### Marginal Costing

#### Basic Concepts

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal Cost</td>
<td>This is the variable cost of one unit of product or a service.</td>
</tr>
<tr>
<td>Marginal Costing</td>
<td>It is a principle whereby variable cost are charged to cost units and fixed cost attributable to the relevant period is written off in full against contribution for that period.</td>
</tr>
<tr>
<td>Absorption Costing</td>
<td>A method of costing by which all direct cost and applicable overheads are charged to products or cost centres for finding out the total cost of production. Absorbed cost includes production cost as well as administrative and other cost.</td>
</tr>
<tr>
<td>Direct Costing</td>
<td>This is a principle under which all costs which are directed related are charged to products, processes, operations or services, of which they form an integral part.</td>
</tr>
<tr>
<td>Differential Costing</td>
<td>It is a technique used in the preparation of ad-hoc information in which only cost and income differences in between alternative courses of action are taken into consideration.</td>
</tr>
<tr>
<td>Marginal Contribution</td>
<td>This is the difference between selling price and variable cost of production.</td>
</tr>
<tr>
<td>Break-even Chart</td>
<td>A mathematical or graphical representation, showing approximate profit or loss of an enterprise at different levels of activity within a limited range.</td>
</tr>
<tr>
<td>Break-even Point</td>
<td>This is the level of activity there is neither a profit nor a loss.</td>
</tr>
<tr>
<td>Cash Break-even Point</td>
<td>It is the level of activity where there is neither a cash profit nor a cash loss.</td>
</tr>
<tr>
<td>Cost Break-even Point</td>
<td>It is the level of activity where the total cost under two alternatives are the same. It is also known as Cost indifference point.</td>
</tr>
<tr>
<td>Profit Volume Chart</td>
<td>It is a diagram showing the expected relationship between costs, revenue at various volumes with profit being the residual.</td>
</tr>
<tr>
<td>Profit Volume Ratio or P/V Ratio</td>
<td>It is the ratio establishing the relationship between the contribution and the sales value.</td>
</tr>
<tr>
<td>Margin of Safety</td>
<td>This is the difference between the expected level of sales and the break even sales.</td>
</tr>
</tbody>
</table>
Basic Formulae

1. **Sales – Variable Cost = Contribution**
   
   Or, **Contribution = Fixed Cost ± Profit/loss**
   
   Or, Sales – (Fixed Cost + Variable Cost) = Profit
   
   By multiplying and dividing L.H.S. by S
   
   \[ S \times (S-V) = F + P \]

2. \[ \frac{S \times (S-V)}{S} = F + P \]

3. Sales \times P/V Ratio = Fixed Cost + Profit or Contribution
   
   \[ \frac{P}{V} \text{ Ratio} = \frac{\text{Sales - Variable Cost}}{\text{Sales}} \]

4. Break-even Sales \times P/V Ratio = Fixed Cost (\because at BEP profit is zero)

5. **Contribution = Sales \times P/V Ratio**

6. **P/V Ratio = \frac{\text{Contribution}}{\text{Sales}}**

7. **P/V Ratio = \frac{\text{Change in profit}}{\text{Change in sales}}**

8. **P/V Ratio = \frac{\text{Change in contribution}}{\text{Change in sales}}**

9. **P/V Ratio = \frac{\text{Fixed Cost}}{\text{BES}}**

10. Break-even Sales (BES) = \frac{\text{Fixed Cost}}{P/V \text{ Ratio}} Or,

    B.E.P (in units) = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}

11. \( (\text{Break-even Sales} + \text{Margin of Safety}) \times P/V \text{ Ratio} = \text{Contribution} \)

12. **Total Sales = Break-even Sales + Margin of Safety**

13. \( (\text{Break-even Sales} \times P/V \text{ Ratio}) + (\text{Margin of Safety} \times P/V \text{ Ratio}) = \text{Fixed Cost} + \text{Profit} \)
12.3  Cost Accounting

14. **Margin of Safety × P/V Ratio = Profit**

15. **Margin of Safety = Total Sales – Break-even Sales or** \[
\frac{\text{Profit}}{\text{P/V Ratio}}
\]

16. **Break-even Sales = Total Sales – Margin of Safety**

17. **P/V Ratio = \frac{\text{Profit}}{\text{Margin of Safety Ratio}}**

18. **Margin of Safety Ratio = \frac{\text{Total Sales - Break-even Sales}}{\text{Total Sales}}**

19. **Profit = (Sales × P/V Ratio) – Fixed Cost**  
   Or,  **P/V Ratio × Margin of Safety**  
   (P/V Ratio to be multiplied by 100 to express it in percentage)

**SECTION-A**

**Question-1**

*Explain and illustrate cash break-even chart.*

**Solution:**

In cash break-even chart, only cash fixed costs are considered. Non-cash items like depreciation etc. are excluded from the fixed cost for computation of break-even point. It depicts the level of output or sales at which the sales revenue will equal to total cash outflow. It is computed as under:

\[
\text{Cash BEP (Units)} = \frac{\text{Cash Fixed Cost}}{\text{Contribution per Units}}
\]

![Cash Break-even Chart](image)
Question-2

Write short notes on Angle of Incidence.

Solution:
This angle is formed by the intersection of sales line and total cost line at the break-even point. This angle shows the rate at which profits are being earned once the break-even point has been reached. The wider the angle the greater is the rate of earning profits. A large angle of incidence with a high margin of safety indicates extremely favourable position.

Question-3

Discuss basic assumptions of Cost Volume Profit analysis.

Solution:
CVP Analysis:-Assumptions
(i) Changes in the levels of revenues and costs arise only because of changes in the number of products (or service) units produced and sold.
(ii) Total cost can be separated into two components: Fixed and variable
(iii) Graphically, the behaviour of total revenues and total cost are linear in relation to output level within a relevant range.
(iv) Selling price, variable cost per unit and total fixed costs are known and constant.
(v) All revenues and costs can be added, sub traded and compared without taking into account the time value of money.

Question-4

Elaborate the practical application of Marginal Costing.

Solution:
Practical applications of Marginal costing:
(i) Pricing Policy: Since marginal cost per unit is constant from period to period, firm decisions on pricing policy can be taken particularly in short term.
(ii) Decision Making: Marginal costing helps the management in taking a number of business decisions like make or buy, discontinuance of a particular product, replacement of machines, etc.
(iii) Ascertaining Realistic Profit: Under the marginal costing technique, the stock of finished goods and work-in-progress are carried on marginal cost basis and the fixed expenses are written off to profit and loss account as period cost. This shows the true profit of the period.
(iv) Determination of production level: Marginal costing helps in the preparation of break-even analysis which shows the effect of increasing or decreasing production activity on the profitability of the company.

SECTION- B

Computation of Break-even Point, Margin of Safety, Sales Volume, Profit, Contribution, P/V Ratio etc.

Question 1

A company produces single product which sells for ₹ 20 per unit. Variable cost is ₹ 15 per unit and Fixed overhead for the year is ₹ 6,30,000.

Required:
(a) Calculate sales value needed to earn a profit of 10% on sales.
(b) Calculate sales price per unit to bring BEP down to 1,20,000 units.
(c) Calculate margin of safety sales if profit is ₹ 60,000.

Solution:

(a) Suppose Sales units are $x$ then

$$S = V + F + P$$

(S = Sales ; V = Variable Cost; F = Fixed Cost; P = Profit)

$$20x = 15x + 6,30,000 + 2x$$

$$20x - 17x = 6,30,000$$

$$x = \frac{6,30,000}{3} = 2,10,000$$ units

Sales value = 2,10,000 units × ₹ 20 = ₹ 42,00,000 to earn a profit of 10% on sales.

