
Super 40
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Financial Management
With Solution✅
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# LEVERAGES



**SOLUTION**

| | (₹) |
|---|---|
| Sales | 24,00,000 |
| *Less:* Variable cost | 12,00,000 |
| Contribution | 12,00,000 |
| *Less:* Fixed cost | 10,00,000 |
| EBIT | 2,00,000 |
| *Less:* Interest | 1,00,000 |
| EBT | 1,00,000 |
| *Less:* Tax (50%) | 50,000 |
| EAT | 50,000 |
| No. of equity shares | 10,000 |
| EPS | 5 |





(a) Operating Leverage $= \frac{₹12,00,000}{₹2,00,000} = 6$ times

(b) Financial Leverage $= \frac{₹2,00,000}{₹1,00,000} = 2$ times

(c) Combined Leverage = OL × FL = 6 × 2 = 12 times.

(d) ROI $= \frac{₹50,000}{₹10,00,000} \times 100 = 5\%$

Here ROI is calculated as ROE i.e. $\frac{\text{EAT - Pref. Dividend}}{\text{Equity shareholders' fund}}$

(e) Operating Leverage = 6

$$6 = \frac{\Delta \text{EBIT}}{0.25}$$

$$\Delta \text{EBIT} = \frac{6 \times 1}{4} = 1.5$$

Increase in EBIT = ₹ 2,00,000 × 1.5

= ₹ 3,00,000

New EBIT = ₹ 5,00,000

**SOLUTION**

**Company A**

(i) Financial Leverage $= \frac{\text{EBIT}}{\text{EBT i.e EBIT} - \text{Interest}}$

So, 3 $= \frac{\text{EBIT}}{\text{EBIT} - ₹\,20,000}$

Or, 3 (EBIT – 20,000) = EBIT

Or, 2 EBIT = 60,000

Or, EBIT = 30,000

(ii) Operating Leverage $= \frac{\text{Contribution}}{\text{EBIT}}$ Or, $5 = \frac{\text{Contribution}}{₹\,30,000}$

Or, Contribution = ₹ 1, 50,000

$\text{Sales} = \frac{\text{contribution}}{\text{P/V Ratio}(1 - \text{variable cost ratio})} = \frac{₹1,50,000}{40\%} = ₹\,3,75,000$

(iii) Fixed Cost = Contribution – EBIT

= ₹ 1, 50,000 – 30,000

Or, Fixed cost = ₹ 1,20,000

**Company B**

(i) Financial Leverage $= \frac{\text{EBIT}}{\text{EBT i.e EBIT} - \text{Interest}}$

So, 2 $= \frac{\text{EBIT}}{\text{EBIT} - 1,00,000}$

Or, 2 (EBIT – ₹1,00,000) = EBIT

Or, 2 EBIT – ₹ 2,00,000 = EBIT

Or, EBIT = ₹ 2,00,000

(ii) Operating Leverage $= \frac{\text{Contribution}}{\text{EBIT}}$

Or, 2 $= \frac{\text{Contribution}}{₹\,2,00,000}$

Or, Contribution = ₹ 4,00,000

$$\text{Sales} = \frac{\text{Contribution}}{\text{P/V Ratio (1 - variable cost ratio)}} = \frac{₹\,4,00,000}{50\%} = ₹\,8,00,000$$

(iii) Fixed Cost = Contribution – EBIT

= ₹ 4, 00,000 – ₹ 2,00,000

Or, Fixed cost = ₹ 2,00,000

**Income Statements of Company A and Company B**

| | Company A (₹) | Company B (₹) |
|---|---|---|
| Sales | 3,75,000 | 8,00,000 |
| Less: Variable cost | 2,25,000 | 4,00,000 |
| Contribution | 1,50,000 | 4,00,000 |
| Less: Fixed Cost | 1,20,000 | 2,00,000 |
| Earnings before interest and tax (EBIT) | 30,000 | 2,00,000 |
| Less: Interest | 20,000 | 1,00,000 |
| Earnings before tax (EBT) | 10,000 | 1,00,000 |
| Less: Tax @ 30% | 3,000 | 30,000 |
| Earnings after tax (EAT) | 7,000 | 70,000 |

**Comment based on Leverage**

Comment based on leverage – Company B is better than company A of the following reasons:

- Capacity of Company B to meet interest liability is better than that of companies A (from EBIT/Interest ratio)

$$[A = \frac{₹30,000}{₹20,000} = 1.5,\ B = \frac{₹2,00,000}{₹1,00,000} = 2]$$

- Company B has the least financial risk as the total risk (business and financial) of company B is lower (combined leverage of Company A – 15 and Company B- 4)

**10. (i) Financial leverage**

Combined Leverage = Operating Leverage (OL) × Financial Leverage (FL)

2.5 = 2 × FL

Or, FL = 1.25

Financial Leverage = 1.25

**(ii) P/V Ratio and Earning per share (EPS)**

$$\text{Operating leverage} = \frac{\text{Contribution(C)}}{\text{Contribution - Fixed Cost (FC)}}$$

$$2 = \frac{C}{C - 3,40,000}$$

Or, C = 2 (C – 3,40,000)

Or, C = 2C – 6,80,000

Or, Contribution = ₹ 6,80,000

$$\text{Now, P/V ratio} = \frac{\text{Contribution (C)}}{\text{Sales (S)}} \times 100$$

$$= \frac{6,80,000}{50,00,000} \times 100 = 13.6\%$$

Therefore, P/V Ratio = 13.6%

EBT = Sales – Variable Cost – Fixed Cost – Interest

= ₹50,00,000 – ₹50,00,000 (1-0.136) – ₹3,40,000 – (8% × ₹30,25,000)

= ₹ 50,00,000 – ₹ 43,20,000 – ₹ 3,40,000 – ₹ 2,42,000

= ₹ 98,000

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PAT = EBT(1-T)= ₹ 98,000(1-0.3) = ₹ 68,600

$$\text{EPS} = \frac{\text{Profit after tax}}{\text{No. of equity shares}}$$

$$\text{EPS} = \frac{₹\ 68,600}{3,40,000 \text{ shares}} = ₹\ 0.202$$

**(iii) Assets turnover**

$$\text{Assets turnover} = \frac{\text{Sales}}{\text{Total Assets}^*}$$

$$= \frac{₹\ 50,00,000}{₹\ 34,00,000 + ₹\ 30,25,000} = 0.78$$

0.78 < 1.5 means lower than industry turnover.

*Total Asset = Equity share capital + 8% Debentures

**(iv)** EBT zero means 100% reduction in EBT. Since combined leverage is 2.5, sales have to be dropped by 100/2.5 = 40%. Hence new sales will be ₹ 50,00,000 × (100 – 40) % = ₹ 30,00,000.

Therefore, at ₹ 30,00,000 level of sales, the Earnings before Tax (EBT) of the company will be zero.

**Alternatively**

$$\text{Required sales when EBT is zero} = \frac{\text{Fixed Cost + Interest + desired Profit}}{\text{P/V Ratio}}$$

$$= \frac{₹\ 3,40,000 + ₹\ 2,42,000 + \text{zero}}{13.60\%}$$

$$= \frac{₹\ 5,82,000}{13.60\%}$$

= ₹ 42,79,412

[**Note:** The question can also be solved by first calculating EBIT with the help of Financial Leverage. Accordingly, answer to the requirement (ii) and (iv) will also vary.

**12. (i) Calculation of Financial Leverage:**

Combined Leverage (CL) = Operating Leverage (OL) × Financial Leverage (FL)

$2.16 = 1.2 \times FL$

$FL = 1.8$

**(ii) Calculation of Fixed cost:**

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{EBT i.e EBIT} - \text{Interest}}$$

$$1.8 = \frac{\text{EBIT}}{\text{EBIT} - 10,00,000}$$

$1.8\ (EBIT - 10,00,000) = EBIT$

$1.8\ EBIT - 18,00,000 = EBIT$





$$EBIT = \frac{18,00,000}{0.8} = ₹\ 22,50,000$$

$$\text{Further, Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}}$$

$$1.2 = \frac{\text{Contribution}}{₹\ 22,50,000}$$

Contribution = ₹ 27,00,000

Fixed Cost = Contribution – EBIT

= ₹ 27, 00,000 – ₹ 22,50,000

Fixed cost = ₹ 4,50,000

**(iii) Calculation of P/V ratio:**

$$\text{P/V ratio} = \frac{\text{Contribution (C)}}{\text{Sales (S)}} \times 100 = \frac{27,00,000}{100,00,000} \times 100 = 27\%$$

**Answer**

**Income Statement**

| Particulars | Amount (₹) |
|---|---|
| Sales | 75,00,000 |
| Less: Variable cost (56% of 75,00,000) | 42,00,000 |
| Contribution | 33,00,000 |
| Less: Fixed costs | 6,00,000 |
| Earnings before interest and tax (EBIT) | 27,00,000 |
| Less: Interest on debt (@ 9% on ₹ 45 lakhs) | 4,05,000 |
| Earnings before tax (EBT) | 22,95,000 |

(i) $ROI = \frac{EBIT}{Capital\ employed} \times 100 = \frac{EBIT}{Equity + Debt} \times 100$

$= \frac{₹\ 27,00,000}{₹\ (55,00,000 + 45,00,000)} \times 100 = 27\%$

(ROI is calculated on Capital Employed)

(ii) ROI = 27% and Interest on debt is 9%, hence, it has a favourable financial leverage.

