 3,000)			9,000	
		60,500		1,21,000
Contribution		14,500		29,000
Less: Fixed Cost				
- Production Overhead	5,500		5,500	
- Selling Overhead	4,000		4,000	
- Administrative Overhead	10,000		10,000	
		19,500		19,500
		(5,000)		9,500
P/V Ratio	$\frac{C}{S} \ x \ 100$		$\frac{C}{S} \ x \ 100$	
	$=\frac{14,500}{75,000} x \ 100$		$=\frac{29,000}{1,50,000} x \ 100$	
	$= 19.33\%$		$= 19.33\%$	
BEP	$\frac{FC}{PV \ Ratio} = \frac{19,500}{19.33\%} = 1,00,879.40$			

(b) 100% Capacity = 5,000 units

75%　Capacity = $(\frac{5,000}{100} \ x \ 75) = 3,750 \ units$

$$\text{Required Sale} = \frac{FC+P}{PV\ Ratio}$$

Or, $(3{,}750 \times 50) = \frac{19{,}500+P}{19.33\%}$

Or, $36{,}243.7 = 19{,}500 + P$

$\therefore$ Profit $= 36{,}243.7 - 19{,}500$

$\qquad = 16{,}743.7$

(c) Required Sale $= \frac{FC+P}{PV\ Ratio} = \frac{19{,}500+25{,}000}{19.33\%} = 2{,}30{,}212$

Number of units to be sold $= \frac{2{,}30{,}212}{50} = 4604.2 = 4605\ units\,(approx)$

(d) Required Sale $= \frac{FC+P}{PV\ Ratio}$

If Sale $= X$

$\therefore$ Profit $= X * 10\% = 0.10X$

$\therefore X = \frac{FC+0.10X}{19.33\%}$

Or, $X * 19.33\% = 19{,}500 + 0.10X$

Or, $X * 0.1933 = 19{,}500 + 0.10X$

Or, $0.1933X - 0.1X = 19{,}500$

Or, $0.0933X = 19{,}500$

$\therefore X = 2{,}09{,}003$

$\therefore$ Sale $=$ ₹ $2{,}09{,}003$