(b) Sales price to bring down BEP to 1,20,000 units

$$B.E.P \ (Units) = \frac{Fixed\ Cost}{Contribution\ per\ unit}$$

$$Or, \ Contribution\ per\ unit = \frac{6,30,000}{1,20,000} = 5.25$$

So, Sales Price = ₹ 15 + ₹ 5.25 = ₹ 20.25

(c) Margin of Safety Sales = \frac{Profit}{P/V\ Ratio} \ Or, \ \frac{60,000}{P/V\ Ratio}
where, \( \frac{P/V \text{ Ratio}}{\text{Sales}} = \frac{\text{Contribution per unit}}{\text{Price}} \times 100 \) Or, \( \frac{\text{₹ 5}}{\text{₹ 20}} \times 100 = 25% \)

Margin of Safety Sales = \( \frac{\text{₹ 60,000}}{25%} = \text{₹ 2,40,000} \)

So if profit is ₹ 60,000, margin of safety sale will be ₹ 2,40,000.

**Question 2**

A company has fixed cost of ₹ 90,000, Sales ₹ 3,00,000 and Profit of ₹ 60,000.

**Required:**

(i) Sales volume if in the next period, the company suffered a loss of ₹ 30,000.

(ii) What is the margin of safety for a profit of ₹ 90,000?

**Solution:**

\[
\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \left( \frac{\text{₹ 1,50,000}}{\text{₹ 3,00,000}} \times 100 \right) = 50%
\]

(i) If in the next period company suffered a loss of ₹ 30,000, then

\[
\text{Contribution} = \text{Fixed Cost} \pm \text{Profit} = \₹ 90,000 - \₹ 30,000 = \₹ 60,000.
\]

\[
\text{Then Sales} = \frac{\text{Contribution}}{\text{P/V ratio}} = \frac{60,000}{50%} = \₹ 1,20,000
\]

So, there will be loss of ₹ 30,000 at sales of ₹ 1,20,000.

(ii) Margin of Safety = \( \frac{\text{Profit}}{\text{P/V Ratio}} \) Or, \( \frac{\text{₹ 90,000}}{50%} = \text{₹ 1,80,000} \)

**Alternative solution of this part:**

\[
\text{Break-even Sales} = \frac{\text{Fixed Cost}}{\text{PV Ratio}} = \frac{\₹ 90,000}{50%} = \₹ 1,80,000
\]

\[
\text{Sales at profit of ₹ 90,000} = \frac{\text{Fixed Cost} + \text{Profit}}{\text{PV Ratio}} = \frac{\₹ 90,000 + \₹ 90,000}{50%} = \frac{\₹ 1,80,000}{50%} = \₹ 3,60,000.
\]

\[
\text{Margin of Safety} = \text{Sales} - \text{Break-even Sales} = 3,60,000 - 1,80,000 = \₹ 1,80,000
\]
Question 3

PQ Ltd. reports the following cost structure at two capacity levels:

<table>
<thead>
<tr>
<th></th>
<th>(100% capacity)</th>
<th>(75% capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2,000 units</td>
<td>1,500 units</td>
</tr>
<tr>
<td>Production overhead I</td>
<td>₹ 3 per unit</td>
<td>₹ 4 per unit</td>
</tr>
<tr>
<td>Production overhead II</td>
<td>₹ 2 per unit</td>
<td>₹ 2 per unit</td>
</tr>
</tbody>
</table>

If the selling price, reduced by direct material and labour is ₹ 8 per unit, what would be its break-even point?

Solution:

Computation of Break-even point in units:

<table>
<thead>
<tr>
<th></th>
<th>2,000 units</th>
<th>1,500 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Overhead I: Fixed Cost (₹)</td>
<td>6,000</td>
<td>6,000</td>
</tr>
<tr>
<td></td>
<td>(2,000 unit × ₹ 3)</td>
<td>(1,500 unit × ₹ 4)</td>
</tr>
<tr>
<td>Selling price – Material and labour (₹) (A)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Production Overhead II (Variable Overhead) (B)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Contribution per unit (A) – (B)</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Break-even point = \[
\frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{₹ 6,000}{₹ 6} = 1,000 \text{ units}.
\]

Question 4

Product Z has a profit-volume ratio of 28%. Fixed operating costs directly attributable to product Z during the quarter II of the financial year 2013-14 will be ₹ 2,80,000. Calculate the sales revenue required to achieve a quarterly profit of ₹ 70,000.

Solution:

\[
P/V \text{ ratio} = 28\%
\]

Quarterly fixed Cost = ₹ 2,80,000

Desired Profit = ₹ 70,000

Sales revenue required to achieve desired profit

\[
\frac{\text{Fixed Cost} + \text{Desired Profit}}{P/V \text{ Ratio}} = \frac{₹ 2,80,000 + ₹ 70,000}{28\%} = ₹ 12,50,000
\]
Question 5

A company sells two products, J and K. The sales mix is 4 units of J and 3 units of K. The contribution margins per unit are ₹ 40 for J and ₹ 20 for K. Fixed costs are ₹ 6,16,000 per month. Compute the break-even point.

Solution:

Let \( 4x \) = No. of units of J
Then \( 3x \) = no. of units of K

BEP in \( x \) units = \( \frac{\text{Fixed Cost}}{\text{Contribution}} \) = \( \frac{₹ 6,16,000}{(4x \times ₹ 40) + (3x \times ₹ 20)} \)

Or \( x = \frac{₹ 6,16,000}{₹ 220} = 2,800 \) units

Break-even point of Product J = \( 4 \times 2,800 = 11,200 \) units
Break even point of Product K = \( 3 \times 2,800 = 8,400 \) units

Question 6

Following informations are available for the year 2013 and 2014 of PIX Limited:

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>₹ 32,00,000</td>
<td>₹ 57,00,000</td>
</tr>
<tr>
<td>Profit/ (Loss)</td>
<td>(₹ 3,00,000)</td>
<td>₹ 7,00,000</td>
</tr>
</tbody>
</table>

Calculate – (a) P/V ratio, (b) Total fixed cost, and (c) Sales required to earn a Profit of ₹ 12,00,000.

Solution:

(a) \( \text{P/V Ratio} = \frac{\text{Change in profit}}{\text{Change in sales}} \times 100 \)

\( = \frac{₹ 7,00,000 - (₹ 3,00,000)}{₹ 57,00,000 - ₹ 32,00,000} \times \frac{₹ 10,00,000}{₹ 25,00,000} \times 100 = 40\% \)

(b) Total Fixed cost = Total Contribution - Profit
= \( (\text{Sales} \times \text{P/V Ratio}) - \text{Profit} \)
= \( (₹ 57,00,000 \times \frac{40}{100}) = ₹ 7,00,000 \)
= ₹ 22,80,000 - ₹ 7,00,000 = ₹ 15,80,000

(c) Contribution required to earn a profit of ₹ 12,00,000
= Total fixed cost + Profit required

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12.9 Cost Accounting

\[ \text{Sales} = \text{₹} 15,80,000 + \text{₹} 12,00,000 = \text{₹} 27,80,000 \]

\[ \text{Required Sales} = \frac{27,80,000}{\text{P/V Ratio}} = \frac{27,80,000}{40\%} = \text{₹} 69,50,000 \]

**Question 7**

MNP Ltd sold 2,75,000 units of its product at ₹ 37.50 per unit. Variable costs are ₹ 17.50 per unit (manufacturing costs of ₹ 14 and selling cost ₹ 3.50 per unit). Fixed costs are incurred uniformly throughout the year and amount to ₹ 35,00,000 (including depreciation of ₹ 15,00,000). There are no beginning or ending inventories.

**Required:**

(i) Estimate breakeven sales level quantity and cash breakeven sales level quantity.

(ii) Estimate the P/V ratio.

(iii) Estimate the number of units that must be sold to earn an income (EBIT) of ₹ 2,50,000.