(iii) $Capital\ Turnover = \frac{Net\ Sales}{Capital}$

$Or = \frac{Net\ Sales}{Capital} = \frac{₹\ 75,00,000}{₹\ 1,00,00,000} = 0.75$

Which is very low as compared to industry average of 3.

(iv) Calculation of Operating, Financial and Combined leverages

(a) Operating Leverage $= \frac{Contribution}{EBIT} = \frac{₹\ 33,00,000}{₹\ 27,00,000} = 1.22$ (approx)

(b) Financial Leverage $= \frac{EBIT}{EBT} = \frac{₹\ 27,00,000}{₹\ 22,95,000} = 1.18$ (approx)

(c) Combined Leverage $= \frac{Contribution}{EBT} = \frac{₹\ 33,00,000}{₹\ 22,95,000} = 1.44$ (approx)

Or = Operating Leverage × Financial Leverage $= 1.22 \times 1.18 = 1.44$ (approx)

(v) Operating leverage is 1.22. So if sales is increased by 10%.

EBIT will be increased by 1.22 × 10 i.e. 12.20% (approx)

(vi) Since the combined Leverage is 1.44, sales have to drop by 100/1.44 i.e. 69.44% to bring EBT to Zero

Accordingly, New Sales = ₹ 75,00,000 × (1 - 0.6944)

= ₹ 75,00,000 × 0.3056

= ₹ 22,92,000 (approx)

Hence at ₹ 22,92,000 sales level EBT of the firm will be equal to Zero.

(vii) Financial leverage is 1.18. So, if EBIT increases by 20% then EBT will increase by

1.18 × 20 = 23.6% (approx)

**Answer**

$$\text{Profit Volume Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

So, $25.55 = \frac{\text{Contribution}}{₹42,00,000} \times 100$ Or, $\text{Contribution} = 42,00,000 \times 25.55$

$\text{Contribution} = ₹10,73,100$

**Income Statement**

| Particulars | (₹) |
|---|---|
| Sales | 42,00,000 |
| Variable Cost (Sales - Contribution) | 31,26,900 |
| Contribution | 10,73,100 |
| Fixed Cost | 3,48,000 |
| EBIT | 7,25,000 |
| Interest | 2,03,500 |
| EBT(EBIT – Interest) | 5,21,600 |
| Tax | 1,82,500 |
| Profit after Tax (EBT – Tax) | 3,39,040 |

(i) Operating Leverage $= \frac{\text{Contribution}}{\text{Earnings before interest and tax(EBIT)}}$

Or, $\frac{\text{Contribution}}{\text{Contribution - Fixed Cost}} = \frac{₹\ 10,73,100}{₹\ 10,73,100 - ₹\ 3,48,000}$

$= \frac{₹\ 10,73,100}{₹\ 7,25,100} = 1.48$

(ii) Combined Leverage = Operating Leverage x Financial Leverage

$= 1.48 \times 1.39 = 2.06$

Or, $\frac{\text{Contribution}}{\text{EBT}}$ i.e. $\frac{₹\ 10,73,100}{₹\ 5,21,600} = 2.06$

$= \frac{₹\ 10,73,100}{₹\ 7,25,100} = 1.48$

(ii) Combined Leverage = Operating Leverage x Financial Leverage

$= 1.48 \times 1.39 = 2.06$

Or, $\frac{\text{Contribution}}{\text{EBT}}$ i.e. $\frac{₹\ 10,73,100}{₹\ 5,21,600} = 2.06$

# CAPITAL STRUCTURE

**SOLUTION**

**1. Valuation of firms**

| Particulars | Levered Firm (₹) | Unlevered Firm (₹) |
|---|---|---|
| EBIT | 30,000 | 30,000 |
| *Less:* Interest on debt (10% × ₹ 1,00,000) | 10,000 | Nil |
| Earnings available to Equity shareholders | 20,000 | 30,000 |
| $K_e$ | 12.5% | 12.5% |
| Value of Equity (S) (Earnings available to Equity shareholders/$K_e$) | 1,60,000 | 2,40,000 |
| Debt (D) | 1,00,000 | Nil |
| Value of Firm (V) = S + D | 2,60,000 | 2,40,000 |



Value of Levered company is more than that of unlevered company. Therefore, investor will sell his shares in levered company and buy shares in unlevered company. To maintain the level of risk he will borrow proportionate amount and invest that amount also in shares of unlevered company.

**2. Investment & Borrowings**

| | ₹ |
|---|---|
| Sell shares in Levered company (₹ 1,60,000 x 15%) | 24,000 |
| Borrow money (₹ 1,00,000 x 15%) | 15,000 |
| Buy shares in Unlevered company | 39,000 |

**3. Change in Return**

| | ₹ |
|---|---|
| Income from shares in Unlevered company (₹ 39,000 x 12.5%) | 4,875 |
| *Less:* Interest on loan (₹ 15,000 x 10%) | 1,500 |
| Net Income from unlevered firm | 3,375 |
| *Less:* Income from Levered firm (₹ 24000 x 12.5%) | 3,000 |
| Incremental Income due to arbitrage | 375 |

**SOLUTION**

**Workings:**

Market Value of Equity $= \frac{\text{Net income (NI) for equity holders}}{K_e}$

₹ 1,750 lakhs $= \frac{\text{Net income (NI) for equity holders}}{0.20}$

Net Income to equity holders/EAT = ₹ 350 lakhs

Therefore, EBIT $= \frac{EAT}{(1-t)} = \frac{₹\ 350\ lakhs}{(1-0.3)} = ₹\ 500\ lakhs$

**Income Statement**

| | All Equity (₹ In lakhs) | Equity & Debt (₹ In lakhs) |
|---|---|---|
| EBIT (as calculated above) | 500 | 500.00 |
| Interest on ₹ 275 lakhs @ 15% | - | 41.25 |
| EBT | 500 | 458.75 |
| Tax @ 30% | 150 | 137.63 |
| Income available to equity holders | 350 | 321.12 |

**(i) Market value of the company**

Market value of levered firm = Value of unlevered firm + Tax Advantage
= ₹ 1,750 lakhs + (₹ 275 lakhs x 0.3)
= ₹ 1,832.5 lakhs

Change in market value of the company = ₹ 1,832.5 lakhs – ₹ 1,750 lakhs
= ₹ 82.50 lakhs

The impact is that the market value of the company has increased by ₹ 82.50 lakhs due to replacement of equity with debt.

**(ii) Overall Cost of Capital**

Market Value of Equity = Market value of levered firm - Equity repurchased
= ₹ 1,832.50 lakhs – ₹ 275 lakhs = ₹ 1,557.50 lakhs

Cost of Equity ($K_e$) $= \frac{\text{Net Income to equity holders}}{\text{Market value of equity}} \times 100$

$= \frac{₹\ 321.12\ lakhs}{₹\ 1,557.50\ lakhs} \times 100 = 20.62\%$

Cost of debt ($K_d$) = I (1 - t) = 15 (1 - 0.3) = 10.50%

| Components | Amount (₹ In lakhs) | Cost of Capital % | Weight | WACC ($K_o$) % |
|---|---|---|---|---|
| Equity | 1,557.50 | 20.62 | 0.85 | 17.53 |
| Debt | 275.00 | 10.50 | 0.15 | 1.58 |
| | 1,832.50 | | 1 | 19.11 |

The impact is that the Overall Cost of Capital or $K_o$ has fallen by 0.89% (20% - 19.11%) due to the benefit of tax relief on debt interest payment.

**(iii) Cost of Equity**

The impact is that cost of equity has risen by 0.62% (20.62% - 20%) due to the presence of financial risk i.e. introduction of debt in capital structure.

**Note:** Cost of Capital and Cost of equity can also be calculated with the help of following formulas, though there will be no change in the final answers.

Cost of Capital ($K_o$) = $K_{eu}$ [1 – (t x L)]

Where,

$K_{eu}$ = Cost of equity in an unlevered company

t = Tax rate

L $= \frac{\text{Debt}}{\text{Debt + Equity}}$

**SOLUTION**

**EPS under alternative financing plans:**

| Particulars | Equity Financing (₹) | Debt Financing (₹) | Preference Financing (₹) |
|---|---|---|---|
| EBIT | 3,12,500 | 3,12,500 | 3,12,500 |
| *Less:* Interest | 0 | 20,000 | 0 |
| PBT | 3,12,500 | 2,92,500 | 3,12,500 |
| Less: Taxes | 1,56,250 | 1,46,250 | 1,56,250 |
| PAT | 1,56,250 | 1,46,250 | 1,56,250 |
| *Less:* Preference dividend | 0 | 0 | 20,000 |
| Earnings available to ordinary shareholders | 1,56,250 | 1,46,250 | 136,250 |
| Shares outstanding | 1,25,000 | 1,00,000 | 1,00,000 |
| EPS | 1.25 | 1.46 | 1.36 |



The firm is able to maximize the earnings per share when it uses debt financing. Though the rate of preference dividend is equal to the rate of interest, EPS is high in case of debt financing because interest charges are tax deductible while preference dividends are not. With increasing levels of EBIT, EPS will increase at a faster rate with a high degree of leverage.

We know that market price per share is equal to earning per share multiplied by price earning (PE) ratio. If PE ratio is same for all three plans, then the plan which has highest EPS will also have highest MPS and it will be selected. On the other hand, if PE ratio for equity plan is 10 times, for debt plan it is 8 times and for preference plan it is 7 times then:

| | | | |
|---|---|---|---|
| EPS | 1.25 | 1.46 | 1.36 |
| PE ratio | x10 | x8 | x7 |
| MPS | 12.50 | 11.68 | 9.52 |

Now despite of lower EPS, equity plan will be selected because it has highest MPS.

However, if a company is not able to earn a rate of return on its assets higher than the interest rate (or the preference dividend rate), debt (or preference financing) will have an adverse impact on EPS. Suppose the firm in illustration above has an EBIT of ₹75,000, then EPS under different methods will be as follows:

EPS under alternative financing methods: Unfavourable EBIT:

| Particulars | Equity Financing (₹) | Debt Financing (₹) | Preference Financing (₹) |
|---|---|---|---|
| EBIT | 75,000 | 75,000 | 75,000 |
| *Less:* Interest | 0 | 20,000 | 0 |
| PBT | 75,000 | 55,000 | 75,000 |
| *Less:* Taxes | 37,500 | 27,500 | 37,500 |
| PAT | 37,500 | 27,500 | 37,500 |
| *Less:* Preference dividend | 0 | 0 | 20,000 |
| Earnings available to ordinary shareholders | 37,500 | 27,500 | 17,500 |
| Shares outstanding | 1,25,000 | 1,00,000 | 1,00,000 |
| EPS | 0.30 | 0.275 | 0.175 |

## SOLUTION

In this question, EBIT after proposed extension is not given. Therefore, we can assume that existing return on capital employed will be maintained.

**Working notes:**

1. $$\text{Return on Capital Employed} = \frac{\text{EBIT}}{\text{Capital Employed}} = \frac{₹\ 52,00,000}{₹\ 3,00,00,000} = 17.33\%$$

   Capital Employed = Debt + Equity

   = ₹ 1,00,00,000 + (₹ 80,00,000 + ₹ 1,20,00,000)

   = ₹ 3,00,00,000

2. Proposed EBIT = Proposed Capital Employed x Return on capital employed

   = (₹ 3,00,00,000 + ₹ 40,00,000) x 17.33%

   = ₹ 58,92,200

   (If you take return on capital employed in full digits then accurate EBIT will be ₹ 58,93,333.)

3. $$\text{Debt Equity Ratio} = \frac{\text{Debt}}{\text{Debt} + \text{Equity}}$$

   **Option1: Loan option**

   Debt = ₹ 1,00,00,000 + ₹ 40,00,000 = ₹ 1,40,00,000

   Equity = ₹ 2,00,00,000

   $$\text{Debt Equity ratio} = \frac{1.4\ \text{cr.}}{1.4\ \text{cr.} + 2\ \text{cr.}} = 41.18\%$$

   Debt equity ratio has crossed the limit of 35%, hence, PE ratio in this case will be 8 times and additional borrowing will be at the rate of 14%.

   **Option2: Equity option**

   Debt = ₹ 1,00,00,000

   Equity = ₹ 2,00,00,000 + ₹ 40,00,000 = ₹ 2,40,00,000

   $$\text{Debt Equtiy ratio} = \frac{₹\ 1\ \text{cr.}}{₹\ 1\ \text{cr.} + ₹\ 2.4\ \text{cr.}} = 29.41\%$$

Debt equity ratio has not crossed the limit of 35% hence PE ratio in this case will remain at 10 times.

4. Number of equity shares to be issued in case of equity option @ ₹ 25 per share = ₹ 40,00,000 / ₹ 25 = 1,60,000

**Calculation of EPS and MPS under two financial options**

| Particulars | Financial Options | |
|---|---|---|
| | **Option I** | **Option II** |
| | **14% additional loan of 40,00,000** | **8,00,000 equity shares @ ₹ 10 i.e 1,60,000 equity shares @ ₹ 25** |
| | **(₹)** | **(₹)** |
| Profit before interest and Tax (PBIT) | 58,92,200 | 58,92,200 |
| *Less:* Interest on old debentures @ 12% | 12,00,000 | 12,00,000 |
| *Less:* Interest on additional loan (new) @ 14% on ₹ 40,00,000 | 5,60,000 | Nil |
| Profit before tax | 41,32,200 | 46,92,000 |
| *Less:* Taxes @ 50% | 20,66,100 | 23,46,100 |
| Earnings for equity shareholders (EAT/Profit after tax) | 20,66,100 | 23,46,100 |
| Number of Equity Shares | 8,00,000 | 9,60,000 |
| Earnings per Share (EPS) | 2.58 | 2.44 |
| Price/ Earnings ratio | 8 | 10 |
| Market price per share (MPS) | 20.66 | 24.44 |

**Decision:** Though loan option has higher EPS but equity option has higher MPS therefore company should raise additional fund through equity option.

(a) Assuming no tax as per MM Approach.

Calculation of Value of Firms 'A Ltd.' and 'B Ltd' according to MM Hypothesis

Market Value of 'B Ltd' [Unlevered(u)]

Total Value of Unlevered Firm ($V_u$) = [NOI/$k_e$] = 18,00,000/0.18 = ₹ 1,00,00,000

$K_e$ of Unlevered Firm (given) = 0.18

$K_o$ of Unlevered Firm (Same as above = $k_e$ as there is no debt) = 0.18

**Market Value of 'A Ltd' [Levered Firm (I)]**

Total Value of Levered Firm ($V_L$) = $V_u$ + (Debt× Nil)

= ₹ 1,00,00,000 + (54,00,000 × nil)

= ₹1,00,00,000

**Computation of Equity Capitalization Rate and Weighted Average Cost of Capital (WACC)**

| | Particulars | A Ltd. | B Ltd. |
|---|---|---|---|
| A. | Net Operating Income (NOI) | ₹ 18,00,000 | ₹ 18,00,000 |
| B. | Less: Interest on Debt (I) | ₹ 6,48,000 | - |
| C. | Earnings of Equity Shareholders (NI) | ₹ 11,52,000 | ₹ 18,00,000 |
| D | Overall Capitalization Rate ($k_o$) | 0.18 | 0.18 |
| E | Total Value of Firm (V = NOI/$k_o$) | ₹ 1,00,00,000 | ₹ 1,00,00,000 |
| F | Less: Market Value of Debt | ₹ 54,00,000 | - |
| G | Market Value of Equity (S) | ₹ 46,00,000 | ₹ 1,00,00,000 |
| H | Equity Capitalization Rate [$k_e$ = NI /S] | 0.2504 | 0.18 |
| I | Weighted Average Cost of Capital [WACC ($k_o$)]*$k_o$ = ($k_e$×S/V) + ($k_d$×D/V) | 0.18 | 0.18 |