(iv) Estimate the sales level to achieve an after-tax income (PAT) of ₹ 2,50,000. Assume 40% corporate Income Tax rate.

**Solution:**

(i) Contribution = ₹ 37.50 - ₹ 17.50 = ₹ 20 per unit.

\[ \text{Break even Sales Quantity} = \frac{\text{Fixed cost}}{\text{Contribution margin per unit}} = \frac{\text{₹} 35,00,000}{\text{₹} 20} = 1,75,000 \text{ units} \]

\[ \text{Cash Break even Sales Qty} = \frac{\text{Cash Fixed Cost}}{\text{Contribution margin per unit}} = \frac{\text{₹} 20,00,000}{\text{₹} 20} = 1,00,000 \text{ units} \]

(ii) P/V ratio = \( \frac{\text{Contribution/unit}}{\text{Selling Price/unit}} \times 100 = \frac{\text{₹} 20}{\text{₹} 37.50} \times 100 = 53.33\% \)

(iii) No. of units that must be sold to earn an Income (EBIT) of ₹ 2,50,000

\[ \text{Fixed cost + Desired EBIT level} \]

\[ = \frac{\text{Contribution margin per unit}}{20} = 1,87,500 \text{ units} \]

(iv) After Tax Income (PAT) = ₹ 2,50,000

Tax rate = 40%

\[ \text{Desired level of Profit before tax} = \frac{\text{₹} 2,50,000}{60} \times 100 = \text{₹} 4,16,667 \]

\[ \text{Estimate Sales Level} = \frac{\text{Fixed Cost + Desired Profit}}{\text{P/V ratio}} \]
Marginal Costing 12.10

\[
\text{Or, } \left( \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{Contribution per unit}} \right) \times \text{Selling Price per unit} = \frac{\text{₹}35,00,000 + \text{₹}4,16,667}{53.33\%} = \text{₹}73,43,750
\]

Question 8

The P/V Ratio of Delta Ltd. is 50% and margin of safety is 40%. The company sold 500 units for ₹5,00,000. You are required to calculate:

(i) Break-even point, and
(ii) Sales in units to earn a profit of 10% on sales

Solution:

(i) P/V Ratio - 50%
Margin of Safety - 40%
Sales 500 Units for ₹5,00,000
Selling price per Unit - ₹1,000
Calculation of Break Even Point (BEP)
Margin of Safety Ratio = \( \frac{\text{Sales} - \text{BEP} \times 100}{\text{Sales}} \)
40 = \( \frac{5,00,000 - \text{BEP}}{5,00,000} \times 100 \)
BEP (in sales) = ₹3,00,000
BEP (in Unit) = ₹3,00,000 ÷ ₹1,000 = 300 Units

(ii) Sales in units to earn a profit of 10% on sales
Sales = \( \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P/V Ratio}} \)
Let the Sales be \( x \)
Profit = 10% of \( x \) i.e. 0.1 \( x \)
Thus -
\( x = \left( \frac{1,50,000 + 0.1X}{50\%} \right) \)
Or, \( x = \text{₹}3,75,000 \)
To find out sales in units amount of sales ₹ 3,75,000 is to be divided by Selling Price per unit
Thus -

\[
\text{Sales (in units)} = \frac{₹3,75,000}{₹1,000} = 375 \text{ Units}
\]

**Working Notes**

1. **Selling price** = ₹ 5,00,000 ÷ ₹ 500 = ₹ 1,000 per unit

2. **Variable cost per unit** = Selling Price - (Selling Price × P/V Ratio)
   = ₹1,000 – (₹ 1,000 x 50%) = ₹ 500

3. **Profit at present level of sales**
   \[
   \text{Margin of Safety} = \frac{\text{Profit}}{\text{P/V Ratio}}
   \]
   = 40% of ₹ 5,00,000 = ₹ 2,00,000
   ₹ 2,00,000 = Profit
   = ₹ 1,00,000

4. **Fixed Cost** = (Sales x P/V Ratio) – Profit
   = (₹5,00,000 x 50%) – ₹ 1,00,000 = ₹1,50,000

(Note: Alternative ways of calculation of ‘Break Even Point’ and required sales to earn a profit of 10% of sales’ can be adopted to solve the problem.)

**Question 9**

The following figures are related to LM Limited for the year ending 31st March, 2014:

- **Sales** - 24,000 units @ ₹ 200 per unit;
- **P/V Ratio** 25% and **Break-even Point** 50% of sales.

You are required to calculate:

(i) **Fixed cost for the year**

(ii) **Profit earned for the year**

(iii) **Units to be sold to earn a target net profit of ₹ 11,00,000 for a year.**

(iv) **Number of units to be sold to earn a net income of 25% on cost.**

(v) **Selling price per unit if Break-even Point is to be brought down by 4,000 units.**
Solution:

Break-even point (in units) is 50% of sales i.e. 12,000 units.

Hence, Break-even point (in sales value) is 12,000 units x ₹ 200 = ₹ 24,00,000

(i) We know that Break even sales = \( \frac{\text{Fixed Cost}}{\text{P/V ratio}} \)

Or, ₹ 24,00,000 = Fixed Cost \( \frac{25\%}{25\%} \)

Or, Fixed Cost = ₹ 24,00,000 x 25%

= ₹ 6,00,000

So Fixed Cost for the year is ₹ 6,00,000

(ii) Contribution for the year = (24,000 units × ₹ 200) × 25%

= ₹ 12,00,000

Profit for the year = Contribution – Fixed Cost

= ₹ 12,00,000 - ₹ 6,00,000

= ₹ 6,00,000

(iii) Target net profit is ₹ 11,00,000

Hence, Target contribution = Target Profit + Fixed Cost

= ₹ 11,00,000 + ₹ 6,00,000

= ₹ 17,00,000

Contribution per unit = 25% of ₹ 200 = ₹ 50 per unit

No. of units = \( \frac{17,00,000}{50 \text{ per unit}} \) = 34,000 unit

So, 34,000 units to be sold to earn a target net profit of ₹ 11,00,000 for a year.

(iv) Net desired total Sales (Number of unit × Selling price) be \( x \) then desired profit is 25% on Cost or 20% on Sales i.e. 0.2 \( x \)

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

\( x = \frac{6,00,000 + 0.2x}{25\%} \)

or, 0.2 \( x = 6,00,000 + 0.2 \times \) 

or, 0.05 \( x = 6,00,000 \)
or, \( x = \frac{1,20,00,000}{200} \)

No. of units to be sold \( = \frac{1,20,00,000}{200} = 60,000 \) units

(v) If Break-even point is to be brought down by 4,000 units then Break-even point will be 12,000 units – 4,000 units = 8,000 units

Let Selling price be \( x \) and fixed cost and variable cost per unit remain unchanged i.e. \( \) ₹6,00,000 and \( \) ₹150 respectively.

Break even point: Sales revenue = Total cost

\[ 8,000 \times x = 8,000 \times 150 + 6,00,000 \]

Or, \( 8,000 \times x = 12,00,000 + 6,00,000 \)

Or, \( x = \frac{18,00,000}{8,000} = 225 \)

\( \therefore \) Selling Price should be ₹225

Hence, selling price per unit shall be ₹225 if Break-even point is to be brought down by 4,000 units.

**Question 10**

*MFN Limited started its operation in 2012 with the total production capacity of 2,00,000 units. The following data for two years is made available to you:*

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales units</th>
<th>Total cost (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>80,000</td>
<td>34,40,000</td>
</tr>
<tr>
<td>2013</td>
<td>1,20,000</td>
<td>45,60,000</td>
</tr>
</tbody>
</table>

There has been no change in the cost structure and selling price and it is expected to continue in 2014 as well. Selling price is ₹40 per unit.