*Computation of WACC A Ltd

| Component of Capital | Amount | Weight | Cost of Capital | WACC |
|---|---|---|---|---|
| Equity | ₹ 46,00,000 | 0.46 | 0.2504 | 0.1152 |
| Debt | ₹ 54,00,000 | 0.54 | 0.12* | 0.0648 |
| Total | ₹ 1,00,00,000 | | | 0.18 |

*$K_d$ = 12% (since there is no tax)

WACC = 18%

**(b)** Assuming 40% taxes as per MM Approach

Calculation of Value of Firms 'A Ltd.' and 'B Ltd' according to MM Hypothesis

Market Value of 'B Ltd' [Unlevered(u)]

Total Value of unlevered Firm ($V_u$) = [NOI (1 - t)/ke] = 18,00,000 (1 – 0.40)] / 0.18

= ₹60,00,000

$K_e$ of unlevered Firm (given) = 0.18

$K_o$ of unlevered Firm (Same as above = $k_e$ as there is no debt) = 0.18

**Market Value of 'A Ltd' [Levered Firm (I)]**

Total Value of Levered Firm ($V_L$) = $V_u$ + (Debt× Tax)

= ₹ 60,00,000 + (₹ 54,00,000 × 0.4)

= ₹ 81,60,000

**Computation of Weighted Average Cost of Capital (WACC) of 'B Ltd.'**

= 18% (i.e. $K_e$ = $K_o$)

**Computation of Equity Capitalization Rate and Weighted Average Cost of Capital (WACC) of A Ltd**

| Particulars | A Ltd. (₹) |
|---|---|
| Net Operating Income (NOI) | 18,00,000 |
| Less: Interest on Debt (I) | 6,48,000 |
| Earnings Before Tax (EBT) | 11,52,000 |
| Less: Tax @ 40% | 4,60,800 |
| Earnings for equity shareholders (NI) | 6,91,200 |
| Total Value of Firm (V) as calculated above | 81,60,000 |
| Less: Market Value of Debt | 54,00,000 |
| Market Value of Equity (S) | 27,60,000 |
| Equity Capitalization Rate [$k_e$ = NI/S] | 0.2504 |
| Weighted Average Cost of Capital ($k_o$)* $k_o = (k_e \times S/V) + (k_d \times D/V)$ | 13.23 |

*Computation of WACC A Ltd

| Component of Capital | ₹ | Weight | Cost of Capital | WACC |
|---|---|---|---|---|
| Equity | 27,60,000 | 0.338 | 0.2504 | 0.0846 |
| Debt | 54,00,000 | 0.662 | 0.072* | 0.0477 |
| Total | 81,60,000 | | | 0.1323 |

*$K_d$= 12% (1- 0.4) = 12% × 0.6 = 7.2%

WACC = 13.23%

**SOLUTION**

The amount of interest will go on declining as the outstanding amount of bond will be reducing due to amortisation. The amount of interest for five years will be:

First year: ₹5,000 × 0.08 = ₹ 400;

Second year: (₹5,000 – ₹1,000) × 0.08 = ₹ 320;

Third year: (₹4,000 – ₹1,000) × 0.08 = ₹ 240;

Fourth year: (₹3,000 – ₹1,000) × 0.08 = ₹ 160; and

Fifth year: (₹2,000 – ₹1,000) × 0.08 = ₹ 80

The outstanding amount of bond will be zero at the end of fifth year.

Since RBML will have to return ₹1,000 every year, the outflows every year will consist of interest payment and repayment of principal as follows:

First year: ₹1,000 + ₹ 400 = ₹1,400;

Second year: ₹1,000 + ₹ 320 = ₹1,320;

Third year: ₹1,000 + ₹ 240 = ₹1,240;



Fourth year: ₹1,000 + ₹ 160 = ₹1,160; and

Fifth year: ₹1,000 + ₹80 = ₹ 1,080

The above cash flows of all five years will be discounted with the cost of capital. Here, cost of capital will be the minimum expected rate of return i.e. 6%.

Value of the bond is calculated as follows:

$$V_B = \frac{₹1,400}{(1.06)^1} + \frac{₹1,320}{(1.06)^2} + \frac{₹1,240}{(1.06)^3} + \frac{₹1,160}{(1.06)^4} + \frac{₹1,080}{(1.06)^5}$$

$$= \frac{₹1,400}{1.06} + \frac{₹1,320}{1.1236} + \frac{₹1,240}{1.1910} + \frac{₹1,160}{1.2624} + \frac{₹1,080}{1.3382}$$

= ₹1,320.75 + ₹1,174.80 + ₹1,041.14 + ₹918.88 + ₹807.05 = ₹ 5,262.62

**SOLUTION**

**(i) Cost of Equity ($K_e$)**

$$= \frac{D_1}{P_0 - F} + g = \frac{₹1}{₹24 - ₹4} + 0.05 = 0.1 \text{ or } 10\%$$

**(ii) Cost of Debt ($K_d$)**

Current market price ($P_0$) – floatation cost

$$= I(1-t) \times PVAF(r,10) + RV \times PVIF(r,10)$$

₹105 – 4% of ₹105 = ₹10 (1-0.3) × PVAF (r,10) + ₹100 × PVIF (r,10)

Calculation of NPV at discount rate of 5% and 7%

| Year | Cash flows (₹) | Discount factor @ 5% | Present Value (₹) | Discount factor @ 7% | Present Value (₹) |
|---|---|---|---|---|---|
| 0 | 100.8 | 1.000 | (100.8) | 1.000 | (100.8) |
| 1 to 10 | 7 | 7.722 | 54.05 | 7.024 | 49.17 |
| 10 | 100 | 0.614 | 61.40 | 0.508 | 50.80 |
| NPV | | | +14.65 | | -0.83 |

**Calculation of IRR**

$$IRR = 5\% + \frac{14.65}{14.65 - (-0.83)}(7\% - 5\%) = 5\% + \frac{14.65}{15.48}(7\% - 5\%) = 6.89\%$$

Cost of Debt ($K_d$) = 6.89%

**(iii) Cost of Preference shares ($K_p$)**

Current market price ($P_0$) – floatation cost = PD × PVAF (r,10) + RV × PVIF (r,10)

₹110 – 2% of ₹110 = ₹5×PVAF (r,10) + ₹100×PVIF (r,10)

Calculation of NPV at discount rate of 3% and 5%

| Year | Cash flows (₹) | Discount factor @ 3% | Present Value (₹) | Discount factor @ 5% | Present Value (₹) |
|---|---|---|---|---|---|
| 0 | 107.8 | 1.000 | (107.8) | 1.000 | (107.8) |
| 1 to 10 | 5 | 8.530 | 42.65 | 7.722 | 38.61 |
| 10 | 100 | 0.744 | 74.40 | 0.614 | 61.40 |
| NPV | | | +9.25 | | -7.79 |

**Calculation of IRR**

$$IRR = 3\% + \frac{9.25}{9.25 - (-7.79)}(5\% - 3\%) = 3\% + \frac{9.25}{17.04}(5\% - 3\%) = 4.08\%$$

Cost of Preference Shares ($K_p$) = 4.08%

**(a) Calculation of WACC using book value weights**

| Source of capital | Book Value | Weights | After tax cost of capital | WACC ($K_o$) |
|---|---|---|---|---|
| | (₹) | (a) | (b) | (c) = (a)×(b) |
| 10% Debentures | 5,00,000 | 0.25 | 0.0689 | 0.01723 |
| 5% Preference shares | 5,00,000 | 0.25 | 0.0408 | 0.0102 |
| Equity shares | 10,00,000 | 0.50 | 0.10 | 0.05000 |
| | 20,00,000 | 1.00 | | 0.07743 |

WACC ($K_o$) = 0.07743 or 7.74%

**(b) Calculation of WACC using market value weights**

| Source of capital | Market Value | Weights | After tax cost of capital | WACC ($K_o$) |
|---|---|---|---|---|
| | (₹) | (a) | (b) | (c) = (a)×(b) |
| 10% Debentures (₹105× 5,000) | 5,25,000 | 0.151 | 0.0689 | 0.0104 |
| 5% Preference shares (₹110× 5,000) | 5,50,000 | 0.158 | 0.0408 | 0.0064 |
| Equity shares (₹24× 1,00,000) | 24,00,000 | 0.691 | 0.10 | 0.0691 |
| | 34,75,000 | 1.000 | | 0.0859 |