You are required to calculate:

(i) **Break-Even Point (in units)**

(ii) **Profit at 75% of the total capacity in 2014**

**Solution:**

<table>
<thead>
<tr>
<th>Item</th>
<th>2012</th>
<th>2013</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Units</td>
<td>80,000</td>
<td>1,20,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Sale Value @ ₹40</td>
<td>32,00,000</td>
<td>48,00,000</td>
<td>16,00,000</td>
</tr>
<tr>
<td>Total Cost (₹)</td>
<td>34,40,000</td>
<td>45,60,000</td>
<td>11,20,000</td>
</tr>
</tbody>
</table>
Variable Cost per unit = \( \frac{\text{Change in Total Cost}}{\text{Change in sales volume}} \)

= \( \frac{₹11,20,000}{40,000 \text{ units}} = ₹28 \text{ per unit} \)

Total Fixed Cost (₹) = ₹ 45,60,000 – (1,20,000 units × ₹28) = ₹12,00,000

(i) Break-even point (in units) = \( \frac{\text{Fixed Cost}}{\text{Contribution per unit}} \)

= \( \frac{₹12,00,000}{(₹40 - ₹28)} = 1,00,000 \text{ units} \)

(ii) Profit at 75% Capacity in 2014.

= (2,00,000 units × 75%) × Contribution per unit – Fixed Cost

= 1,50,000 units × ₹ 12 - ₹ 12,00,000 = ₹ 6,00,000.

Question 11

Arnav Ltd. manufacture and sales its product R-9. The following figures have been collected from cost records of last year for the product R-9:

<table>
<thead>
<tr>
<th>Elements of Cost</th>
<th>Variable Cost portion</th>
<th>Fixed Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Material</td>
<td>30% of Cost of Goods Sold</td>
<td>--</td>
</tr>
<tr>
<td>Direct Labour</td>
<td>15% of Cost of Goods Sold</td>
<td>--</td>
</tr>
<tr>
<td>Factory Overhead</td>
<td>10% of Cost of Goods Sold</td>
<td>₹ 2,30,000</td>
</tr>
<tr>
<td>General &amp; Administration Overhead</td>
<td>2% of Cost of Sales</td>
<td>₹ 71,000</td>
</tr>
<tr>
<td>Selling &amp; Distribution Overhead</td>
<td>4% of Cost of Sales</td>
<td>₹ 68,000</td>
</tr>
</tbody>
</table>

Last Year 5,000 units were sold at ₹185 per unit. From the given data find the followings:

(a) Break-even Sales (in rupees)

(b) Profit earned during last year

(c) Margin of safety (in %)

(d) Profit if the sales were 10% less than the actual sales.
Solution:

Working Notes:

(i) Calculation of Cost of Goods Sold (COGS):

\[
\text{COGS} = (\text{DM} - 0.3 \text{ COGS}) + (\text{DL} - 0.15 \text{ COGS}) + (\text{FOH} - 0.10 \text{ COGS} + \text{2,30,000}) + (\text{G&AOH} - 0.02 \text{ COGS} + \text{71,000})
\]

Or \( \text{COGS} = 0.57 \text{ COGS} + \text{3,01,000} \)

Or \( \text{COGS} = \frac{\text{3,01,000}}{0.43} = \text{7,00,000} \)

(ii) Calculation of Cost of Sales (COS):

\[
\text{COS} = \text{COGS} + (\text{S&DOH} - 0.04 \text{ COS} + \text{68,000})
\]

Or \( \text{COS} = \text{7,00,000} + (0.04 \text{ COS} + \text{68,000}) \)

Or \( \text{COS} = \frac{\text{7,68,000}}{0.96} = \text{8,00,000} \)

(iii) Calculation of Variable Costs:

Direct Material- \((0.3 \times \text{7,00,000})\) \text{2,10,000}

Direct Labour- \((0.15 \times \text{7,00,000})\) \text{1,05,000}

Factory Overhead- \((0.10 \times \text{7,00,000})\) \text{70,000}

General & Administration OH- \((0.02 \times \text{7,00,000})\) \text{14,000}

Selling & Distribution OH \((0.04 \times \text{8,00,000})\) \text{32,000}

\( \text{4,31,000} \)

(iv) Calculation of total Fixed Costs:

Factory Overhead- \text{2,30,000}

General & Administration OH- \text{71,000}

Selling & Distribution OH \text{68,000}

\( \text{3,69,000} \)

(v) Calculation of P/V Ratio:

\[
\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\text{Sales} - \text{Variable Costs}}{\text{Sales}} \times 100
\]

\[
= \frac{\text{\text{(\text{185}\times5,000\text{units})} - \text{\text{4,31,000}}} \times 100}{\text{185\times5,000\text{units}}} = 53.41\%
\]

(a) Break-Even Sales \(\text{= \frac{\text{Fixed Costs}}{\text{P/V Ratio}} = \frac{\text{3,69,000}}{53.41\%} = \text{6,90,882}}\)
(b) Profit earned during the last year
   \[ \text{Profit} = (\text{Sales} - \text{Total Variable Costs}) - \text{Total Fixed Costs} \]
   \[ \text{Profit} = (\text{₹} 9,25,000 - \text{₹} 4,31,000) - \text{₹} 3,69,000 \]
   \[ = \text{₹} 1,25,000 \]

(c) Margin of Safety (%) = \( \frac{\text{Sales} - \text{Break-even sales}}{\text{Sales}} \times 100 \)
   \[ \text{Margin of Safety (%)} = \frac{\text{₹} 9,25,000 - \text{₹} 6,90,882}{\text{₹} 9,25,000} \times 100 = 25.31\% \]

(d) Profit if the sales were 10% less than the actual sales:
   \[ \text{Profit} = 90\% (\text{₹} 9,25,000 - \text{₹} 4,31,000) - \text{₹} 3,69,000 \]
   \[ = \text{₹} 4,44,600 - \text{₹} 3,69,000 = \text{₹} 75,600 \]

Question 12

Maxim Ltd. manufactures a product “N-joy”. In the month of August 2014, 14,000 units of the product “N-joy” were sold, the details are as under:

\[
\begin{align*}
\text{₹} & \\
\text{Sales Revenue} & 2,52,000 \\
\text{Direct Material} & 1,12,000 \\
\text{Direct Labour} & 49,000 \\
\text{Variable Overheads} & 35,000 \\
\text{Fixed Overheads} & 28,000
\end{align*}
\]

A forecast for the month of September 2014 has been carried out by the General Manager of Maxim Ltd. As per the forecast, price of direct material and variable overhead will be increased by 10% and 5% respectively.

Required to calculate:

(i) Number of units to be sold to maintain the same quantum of profit that made in August 2014.

(ii) Margin of safety in the month of August 2014 and September 2014.

Solution:

Calculation of Profit made in the month of August 2014 by selling 14,000 units.

<table>
<thead>
<tr>
<th></th>
<th>Amount per unit (₹)</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Revenue</td>
<td>18.00</td>
<td>2,52,000</td>
</tr>
<tr>
<td>Less: Variable Costs:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(i) To maintain the same amount of profit i.e. ₹ 28,000 in September 2014 also, the company needs to maintain a contribution of ₹ 56,000.

Let, number of units to be sold in September 2014 is ‘x’, then the contribution will be

₹ 18 x – [(₹8 × 1.10) + ₹ 3.5 + (₹ 2.5 × 1.05)] x = ₹ 56,000

₹ 18 x – (₹ 8.8 + ₹ 3.5 + ₹ 2.625) x = ₹ 56,000

Or, \( x = \frac{₹ 56,000}{₹ 3.075} \) = 18,211.38 units or 18,212 units.