WACC ($K_o$) = 0.0859 or 8.59%

**4. (a)** Pattern for raising the additional finance:

Equity 70% of ₹ 10,00,000 = ₹ 7,00,000

Debt 30% of ₹ 10,00,000 = ₹ 3,00,000

The capital structure after raising additional finance:

| | | (₹) |
|---|---|---|
| **Shareholders' funds** | | |
| Equity Capital | (₹7,00,000–₹2,10,000) | 4,90,000 |
| Retained earnings | | 2,10,000 |
| Debt (Interest at 10% p.a.) | | 1,80,000 |
| (Interest at 16% p.a.) | (₹3,00,000–₹1,80,000) | 1,20,000 |
| Total Funds | | 10,00,000 |

**(b)** Determination of post-tax average cost of additional debt:

$K_d = I (1 - t)$

Where,

I = Interest Rate

t = Corporate tax-rate

On ₹ 1,80,000 =10% (1 – 0.5)=5% or 0.05

On ₹ 1,20,000 =16% (1 – 0.5)=8% or 0.08

Average Cost of Debt

$$= \frac{(₹\,1,80,000 \times 0.05) + (₹\,1,20,000 \times 0.08)}{₹\,3,00,000} \times 100 = 6.2\%$$

**(c)** Determination of cost of retained earnings and cost of equity by applying Dividend growth model:

$$K_e \text{ or } K_r = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g$$

Where,

$D_0$ = Dividend paid = 50% of EPS = 50% × ₹ 4 = ₹ 2

g = Growth rate =10%

$P_0$ = Current market price per share = ₹44

$$\text{So, } K_e \text{ or } K_r = \frac{₹\ 2\,(1+0.10)}{₹\ 44} + 0.10 = \frac{₹\ 2.2}{₹\ 44} + 0.10 = 0.05 + 0.10 = 0.15 \text{ or } 15\%$$

**(d)** Computation of overall weighted average after tax cost of additional finance:

| **Particulars** | **Amount (₹)** | **Weights** | **Cost of funds** | **Weighted Cost (%)** |
|---|---|---|---|---|
| Equity (including retained earnings) | 7,00,000 | 0.70 | 15% | 10.5 |
| Debt | 3,00,000 | 0.30 | 6.2% | 1.86 |
| WACC | 10,00,000 | | | **12.36** |

**5.** (i) Cost of Equity $(K_e) = \frac{D_1}{P_0 - F} + g = \frac{₹15}{₹125 - ₹5} + 0.06^*$

$K_e = 0.125 + 0.06 = 0.185$

*Calculation of g:

$₹ 10.6(1+g)^5 = ₹ 14.19$

Or, $(1+g)^5 = \frac{14.19}{10.6} = 1.338$

Table (FVIF) suggests that ₹1 compounds to ₹1.338 in 5 years at the compound rate of 6 percent. Therefore, g is 6 per cent.

(ii) Cost of Retained Earnings $(K_r) = \frac{D_1}{P_0} + g = \frac{₹15}{₹125} + 0.06 = 0.18$

(iii) Cost of Preference Shares $(K_p) = \frac{PD}{P_0} = \frac{₹15}{₹105} = 0.1429$

(iv) Cost of Debentures $(K_d) = \frac{I(1-t) + \left(\frac{RV - NP}{n}\right)}{\frac{RV + NP}{2}}$

$$= \frac{₹15(1-0.35) + \left(\frac{₹100 - ₹91.75^*}{11 \text{years}}\right)}{\frac{₹100 + ₹91.75^*}{2}}$$

$$= \frac{₹15 \times 0.65 + ₹0.75}{₹95.875} = \frac{₹10.5}{₹95.875} = 0.1095$$

*Since yield on similar type of debentures is 16 per cent, the company would be required to offer debentures at discount.

Market price of debentures (approximation method)

= ₹ 15 ÷ 0.16 = ₹ 93.75

Sale proceeds from debentures = ₹93.75 – ₹ 2 (i.e., floatation cost) = ₹91.75

Market value ($P_0$) of debentures can also be found out using the present value method:

$P_0$ = Annual Interest × PVIFA (16%, 11 years) + Redemption value × PVIF (16%, 11 years)

$P_0$ = ₹15 × 5.029 + ₹100 × 0.195

$P_0$ = ₹75.435 + ₹19.5 = ₹ 94.935

Net Proceeds = ₹94.935 – 2% of ₹100 = ₹ 92.935

Accordingly, the cost of debt can be calculated

**Total Cost of capital [BV weights and MV weights]**

**(Amount in (₹) lakh)**

| Source of capital | Weights | | Specific Cost (K) | Total cost | |
|---|---|---|---|---|---|
| | BV | MV | | (BV × K) | (MV × K) |
| Equity Shares | 120 | 160* | 0.1850 | 22.2 | 29.6 |
| Retained Earnings | 30 | 40* | 0.1800 | 5.4 | 7.2 |
| Preference Shares | 36 | 33.75 | 0.1429 | 5.14 | 4.82 |
| Debentures | 9 | 10.4 | 0.1095 | 0.986 | 1.139 |
| Total | 195 | 244.15 | | 33.73 | 42.76 |

*Market Value of equity has been apportioned in the ratio of Book Value of equity and retained earnings i.e., 120:30 or 4:1.

**Weighted Average Cost of Capital (WACC):**

Using Book Value = $\frac{₹\,33.73}{₹\,195}$ = 0.1729 or 17.29%

Using Market Value = $\frac{₹\,42.76}{₹\,244.15}$ = 0.1751 or 17.51%

**6. Workings:**

(a) **Value of Debt** = $\frac{\text{Interest}}{\text{Cost of debt } (K_d)}$

= $\frac{₹\,7,50,000}{0.08}$ = ₹ 93,75,000

(b) **Value of equity capital** $= \frac{\text{Operating profit} - \text{Interest}}{\text{Cost of equity } (K_e)}$

$$= \frac{₹\ 34,50,000 - ₹\ 7,50,000}{0.16}$$

$$= ₹\ 1,68,75,000$$

(c) **New Cost of equity ($K_e$) after proposal**

$$= \frac{\text{Increased Operating profit} - \text{Interest on Increased debt}}{\text{Equity capital}}$$

$$= \frac{(₹\ 34,50,000 + ₹\ 14,25,000) - (₹\ 7,50,000 + ₹\ 6,00,000)}{₹\ 1,68,75,000}$$

$$= \frac{₹\ 48,75,000 - ₹\ 13,50,000}{₹\ 1,68,75,000}$$

$$= \frac{₹\ 35,25,000}{₹\ 1,68,75,000}$$

$$= 0.209 \text{ or } 20.9\%$$

**(i) Calculation of Weighted Average Cost of Capital (WACC) before the new proposal**

| Sources | (₹) | Weight | Cost of Capital | WACC |
|---|---|---|---|---|
| Equity | 1,68,75,000 | 0.6429 | 0.160 | 0.1029 |
| Debt | 93,75,000 | 0.3571 | 0.080 | 0.0286 |
| **Total** | **2,62,50,000** | **1** | | **0.1315 or 13.15 %** |

**(ii) Calculation of Weighted Average Cost of Capital (WACC) after the new proposal**

| Sources | (₹) | Weight | Cost of Capital | WACC |
|---|---|---|---|---|
| Equity | 1,68,75,000 | 0.5000 | 0.209 | 0.1045 |
| Debt | 1,68,75,000 | 0.5000 | 0.080 | 0.0400 |
| **Total** | **3,37,50,000** | **1** | | **0.1445 or 14.45 %** |

# RATIO ANALYSIS

**SOLUTION**

**Workings:**

(i) $$\frac{\text{Fixed Assets}}{\text{Total Current Assets}} = \frac{5}{7}$$

Or, Total Current Assets = $\frac{₹40,00,000 \times 7}{5}$ = ₹ 56,00,000

(ii) $$\frac{\text{Fixed Assets}}{\text{Capital}} = \frac{5}{4}$$

Or, Capital = $\frac{₹40,00,000 \times 4}{5}$ = ₹ 32,00,000





(iii) $$\frac{\text{Capital}}{\text{Total Liabilities*}} = \frac{1}{2}$$

Or, Total liabilities = ₹ 32,00,000 × 2 = ₹ 64,00,000

*It is assumed that total liabilities do not include capital.

(iv) $$\frac{\text{Net Profit}}{\text{Capital}} = \frac{1}{5}$$

Or, Net Profit = ₹ 32,00,000 × 1/5 = ₹ 6,40,000

(v) $$\frac{\text{Net Profit}}{\text{Sales}} = \frac{1}{5}$$

Or, Sales = ₹ 6,40,000 × 5 = ₹ 32,00,000

(vi) Gross Profit = 25% of ₹ 32,00,000 = ₹ 8,00,000

(vii) Stock Turnover = $\frac{\text{Cost of Goods Sold (i.e. Sales - Gross profit)}}{\text{Average Stock}} = 10$

$$= \frac{₹ 32,00,000 - ₹ 8,00,000}{\text{Average Stock}} = 10$$

Or, Average Stock = ₹ 2,40,000

Or, $\frac{\text{Opening Stock} + ₹ 4,00,000}{2}$ = ₹ 2,40,000

**Trading Account**

| Particulars | (₹) | Particulars | (₹) |
|---|---|---|---|
| To Opening Stock | 80,000 | By Sales | 32,00,000 |
| To Manufacturing exp./ Purchase (Balancing figure) | 27,20,000 | | |
| To Gross Profit b/d | 8,00,000 | By Closing Stock | 4,00,000 |
| | 36,00,000 | | 36,00,000 |





**Profit and Loss Account**

| Particulars | (₹) | Particulars | (₹) |
|---|---|---|---|
| To Operating Expenses (Balancing figure) | 1,60,000 | By Gross Profit c/d | 8,00,000 |
| To Net Profit | 6,40,000 | | |
| | 8,00,000 | | 8,00,000 |

**Balance Sheet**

| Capital and Liabilities | (₹) | Assets | (₹) |
|---|---|---|---|
| Capital | 32,00,000 | Fixed Assets | 40,00,000 |
| Liabilities | 64,00,000 | Current Assets: | |
| | | Closing Stock | 4,00,000 |
| | | Other Current Assets (Bal. figure) | 52,00,000 |
| | 96,00,000 | | 96,00,000 |

**SOLUTION**

| Ratios | 2020-21 | 2021-22 | 2022-23 |
|---|---|---|---|
| Current ratio (Current Assets / Current Liabilities) | 1.19 $\left(\frac{₹\ 6,30,000}{₹5,30,000}\right)$ | 1.25 $\left(\frac{₹7,60,000}{₹6,10,000}\right)$ | 1.20 $\left(\frac{₹8,95,000}{₹7,45,000}\right)$ |
| Acid-test ratio (Quick Assets / Current Liabilities) | 0.43 $\left(\frac{₹2,30,000}{₹5,30,000}\right)$ | 0.46 $\left(\frac{₹2,80,000}{₹6,10,000}\right)$ | 0.40 $\left(\frac{₹2,95,000}{₹7,45,000}\right)$ |
| Receivables turnover ratio (Sales/ Average Receivables) (Refer Working Notes) | 20 $\left(\frac{₹40,00,000}{₹2,00,000}\right)$ | 18.70 $\left(\frac{₹43,00,000}{₹2,30,000}\right)$ | 13.82 $\left(\frac{₹38,00,000}{₹2,75,000}\right)$ |
| Average collection period (365 / Receivables turnover ratio) | 18.25 (365/20) | 19.52 (365/18.70) | 26.41 (365/13.82) |
| Inventory turnover ratio (COGS / Average Inventory) (Refer Working Notes) | 8 $\left(\frac{₹\ 32,00,000}{₹\ 4,00,000}\right)$ | 8.18 $\left(\frac{₹\ 36,00,000}{₹\ 4,40,000}\right)$ | 6.11 $\left(\frac{₹\ 33,00,000}{₹\ 5,40,000}\right)$ |
| Total debt to net worth (Short term + Long term Debt) / (Common stock + Retained earnings) | 1.38 $\left(\frac{₹\ 8,30,000}{₹\ 6,00,000}\right)$ | 1.40 $\left(\frac{₹\ 9,10,000}{₹\ 6,50,000}\right)$ | 1.61 $\left(\frac{₹\ 10,45,000}{₹\ 6,50,000}\right)$ |
| Long-term debt to total capitalization | 0.33 $\left(\frac{₹3,00,000}{₹9,00,000}\right)$ | 0.32 $\left(\frac{₹3,00,000}{₹9,50,000}\right)$ | 0.32 $\left(\frac{₹3,00,000}{₹9,50,000}\right)$ |
| Gross profit margin (Gross Profit / Sales) {Gross profit = Sales – Cost of Goods sold} | 0.20 $\left(\frac{₹8,00,000}{₹40,00,000}\right)$ | 0.16 $\left(\frac{₹7,00,000}{₹43,00,000}\right)$ | 0.13 $\left(\frac{₹5,00,000}{₹38,00,000}\right)$ |
| Net profit margin (Net Profit / Sales) | 0.075 $\left(\frac{₹3,00,000}{₹40,00,000}\right)$ | 0.047 $\left(\frac{₹2,00,000}{₹43,00,000}\right)$ | 0.026 $\left(\frac{₹1,00,000}{₹38,00,000}\right)$ |
| Total Asset turnover (Sales / Total Assets) | 2.80 $\left(\frac{₹40,00,000}{₹14,30,000}\right)$ | 2.76 $\left(\frac{₹43,00,000}{₹15,60,000}\right)$ | 2.24 $\left(\frac{₹38,00,000}{₹16,95,000}\right)$ |

| | | | |
|---|---|---|---|
| Return on assets (Net profit/ Total Assets) | 0.21 $\left(\frac{₹3,00,000}{₹14,30,000}\right)$ | 0.13 $\left(\frac{₹2,00,000}{₹15,60,000}\right)$ | 0.06 $\left(\frac{₹1,00,000}{₹16,95,000}\right)$ |
| **Working Notes** | | | |
| Average receivables {(Opening + closing)/2} | (₹ 2,00,000 + ₹ 2,00,000)/2 = ₹ 2,00,000 | (₹ 2,00,000 + ₹ 2,60,000)/2 = ₹ 2,30,000 | (₹ 2,60,000 + ₹ 2,90,000)/2 = ₹ 2,75,000 |
| Average Inventory {(Opening + closing)/2} | (₹ 4,00,000 + ₹ 4,00,000)/2 = ₹ 4,00,000 | (₹ 4,00,000 + ₹ 4,80,000)/2 = ₹ 4,40,000 | (₹ 4,80,000 + ₹ 6,00,000)/2 = ₹ 5,40,000 |

**Analysis:** The current ratio and quick ratio are less than the ideal ratio (2:1 and 1:1 respectively) indicating that the company is not having enough resources to meet its current obligations.

Receivables are growing slower, although the average collection period is still very reasonable relative to the terms given. Inventory turnover is slowing as well, indicating a relative build-up in inventories. The increase in receivables and inventories, coupled with the fact that net worth has increased very little, has resulted in the total debt-to-net worth ratio increasing to what would have to be regarded on an absolute basis as a high level.

Long-term debt to total capitalization has not changed relatively coupled with the fact that retained earnings of only ₹ 50,000 is made in year 2019-20, and there is no issuance of new long-term debt in year 2019-20 and 2020-21.

Both the gross profit and net profit margins have declined substantially. The relationship between the two suggests that the company has incurred more relative expenses. The build-up in inventories and receivables has resulted in a decline in the asset turnover ratio, and this, coupled with the decline in profitability, has resulted in a sharp decrease in the return on assets ratio.