(ii) Margin of Safety

<table>
<thead>
<tr>
<th></th>
<th>August 2014</th>
<th>September 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit</td>
<td>₹ 28,000</td>
<td>₹ 28,000</td>
</tr>
<tr>
<td>P/V Ratio</td>
<td>₹4/18 × 100</td>
<td>₹3.075/18 × 100</td>
</tr>
<tr>
<td>Margin of Safety</td>
<td>₹1,26,000</td>
<td>₹1,63,902.44</td>
</tr>
</tbody>
</table>

**Question 13**

Maryanne Petrochemicals Ltd. is operating at 80% capacity and presents the following information:

- **Break-even Sales**: ₹ 400 crores
- **P/V Ratio**: 30%
- **Margin of Safety**: ₹ 120 crores

Maryanne’s management has decided to increase production to 95% capacity level with the following modifications:

(a) The selling price will be reduced by 10%.

(b) The variable cost will be increased by 2% on sales
(c) The fixed costs will increase by ₹ 50 crores, including depreciation on additions, but excluding interest on additional capital.

Additional capital of ₹ 100 crores will be needed for capital expenditure and working capital.

Required:

(i) Indicate the sales figure, with the working, that will be needed to earn ₹ 20 crores over and above the present profit and also meet 15% interest on the additional capital.

(ii) What will be the revised

(a) Break-even Sales

(b) P/V Ratio

(c) Margin of Safety

Solution:

Working Notes:

1. Total Sales = Break-even Sales + Margin of Safety
   = ₹ 400 crores + ₹ 120 crores
   = ₹ 520 crores

2. Variable Cost = Total Sales × (1 - P/V Ratio)
   = ₹ 520 crores × (1 – 0.3)
   = ₹ 364 crores

3. Fixed Cost = Break-even Sales × P/V Ratio
   = ₹ 400 crores × 30%
   = ₹ 120 crores

4. Profit = Total Sales – (Variable Cost + Fixed Cost)
   = ₹ 520 crores – (₹ 364 crores + ₹ 120 crores)
   = ₹ 36 crores

(i) Revised Sales figure to earn profit of ₹ 56 crores (i.e. ₹ 36 crores + ₹ 20 crores)

Revised Sales = \( \frac{\text{Revised FixedCost} + \text{DesiredProfit}}{\text{Revised P / V Ratio}} \)

= \( \frac{₹ 185 crores + ₹ 56 crores}{28\%} \)

= ₹ 860.71 Crores
*Revised Fixed Cost = Present Fixed Cost + Increment in fixed cost + Interest on additional Capital
= ₹ 120 crores + ₹ 50 crores + 15% of ₹ 100 crores
= ₹ 185 crores

**Revised P/V Ratio : Let current selling price per unit be ₹ 100.
Therefore, Reduced selling price per unit = ₹ 100 \times 90\% = ₹ 90
Revised Variable Cost on Sales = 70\% + 2\% = 72\%
Variable Cost per unit = ₹ 90 \times 72\% = ₹ 64.80
Contribution per unit = ₹ 90 - ₹ 64.80 = ₹ 25.20
Revised P/V Ratio = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹ 25.2}{₹ 90} \times 100 = 28\% 

(ii) (a) Revised Break-even Sales = \frac{\text{Fixed Cost}}{\text{P/V Ratio}} \times 100 = \frac{₹ 185 crores}{28\%} = ₹ 660.71 crores
(b) Revised P/V Ratio = 28\% (as calculated above)
(c) Revised Margin of safety = Total Sales – Break-even Sales
= ₹ 860.71 crores - ₹ 660.71 crores
= ₹ 200 crores.

Question 14
SHA Limited provides the following trading results:

<table>
<thead>
<tr>
<th>Year</th>
<th>Sale</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-13</td>
<td>₹ 25,00,000</td>
<td>10% of Sale</td>
</tr>
<tr>
<td>2013-14</td>
<td>₹ 20,00,000</td>
<td>8% of Sale</td>
</tr>
</tbody>
</table>

You are required to calculate:
(i) Fixed Cost
(ii) Break Even Point
(iii) Amount of profit, if sale is ₹ 30,00,000
(iv) Sale, when desired profit is ₹ 4,75,000
(v) Margin of Safety at a profit of ₹ 2,70,000
Solution:

Workings:

Profit in year 2012-13 = ₹ 25,00,000 × 10% = ₹ 2,50,000
Profit in year 2013-14 = ₹ 20,00,000 × 8% = ₹ 1,60,000

So, P/V Ratio

\[
\text{P/V Ratio} = \frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100
\]

\[
= \frac{₹ 2,50,000 – ₹ 1,60,000}{₹ 25,00,000 – ₹ 20,00,000} \times 100 = \frac{₹ 90,000}{₹ 5,00,000} \times 100 = 18\%
\]

(i) Fixed Cost

\[
\text{Fixed Cost} = \text{Contribution (in year 2012-13)} – \text{Profit (in year 2012-13)}
\]

\[
= (\text{Sales} \times \text{P/V Ratio}) – ₹ 2,50,000
\]

\[
= (₹ 25,00,000 \times 18%) – ₹ 2,50,000
\]

\[
= ₹ 4,50,000 – ₹ 2,50,000
\]

\[
= ₹ 2,00,000
\]

(ii) Break-even Point (in Sales)

\[
\text{Break-even Point} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}
\]

\[
= \frac{₹ 2,00,000}{18\%} = ₹ 11,11,111 \text{ (Approx)}
\]

(iii) Calculation of profit, if sale is ₹ 30,00,000

\[
\text{Profit} = \text{Contribution} – \text{Fixed Cost}
\]

\[
= (\text{Sales} \times \text{P/V Ratio}) – \text{Fixed Cost}
\]

\[
= (₹ 30,00,000 \times 18%) – ₹ 2,00,000
\]

\[
= ₹ 5,40,000 – ₹ 2,00,000
\]

\[
= ₹ 3,40,000
\]

So profit is ₹ 3,40,000, if Sale is ₹ 30,00,000.

(iv) Calculation of Sale, when desired Profit is ₹ 4,75,000

\[
\text{Contribution Required} = \text{Desired Profit} + \text{Fixed Cost}
\]

\[
= ₹ 4,75,000 + ₹ 2,00,000
\]

\[
= ₹ 6,75,000
\]

\[
\text{Sales} = \frac{\text{Contribution Required}}{\text{P/V Ratio}} \times 100
\]

\[
= \frac{₹ 6,75,000}{18\%} = ₹ 37,50,000
\]
Sales is ₹ 37,50,000 when desired profit is ₹ 4,75,000.

(v) Margin of Safety = \( \frac{\text{Profit}}{\text{P/V Ratio}} \) = \( \frac{\₹ 2,70,000}{18\%} \) = ₹ 15,00,000

So Margin of Safety is ₹ 15,00,000 at a profit of ₹ 2,70,000

Question 15

Zed Limited sells its product at ₹ 30 per unit. During the quarter ending on 31st March, 2014, it produced and sold 16,000 units and suffered a loss of ₹ 10 per unit. If the volume of sales is raised to 40,000 units; it can earn a profit of ₹ 8 per unit.

You are required to calculate:

(i) Break Even Point in Rupees.

(ii) Profit if the sale volume is 50,000 units.

(iii) Minimum level of production where the company needs not to close the production if unavoidable fixed cost is ₹ 1,50,000.