**7. Workings Notes:**

(i) **Computation of Current Assets & Current Liabilities & Total Assets**

Net Working Capital = Current Assets – Current Liabilities

= 2.5 – 1 = 1.5

Thus, Current Assets $= \frac{\text{Net Working Capital} \times 2.5}{1.5}$

$= \frac{₹\,13,50,000 \times 25}{1.5} = ₹\,22,50,000$

Current Liabilities (CL) = ₹ 22,50,000 – ₹ 13,50,000 = ₹ 9,00,000

Total Assets = Current Assets + Fixed Assets

= ₹ 22,50,000 + ₹ 30,00,000 = ₹ 52,50,000

(ii) **Computation of Sales & Cost of Goods Sold**

Sales = Total Assets Turnover × Total Assets

= 2 x (Fixed Assets + Current Assets)

= 2 × (₹ 30,00,000 + ₹ 22,50,000)

= ₹ 1,05,00,000

Cost of Goods Sold = (100% – 20%) of Sales = 80% of Sales

= 80% × ₹ 1,05,00,000 = ₹ 84,00,000

(iii) **Computation of Stock & Quick Assets**

Average Stock $= \frac{\text{Cost of Good Sold}}{\text{Stock Turnover Ratio}} = \frac{₹\,84,00,000}{7}$

= ₹ 12,00,000

Closing Stock = (Average Stock × 2) – Opening Stock

= (₹ 12,00,000 × 2) – ₹ 11,40,000

= ₹ 12,60,000

Quick Assets = Current Assets – Closing Stock

= ₹ 22,50,000 – ₹ 12,60,000 = ₹ 9,90,000

(iv) **Computation of Proprietary Fund**

Debt-Equity Ratio $= \frac{\text{Debt}}{\text{Equity}} = \frac{1}{1.5}$

Or, Equity = 1.5 Debt

Total Assets = Equity + Preference capital + Debt + CL

₹ 52,50,000 = 1.5 Debt+ ₹ 6,00,000 + Debt + ₹ 9,00,000

Thus, Debt $= \frac{₹\ 37,50,000}{2.5} = ₹\ 15,00,000$

Equity = ₹ 15,00,000 × 1.5

= ₹ 22,50,000

So, Proprietary Fund = Equity + Preference Capital

= ₹ 22,50,000 + ₹ 6,00,000

= ₹ 28,50,000

(v) **Computation of Profit after tax (PAT)**

= Total Assets × Return on Total Assets

= ₹ 52,50,000 × 15%

= ₹ 7,87,500

**(a) Quick Ratio**

$$\text{Quick Ratio} = \frac{\text{Quick Assets}}{\text{Current Liabilities}} = \frac{₹\ 9,90,000}{₹\ 9,00,000} = 1.1$$

**(b) Fixed Assets Turnover Ratio**

$$\text{Fixed Assets Turnover Ratio} = \frac{\text{Sales}}{\text{Fixed Assets}} = \frac{₹\ 1,05,00,000}{₹\ 30,00,000} = 3.5$$

**(c) Proprietary Ratio**

$$\text{Proprietary Ratio} = \frac{\text{Proprietary fund}}{\text{Total Assets}} = \frac{₹\ 28,50,000}{₹\ 52,50,000} = 0.54$$

**(d) Earnings per Equity Share (EPS)**

$$\text{Earnings per Equity Share} = \frac{\text{PAT - Preference Share Dividend}}{\text{Number of Equity Shares}}$$

$$= \frac{₹\ 7,87,500 - ₹\ 54,000\ (9\%\ \text{of}\ ₹\ 6,00,000)}{1,80,000}$$

= ₹ 4.075 per share

**9. (i) Determination of Sales and Cost of goods sold:**

$$\text{Gross Profit Ratio} = \frac{\text{Gross Profit}}{\text{Sales}} \times 100$$

$$\text{Or, } \frac{25}{100} = \frac{₹\,4,00,000}{\text{Sales}}$$

$$\text{Or, Sales} = \frac{4,00,00,000}{25} = ₹\ 16,00,000$$

Cost of Goods Sold = Sales – Gross Profit

= ₹ 16,00,000 - ₹ 4,00,000 = ₹ 12,00,000

**(ii) Determination of Sundry Debtors:**

Debtors' velocity is 3 months or Debtors' collection period is 3 months,

$$\text{So, Debtors' turnover ratio} = \frac{12 \text{ months}}{3 \text{ months}} = 4$$

$$\text{Debtors' turnover ratio} = \frac{\text{Credit Sales}}{\text{Average Accounts Receivable}}$$

$$= \frac{₹\,16,00,000}{\text{Bills Receivable} + \text{Sundry Debtors}} = 4$$

Or, Sundry Debtors + Bills receivable = ₹ 4,00,000

Sundry Debtors = ₹ 4,00,000 – ₹ 25,000 = ₹ 3,75,000

**(iii) Determination of Sundry Creditors:**

Creditors' velocity of 2 months or credit payment period is 2 months.

$$\text{So, Creditors' turnover ratio} = \frac{12 \text{ months}}{2 \text{ months}} = 6$$

$$\text{Creditors turnover ratio} = \frac{\text{Credit Purchases}^*}{\text{Average Accounts Payables}}$$

$$= \frac{₹\ 12,10,000}{\text{Sundry Creditors} + \text{Bills Payables}} = 6$$

So, Sundry Creditors + Bills Payable = ₹ 2,01,667

Or, Sundry Creditors + ₹ 10,000 = ₹ 2,01,667

Or, Sundry Creditors = ₹ 2,01,667 – ₹ 10,000 = ₹ 1,91,667

**(iv) Determination of Closing Stock**

$$\text{Stock Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Stock}} = \frac{₹12,00,000}{\text{Average Stock}} = 1.5$$

So, Average Stock = ₹ 8,00,000

$$\text{Now Average Stock} = \frac{\text{Opening Stock} + \text{Closing Stock}}{2}$$

$$\text{Or } \frac{\text{Opening Stock} + (\text{Opening Stock} + ₹10,000)}{2} = ₹\ 8,00,000$$

Or, Opening Stock = ₹ 7,95,000

So, Closing Stock = ₹ 7,95,000 + ₹ 10,000 = ₹ 8,05,000

**(v) Determination of Fixed Assets**

$$\text{Fixed Assets Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Fixed Assets}} = 4$$

$$\text{Or,} \qquad = \frac{₹12,00,000}{\text{Fixed Assets}} = 4$$

Or, Fixed Asset = ₹ 3,00,000

**Workings:**

***Calculation of Credit purchases:**

Cost of goods sold = Opening stock + Purchases – Closing stock

₹ 12,00,000 = ₹ 7,95,000 + Purchases – ₹ 8,05,000

₹ 12,00,000 + ₹ 10,000 = Purchases

₹ 12,10,000 = Purchases (credit)

**Assumption:**

(i) All sales are credit sales

(ii) All purchases are credit purchase

(iii) Stock Turnover Ratio and Fixed Asset Turnover Ratio may be calculated either on Sales or on Cost of Goods Sold.

**SOLUTION**

**(i) Calculation of Pay-back Period**

| | |
|---|---|
| Cash Outlay of the Project | = ₹ 80,00,000 |
| Total Cash Inflow for the first five years | = ₹ 70,00,000 |
| Balance of cash outlay left to be paid back in the 6th year | = ₹ 10,00,000 |
| Cash inflow for 6th year | = ₹ 16,00,000 |

So, the payback period is between 5th and 6th years, i.e.,

$$5 \text{ years} + \frac{₹10,00,000}{₹16,00,000} = 5.625 \text{ years or } 5 \text{ years } 7.5 \text{ months}$$

**(ii) Calculation of Net Present Value (NPV) @10% discount rate:**

| Year | Net Cash Inflow (₹) | Present Value at Discount Rate of 10% | Present Value (₹) |
|---|---|---|---|
| | (a) | (b) | (c) = (a)× (b) |
| 1 | 14,00,000 | 0.909 | 12,72,600 |
| 2 | 14,00,000 | 0.826 | 11,56,400 |
| 3 | 14,00,000 | 0.751 | 10,51,400 |
| 4 | 14,00,000 | 0.683 | 9,56,200 |
| 5 | 14,00,000 | 0.621 | 8,69,400 |
| 6 | 16,00,000 | 0.564 | 9,02,400 |
| 7 | 20,00,000 | 0.513 | 10,26,000 |
| 8 | 30,00,000 | 0.467 | 14,01,000 |
| 9 | 20,00,000 | 0.424 | 8,48,000 |
| 10 | 8,00,000 | 0.386 | 3,08,800 |
| | | | 97,92,200 |

Net Present Value (NPV) = Cash Outflow – Present Value of Cash Inflows

= ₹ 80,00,000 – ₹ 97,92,200 = 17,92,200

**(iii) Calculation of Profitability Index @ 10% discount rate:**

$$\text{Profitability Index} = \frac{\text{Present Value of Cash inflows}}{\text{Cost of the investment}}$$

$$= \frac{₹97,92,200}{₹\ 80,00,000} = 1.224$$

**(iv) Calculation of Internal Rate of Return:**

Net present value @ 10% interest rate factor has already been calculated in (ii) above, we will calculate Net present value @15% rate factor.