Solution:

<table>
<thead>
<tr>
<th>Units sold</th>
<th>Sales value (₹)</th>
<th>Profit/ (loss) (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16,000 units</td>
<td>4,80,000 (₹ 30 × 16,000 units)</td>
<td>(1,60,000) (₹ 10 × 16,000 units)</td>
</tr>
<tr>
<td>40,000 units</td>
<td>12,00,000 (₹ 30 × 40,000 units)</td>
<td>3,20,000 (₹ 8 × 40,000 units)</td>
</tr>
</tbody>
</table>

\[
P/V \text{ Ratio} = \frac{\text{Change in profit}}{\text{Change in sales value}} \times 100 = \frac{\₹ 3,20,000 - (-\₹ 1,60,000)}{\₹ 12,00,000 - \₹ 4,80,000} \times 100 = \frac{\₹ 4,80,000}{\₹ 7,20,000} = 66.67\%
\]

Total Contribution in case of 40,000 units = Sales Value × P/V Ratio
= ₹ 12,00,000 × 66.67%
= ₹ 8,00,000

So, Fixed cost = Contribution – Profit
= ₹ 8,00,000 – ₹ 3,20,000
= ₹ 4,80,000
(i) Break-even Point in Rupees = Fixed Cost \[ \text{P/V Ratio} \]
\[ = \frac{₹ 4,80,000}{66.67\%} = ₹ 7,20,000 \]

(ii) If sales volume is 50,000 units, then profit = Sales Value × P/V Ratio – Fixed Cost
\[ = (50,000 \text{ units} \times ₹ 30 \times 66.67\% - ₹ 4,80,000) \]
\[ = ₹ 5,20,000 \]

(iii) Minimum level of production where the company needs not to close the production, if unavoidable fixed cost is ₹ 1,50,000:
\[ = \frac{\text{Avoidable fixed cost}}{\text{Contribution per unit}} \]
\[ = \frac{\text{Total fixed cost} - \text{Unavoidable fixed cost}}{\text{Contribution per unit}} \]
\[ = \frac{₹ 4,80,000 - ₹ 1,50,000}{₹ 30 \times 66.67\%} \]
\[ = \frac{₹ 3,30,000}{₹ 20} = 16,500 \text{ units.} \]

At production level of ≥ 16,500 units, company needs not to close the production.

**Question 16**

ABC Limited started its operation in the year 2013 with a total production capacity of 2,00,000 units. The following information, for two years, are made available to you:

<table>
<thead>
<tr>
<th>Year</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>2014</td>
</tr>
<tr>
<td>Sales (units)</td>
<td>80,000</td>
</tr>
<tr>
<td>Total Cost (₹)</td>
<td>34,40,000</td>
</tr>
</tbody>
</table>

There has been no change in the cost structure and selling price and it is anticipated that it will remain unchanged in the year 2015 also.

Selling price is ₹ 40 per unit.

Calculate:

(i) Variable cost per unit.

(ii) Profit Volume Ratio.
(iii) Break-Even Point (in units)

(iv) Profit if the firm operates at 75% of the capacity.

Solution:

(i) Variable Cost per unit
\[
= \frac{\text{Change in total cost}}{\text{Change in sales volume}}
\]
\[
= \frac{\text{₹} 45,60,000 - \text{₹} 34,40,000}{1,20,000 \text{ units} - 80,000 \text{ units}}
\]
\[
= \frac{\text{₹} 11,20,000}{40,000 \text{ units}} = \text{₹} 28
\]

(ii) Profit Volume Ratio
\[
= \frac{\text{Contribution per unit}}{\text{Selling price per unit}} \times 100
\]
\[
= \frac{\text{₹} 40 - \text{₹} 28}{\text{₹} 40} \times 100 = 30\%
\]

(iii) Break-Even Point (in units)
\[
= \frac{\text{Fixed cost}}{\text{Contribution per unit}}
\]

Fixed Cost
\[
= \text{Total Cost in 2013} - \text{Total Variable Cost in 2013}
\]
\[
= \text{₹} 34,40,000 - (\text{₹} 28 \times 80,000 \text{ units})
\]
\[
= \text{₹} 34,40,000 - \text{₹} 22,40,000
\]
\[
= \text{₹} 12,00,000
\]

Therefore, Break-Even Point
\[
= \frac{\text{₹} 12,00,000}{\text{₹} 12} = 1,00,000 \text{ units}
\]

(iv) Profit if the firm operates at 75% of the capacity:

Number of units to be produced and sold = 2,00,000 units × 75% = 1,50,000 units

Profit
\[
= \text{Total contribution} - \text{Fixed Cost}
\]
Or,
\[
= \text{₹} 12 \times 1,50,000 \text{ units} - \text{₹} 12,00,000
\]
Or,
\[
= \text{₹} 18,00,000 - \text{₹} 12,00,000
\]
Or,
\[
\text{Profit} = \text{₹} 6,00,000
\]
Question 17

Maximum Production capacity of KM (P) Ltd. is 28000 units per month. Output at different levels along with cost data is furnished below:

<table>
<thead>
<tr>
<th>Particulars of Costs</th>
<th>Activity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16,000 units</td>
</tr>
<tr>
<td>Direct Material</td>
<td>₹12,80,000</td>
</tr>
<tr>
<td>Direct labour</td>
<td>₹17,60,000</td>
</tr>
<tr>
<td>Total factory overheads</td>
<td>₹22,00,000</td>
</tr>
</tbody>
</table>

You are required to work out the selling price per unit at an activity level of 24,000 units by considering profit at the rate of 25% on sales.

Solution:

Computation of Overheads:

Variable Overhead per unit = Change in Factory Overheads / Change in activity level

= (23,70,000 - 22,00,000) / (18,000 - 16,000) or (25,40,000 - 23,70,000) / (20,000 - 18,000)

= 1,70,000 / 2000 = ₹85 per unit

Fixed Overhead

Activity level = 16,000 units

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total factory overheads</td>
<td>22,00,000</td>
</tr>
<tr>
<td>Less: Variable overheads 16,000 units @ ₹85 per unit</td>
<td>13,60,000</td>
</tr>
<tr>
<td>Fixed Overhead</td>
<td>8,40,000</td>
</tr>
</tbody>
</table>

Computation of Costs at Activity Level 24,000 units

<table>
<thead>
<tr>
<th>Per Unit (₹)</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Material (12,80,000/16,000)</td>
<td>80.00</td>
</tr>
<tr>
<td>Direct Labour (17,60,000/16,000)</td>
<td>110.00</td>
</tr>
<tr>
<td>Variable Overhead (As calculated above)</td>
<td>85.00</td>
</tr>
<tr>
<td>Fixed Overhead</td>
<td></td>
</tr>
<tr>
<td>Total Cost</td>
<td></td>
</tr>
</tbody>
</table>
Computation of Selling Price at activity level 24,000 units
Profit required is 25% on selling price, hence cost will be 75%.

Therefore desired profit = \( \frac{25 \times 74,40,000}{75} = ₹ 24,80,000 \)

Cost of 24,000 units 74,40,000
Desired Profit 24,80,000
Total Sales 99,20,000

Selling Price Per Unit = \( \frac{\text{Total Sales}}{\text{No of Units}} = \frac{99,20,000}{24,000} = ₹ 413.33 \text{ or } ₹ 413 \)

**Question 18**

SK Lit. is engaged in the manufacture of tyres. Analysis of income statement indicated a profit of ₹ 150 lakhs on a sales volume of 50,000 units. The fixed costs are ₹ 850 lakhs which appears to be high. Existing selling price is ₹ 3,400 per unit. The company is considering to revise the profit target to ₹ 350 lakhs. You are required to compute –

(i) Break-even point at existing levels in units and in rupees.
(ii) The number of units required to be sold to earn the target profit.
(iii) Profit with 15% increase in selling price and drop in sales volume by 10%.
(iv) Volume to be achieved to earn target profit at the revised selling price as calculated in (ii) above, if a reduction of 8% in the variable costs and ₹ 85 lakhs in the fixed cost is envisaged.

**Solution:**

Sales Volume 50,000 Units

Computation of existing contribution

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Per unit (₹)</th>
<th>Total (₹ In lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>3,400</td>
<td>1,700</td>
</tr>
<tr>
<td>Fixed Cost</td>
<td>1,700</td>
<td>850</td>
</tr>
<tr>
<td>Profit</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Contribution</td>
<td>2,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Variable Cost</td>
<td>1,400</td>
<td>700</td>
</tr>
</tbody>
</table>

(i) Break even sales in units = \( \frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{8,50,00,000}{2,000} = 42,500 \text{ units} \)

Break even sales in rupees = 42,500 units x ₹ 3,400 = ₹ 1,445 lakhs
Marginal Costing

OR

\[
P/V \text{ Ratio} = \frac{2,000}{3,400} \times 100 = 58.82\%
\]

B.E.P (Rupees) = \(\frac{\text{FC}}{P/V \text{ Ratio}}\) = \(\frac{8,50,00,000}{58.82\%}\) = ₹ 1,445 lakhs (approx.)

(ii) Number of units sold to achieve a target profit of ₹350 lakhs:

Desired Contribution = Fixed Cost + Target Profit
= 850 L + 350 L = 1,200L

Number of units to be sold = \(\frac{\text{Desired Contribution}}{\text{Contribution per unit}}\) = \(\frac{12,00,00,000}{2,000}\) = 60,000 units

(iii) Profit if selling price is increased by 15% and sales volume drops by 10%:

Existing Selling Price per unit = ₹ 3,400
Revised selling price per unit = ₹ 3,400 x 115% = ₹ 3,910
Existing Sales Volume = 50,000 units
Revised sales volume = 50,000 units – 10% of 50,000 = 45,000 units.

**Statement of profit at sales volume of 45,000 units @ ₹ 3910 per unit**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Per unit (₹)</th>
<th>Total (₹ in lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>3,910.00</td>
<td>1,759.50</td>
</tr>
<tr>
<td>Less: Variable Costs</td>
<td>1,400.00</td>
<td>630.00</td>
</tr>
<tr>
<td>Contribution</td>
<td>2,510.00</td>
<td>1,129.50</td>
</tr>
<tr>
<td>Less: Fixed Cost</td>
<td></td>
<td>850.00</td>
</tr>
<tr>
<td>Profit</td>
<td></td>
<td>279.50</td>
</tr>
</tbody>
</table>

(iv) Volume to be achieved to earn target profit of ₹350 lakhs with revised selling price and reduction of 8% in variable costs and ₹85 lakhs in fixed cost:

Revised selling price per unit = ₹ 3,910
Variable costs per unit existing = ₹1,400
Revised Variable Costs
Reduction of 8% in variable costs = ₹ 1,400 – 8% of 1,400
= ₹ 1,400 – ₹112
= ₹1,288
Total Fixed Cost (existing) = ₹ 850 lakhs
Reduction in fixed cost = ₹ 85 lakhs
Revised fixed cost = ₹ 850 lakhs – ₹ 85 lakhs = ₹765 lakhs
Revised Contribution (unit) = Revised selling price per unit – Revised Variable Costs per units
Revised Contribution per unit = ₹ 3,910 – ₹ 1,288 = ₹ 2,622
Desired Contribution = Revised Fixed Cost + Target Profit
= ₹ 765 lakhs + ₹350 lakhs = ₹1,115 lakhs
No. of units to be sold = Desired Contribution × Contribution per unit = ₹1,115 lakh × ₹2,622 = 42,525 units

Question 19
A company gives the following information:
Margin of Safety = ₹ 3,75,000
Total Cost = ₹ 3,87,500
Margin of Safety (Qty.) = 15,000 units
Break Even Sales in Units = 5,000 units

You are required to calculate:
(i) Selling price per unit
(ii) Profit
(iii) Profit/ Volume Ratio
(iv) Break Even Sales (in Rupees)
(v) Fixed Cost

Solution:
(i) Selling Price per unit = \( \frac{\text{Margin of Safety in Rupee value}}{\text{Margin of Safety in Quantity}} \)
= ₹ 3,75,000
= ₹ 25

(ii) Profit = Sales Value – Total Cost
= Selling price per unit × (BEP units + MoS units) – Total Cost
= ₹ 25 × (5,000 + 15,000) units – ₹ 3,87,500
= ₹ 5,00,000 – ₹ 3,87,500 = ₹ 1,12,500
Marginal Costing  12.28

(iii) Profit/ Volume (P/V) Ratio  = \[ \frac{\text{Profit}}{\text{Margin of Safety in Rupee value}} \times 100 \]
= \[ \frac{\text{₹112,500}}{\text{₹3,75,000}} \times 100 = 30\% \]

(iv) Break Even Sales (in Rupees)  = BEP units × Selling Price per unit
= 5,000 units × ₹25 = ₹1,25,000

(v) Fixed Cost  = Contribution – Profit
= Sales Value × P/V Ratio – Profit
= (₹5,00,000 × 30%) – ₹1,12,500
= ₹1,50,000 – ₹1,12,500 = ₹37,500

Computation of Profit under Marginal Costing Method and under Absorption Costing Method and Reconciliation of Profit.

Question 20
Mega Company has just completed its first year of operations. The unit costs on a normal costing basis are as under:

\[
\begin{align*}
\text{Direct material} & \quad 4 \text{ kg} \times ₹4 & = 16.00 \\
\text{Direct labour} & \quad 3 \text{ hrs} \times ₹18 & = 54.00 \\
\text{Variable overhead} & \quad 3 \text{ hrs} \times ₹4 & = 12.00 \\
\text{Fixed overhead} & \quad 3 \text{ hrs} \times ₹6 & = 18.00 \\
\end{align*}
\]

\[
\begin{align*}
\text{Total} & = 100.00 \\
\end{align*}
\]

Selling and administrative costs:

\[
\begin{align*}
\text{Variable} & = ₹20 \text{ per unit} \\
\text{Fixed} & = ₹7,60,000 \\
\end{align*}
\]

During the year the company has the following activity:

\[
\begin{align*}
\text{Units produced} & = 24,000 \\
\text{Units sold} & = 21,500 \\
\text{Unit selling price} & = ₹168 \\
\text{Direct labour hours worked} & = 72,000 \\
\end{align*}
\]

Actual fixed overhead was ₹48,000 less than the budgeted fixed overhead. Budgeted variable overhead was ₹20,000 less than the actual variable overhead. The company used an
expected actual activity level of 72,000 direct labour hours to compute the predetermined overhead rates.

Required:
(i) Compute the unit cost and total income under:
   (a) Absorption costing
   (b) Marginal costing
(ii) Under or over absorption of overhead.
(iii) Reconcile the difference between the total income under absorption and marginal costing.

Solution:
(i) Computation of Unit Cost & Total Income

<table>
<thead>
<tr>
<th></th>
<th>Absorption Costing (₹)</th>
<th>Marginal Costing (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Material</td>
<td>16.00</td>
<td>16.00</td>
</tr>
<tr>
<td>Direct Labour</td>
<td>54.00</td>
<td>54.00</td>
</tr>
<tr>
<td>Variable Overhead (₹12 + ₹20,000/24,000)</td>
<td>12.83</td>
<td>12.83</td>
</tr>
<tr>
<td>Fixed Overhead</td>
<td>18.00</td>
<td>--</td>
</tr>
<tr>
<td><strong>Unit Cost</strong></td>
<td><strong>100.83</strong></td>
<td><strong>82.83</strong></td>
</tr>
</tbody>
</table>

Income Statements

<table>
<thead>
<tr>
<th></th>
<th>Absorption Costing (₹)</th>
<th>Marginal Costing (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (21,500 units × ₹168)</td>
<td>36,12,000</td>
<td></td>
</tr>
<tr>
<td>Less: Cost of goods sold (Refer the working note)</td>
<td>(21,19,917)</td>
<td></td>
</tr>
<tr>
<td>Less: Selling &amp; Distribution Expenses</td>
<td>(11,90,000)</td>
<td></td>
</tr>
<tr>
<td>Profit</td>
<td>3,02,083</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Marginal Costing (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (as above)</td>
<td>36,12,000</td>
</tr>
<tr>
<td>Less: Cost of goods sold (Refer the working note)</td>
<td>(17,80,917)</td>
</tr>
<tr>
<td>Less: Selling &amp; Distribution Expenses</td>
<td>(4,30,000)</td>
</tr>
<tr>
<td>Contribution</td>
<td>14,01,083</td>
</tr>
<tr>
<td>Less: Fixed Factory and Selling &amp; Distribution Overhead (₹ 3,84,000 + ₹ 7,60,000)</td>
<td>(11,44,000)</td>
</tr>
<tr>
<td>Profit</td>
<td>2,57,083</td>
</tr>
</tbody>
</table>
(ii) Under or over absorption of overhead:

<table>
<thead>
<tr>
<th></th>
<th>(₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Overhead:</strong></td>
<td></td>
</tr>
<tr>
<td>Budgeted (₹6 × 72,000 hours)</td>
<td>4,32,000</td>
</tr>
<tr>
<td>Actual (₹4,32,000 – ₹48,000)</td>
<td>3,84,000</td>
</tr>
<tr>
<td>Over-absorption</td>
<td>48,000</td>
</tr>
<tr>
<td><strong>Variable Overhead:</strong></td>
<td></td>
</tr>
<tr>
<td>Budgeted (₹4 × 72,000 hours)</td>
<td>2,88,000</td>
</tr>
<tr>
<td>Actual (₹2,88,000 + ₹20,000)</td>
<td>3,08,000</td>
</tr>
<tr>
<td>Under-absorption</td>
<td>20,000</td>
</tr>
</tbody>
</table>

(iii) Reconciliation of Profit:

Difference in Profit: ₹ 3,02,083 – ₹ 2,57,083 = ₹ 45,000

Due to Fixed Factory Overhead being included in Closing Stock in Absorption Costing not in Marginal Costing.

Therefore, Difference in Profit = Fixed Overhead Rate (Production – Sale)

= ₹18 (24,000 – 21,500) = ₹45,000

Working Note:

Calculation of Cost of Goods Sold

<table>
<thead>
<tr>
<th></th>
<th>Absorption Costing</th>
<th>Marginal Costing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Materials (₹16 × 24,000)</td>
<td>3,84,000</td>
<td>3,84,000</td>
</tr>
<tr>
<td>Direct labour (₹54 × 24,000)</td>
<td>12,96,000</td>
<td>12,96,000</td>
</tr>
<tr>
<td>Variable OH</td>
<td>3,08,000</td>
<td>3,08,000</td>
</tr>
<tr>
<td>(₹12 × 24,000 + ₹20,000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Overhead (₹18 × 24,000)</td>
<td>4,32,000</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>24,20,000</td>
<td>19,88,000</td>
</tr>
<tr>
<td>Add: Opening stock</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Less: Closing Stock (24,000 – 21,500)</td>
<td>(2,52,083)</td>
<td>(2,07,083)</td>
</tr>
<tr>
<td>Cost of Goods Produced</td>
<td>21,67,917</td>
<td>17,80,917</td>
</tr>
<tr>
<td>Add: Adjustment for over/ under absorption</td>
<td>(48,000)</td>
<td>--</td>
</tr>
<tr>
<td>Cost of Goods Sold</td>
<td>21,19,917</td>
<td>17,80,917</td>
</tr>
</tbody>
</table>
Question 21

ABC Ltd. can produce 4,00,000 units of a product per annum at 100% capacity. The variable production costs are ₹ 40 per unit and the variable selling expenses are ₹ 12 per sold unit. The budgeted fixed production expenses were ₹ 24,00,000 per annum and the fixed selling expenses were ₹ 16,00,000. During the year ended 31st March, 2014, the company worked at 80% of its capacity. The operating data for the year are as follows:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>3,20,000 units</td>
</tr>
<tr>
<td>Sales @ ₹ 80 per unit</td>
<td>3,10,000 units</td>
</tr>
<tr>
<td>Opening stock of finished goods</td>
<td>40,000 units</td>
</tr>
</tbody>
</table>

Fixed production expenses are absorbed on the basis of capacity and fixed selling expenses are recovered on the basis of period.

You are required to prepare Statements of Cost and Profit for the year ending 31st March, 2014:

(i) On the basis of marginal costing
(ii) On the basis of absorption costing

Solution:

(i) Statement of Cost and Profit under Marginal Costing for the year ending 31st March, 2014

Output = 3,20,000 units

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales: 3,10,000 units @ ₹ 80</td>
<td>2,48,00,000</td>
</tr>
<tr>
<td>Marginal cost / variable cost:</td>
<td></td>
</tr>
<tr>
<td>Variable cost of production (3,20,000 × ₹ 40)</td>
<td>1,28,00,000</td>
</tr>
<tr>
<td>Add: Opening stock 40,000 units @ ₹ 40</td>
<td>16,00,000</td>
</tr>
<tr>
<td></td>
<td>1,44,00,000</td>
</tr>
<tr>
<td>Less: Closing Stock (₹1,44,00,000 × 50,000 units × 3,60,000 units)</td>
<td>(20,00,000)</td>
</tr>
<tr>
<td>Variable cost of production of 3,10,000 units</td>
<td>1,24,00,000</td>
</tr>
<tr>
<td>Add: Variable selling expenses @ ₹ 12 per unit</td>
<td>37,20,000</td>
</tr>
<tr>
<td>Contribution (sales – variable cost)</td>
<td>86,40,000</td>
</tr>
<tr>
<td>Less: Fixed production cost</td>
<td>24,00,000</td>
</tr>
<tr>
<td>Fixed selling expenses</td>
<td>16,00,000</td>
</tr>
<tr>
<td>Actual profit under marginal costing</td>
<td>46,80,000</td>
</tr>
</tbody>
</table>

* Closing stock = 40,000 + 3,20,000 – 3,10,000 = 50,000 units
(ii) **Statement of Cost and Profit under Absorption Costing**
for the year ending 31st March, 2014

Output = 3,20,000 units

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Amount (₹)</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales: 3,10,000 units @ ₹ 80</td>
<td>2,48,00,000</td>
<td></td>
</tr>
<tr>
<td>Less: Cost of Goods sold:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable cost of production</td>
<td></td>
<td>1,28,00,000</td>
</tr>
<tr>
<td>(3,20,000 @ ₹ 40)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add: Fixed cost of production absorbed</td>
<td></td>
<td>19,20,000</td>
</tr>
<tr>
<td>3,20,000 units @ ₹ 6 (1)</td>
<td></td>
<td>1,47,20,000</td>
</tr>
</tbody>
</table>
| Add: Opening Stock: \[
\frac{1,47,20,000}{3,20,000} \times 40,000\] | 18,40,000    |              |
| Less: Closing Stock: \[
\frac{1,65,60,000}{3,60,000} \times 50,000\] | (23,00,000)  |              |
| Production cost of 3,10,000 units  | 1,42,60,000  |              |
| Adjustment for Over/under-absorption: |          |              |
| Under absorption of fixed production overheads (2) | 4,80,000   |              |
| Cost of Goods Sold                 | 1,47,40,000  |              |
| Selling expenses:                  |              |              |
| Variable: ₹ 12 \times 3,10,000 units | 37,20,000   |              |
| Fixed                              | 16,00,000    | (2,00,60,000)|
| Actual profit under absorption costing | 47,40,000   |              |

**Workings:**

1. Absorption rate for fixed cost of production = \[
\frac{24,00,000}{4,00,000 \text{ units}} \] = ₹ 6 per unit
2. Fixed production overhead under absorbed = ₹ (24,00,000 – 19,20,000) = ₹ 4,80,000.