| Year | Net Cash Inflow (₹) | Present Value at Discount Rate of 15% | Present Value (₹) |
|---|---|---|---|
| | (a) | (b) | (c) = (a)× (b) |
| 1 | 14,00,000 | 0.870 | 12,18,000 |
| 2 | 14,00,000 | 0.756 | 10,58,400 |
| 3 | 14,00,000 | 0.658 | 9,21,200 |
| 4 | 14,00,000 | 0.572 | 8,00,800 |
| 5 | 14,00,000 | 0.497 | 6,95,800 |
| 6 | 16,00,000 | 0.432 | 6,91,200 |
| 7 | 20,00,000 | 0.376 | 7,52,000 |
| 8 | 30,00,000 | 0.327 | 9,81,000 |
| 9 | 20,00,000 | 0.284 | 5,68,000 |
| 10 | 8,00,000 | 0.247 | 1,97,600 |
| | | | 78,84,000 |

Net Present Value at 15% = ₹ 78,84,000 – ₹ 80,00,000 = ₹ -1,16,000

As the net present value @ 15% discount rate is negative, hence internal rate of return falls in between 10% and 15%. The correct internal rate of return can be calculated as follows:

$$IRR = L + \frac{NPV_L}{NPV_L - NPV_H}(H - L)$$

$$= 10\% + \frac{₹17,92,200}{₹17,92,200 - (-₹\ 1,16,000)}(15\% - 10\%)$$

$$= 10\% + \frac{₹\ 17,92,200}{₹19,08,200} \times 5\% = 14.7\%$$

**Workings:**

1. **Calculation of Base for depreciation or Cost of New Machine**

| Particulars | (₹) |
|---|---|
| Purchase price of new machine | 4,50,000 |
| Less: Sale price of old machine | 1,00,000 |
| | **3,50,000** |

2. **Calculation of Profit before tax as per books**

| Particulars | Old machine (₹) | New machine (₹) | Difference (₹) |
|---|---|---|---|
| PBT as per books | 3,24,750 | 3,87,250 | 62,500 |
| Add: Depreciation as per books | 24,000 | 41,500 | 17,500 |
| Profit before tax and depreciation (PBTD) | 3,48,750 | 4,28,750 | 80,000 |

**Calculation of Incremental NPV**

| Year | PVF @ 10% | PBTD (₹) | Dep. @ 7.5% (₹) | PBT (₹) | Tax @ 30% (₹) | Cash Inflows (₹) | PV of Cash Inflows (₹) |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) = (4) x 0.30 | (6) = (4) – (5) + (3) | (7) = (6) x (1) |
| 1 | 0.909 | 80,000.00 | 26,250.00 | 53,750.00 | 16,125.00 | 63,875.00 | 58,062.38 |
| 2 | 0.826 | 80,000.00 | 24,281.25 | 55,718.75 | 16,715.63 | 63,284.38 | 52,272.89 |
| 3 | 0.751 | 80,000.00 | 22,460.16 | 57,539.84 | 17,261.95 | 62,738.05 | 47,116.27 |
| 4 | 0.683 | 80,000.00 | 20,775.64 | 59,224.36 | 17,767.31 | 62,232.69 | 42,504.93 |
| 5 | 0.621 | 80,000.00 | 19,217.47 | 60,782.53 | 18,234.76 | 61,765.24 | 38,356.21 |
| 6 | 0.564 | 80,000.00 | 17,776.16 | 62,223.84 | 18,667.15 | 61,332.85 | 34,591.73 |
| 7 | 0.513 | 80,000.00 | 16,442.95 | 63,557.05 | 19,067.12 | 60,932.88 | 31,258.57 |
| 8 | 0.467 | 80,000.00 | 15,209.73 | 64,790.27 | 19,437.08 | 60,562.92 | 28,282.88 |
| 9 | 0.424 | 80,000.00 | 14,069.00 | 65,931.00 | 19,779.30 | 60,220.70 | 25,533.58 |
| 10 | 0.386 | 80,000.00 | 13,013.82 | 66,986.18 | 20,095.85 | 59,904.15 | 23,123.00 |
| | | | | | | | 3,81,102.44 |
| Add: PV of Salvage value of new machine (₹ 35,000 × 0.386) | | | | | | | 13,510.00 |
| Total PV of incremental cash inflows | | | | | | | 3,94,612.44 |
| Less: Cost of new machine | | | | | | | 3,50,000.00 |
| Incremental Net Present Value | | | | | | | 44,612.44 |

**Analysis:** Since the Incremental NPV is positive, the old machine should be replaced.

1. (i) **Cost of the Project**

At 12% internal rate of return (IRR), the sum of total cash inflows = cost of the project i.e initial cash outlay



Annual cash inflows = ₹ 1,00,000

Useful life = 4 years

Considering the discount factor table @ 12%, cumulative present value of cash inflows for 4 years is 3.038 (0.893 + 0.797 + 0.712 + 0.636).

Hence, Total Cash inflows for 4 years for the Project is:

₹ 1,00,000 × 3.038 = ₹ 3,03,800

Hence, Cost of the Project = ₹ 3,03,800

**(ii) Cost of Capital**

$$\text{Profitability index} = \frac{\text{Sum of Discounted Cash inflows}}{\text{Cost of the project}}$$

$$1.064 = \frac{\text{Sum of Discounted Cash inflows}}{₹\,3,03,800}$$

∴ Sum of Discounted Cash inflows = ₹ 3,23,243.20

Since, Annual Cash Inflows = ₹ 1,00,000

Hence, cumulative discount factor for 4 years $= \frac{₹\,3,23,243.20}{₹\,1,00,000} = 3.232$

From the discount factor table, at discount rate of 9%, the cumulative discount factor for 4 years is 3.239 (0.917 + 0.842 + 0.772 + 0.708).

Hence, Cost of Capital = 9% (approx.)

**(iii) Net Present Value (NPV)**

NPV = Sum of Present Values of Cash inflows – Cost of the Project

= ₹ 3,23,243.20 – ₹ 3,03,800 = ₹ 19,443.20₹

**(iv) Payback Period**

$$\text{Payback period} = \frac{\text{Cost of the Project}}{\text{Annual Cash Inflows}} = \frac{₹\,3,03,800}{₹\,1,00,000} = 3.038 \text{ years}$$

**5. Calculation of Net Cash flow**

Contribution = (3.00 – 1.75) × 50,000 = ₹ 62,500

Fixed costs = 40,000 – [(1,25,000 – 30,000)/5] = ₹ 21,000

| Year | Capital (₹) | Contribution (₹) | Fixed costs (₹) | Adverts (₹) | Net cash flow (₹) |
|---|---|---|---|---|---|
| 0 | (1,00,000) | - | - | - | (1,00,000) |
| 1 | (25,000) | 62,500 | (21,000) | (10,000) | 6,500 |
| 2 | - | 62,500 | (21,000) | (15,000) | 26,500 |



| | | | | | |
|---|---|---|---|---|---|
| 3 | - | 62,500 | (21,000) | - | 41,500 |
| 4 | - | 62,500 | (21,000) | - | 41,500 |
| 5 | 30,000 | 62,500 | (21,000) | - | 71,500 |

**Calculation of Net Present Value**

| Year | Net cash flow (₹) | 10% discount factor | Present value (₹) |
|---|---|---|---|
| 0 | (1,00,000) | 1.000 | (1,00,000) |
| 1 | 6,500 | 0.909 | 5,909 |
| 2 | 26,500 | 0.826 | 21,889 |
| 3 | 41,500 | 0.751 | 31,167 |
| 4 | 41,500 | 0.683 | 28,345 |
| 5 | 71,500 | 0.621 | 44,402 |
| | | NPV | 31,712 |

The net present value of the project is ₹ 31,712.

7. **Option I: Purchase Machinery and Service Part at the end of Year 1.**

Net Present value of cash flow @ 10% per annum discount rate.



$$\text{NPV (in ₹)} = -1,00,000 + \frac{36,000}{(1.1)} + \frac{36,000}{(1.1)^2} + \frac{36,000}{(1.1)^3} - \frac{20,000}{(1.1)} + \frac{25,000}{(1.1)^3}$$

$$= -1,00,000 + 36,000\,(0.9091 + 0.8264 + 0.7513) - (20,000 \times 0.9091) + (25,000 \times 0.7513)$$

$$= -1,00,000 + (36,000 \times 2.4868) - 18,182 + 18,782.5$$

$$= -1,00,000 + 89,524.8 - 18,182 + 18,782.5$$

$$\text{NPV} = -9,874.7$$

Since, Net Present Value is negative; therefore, this option is not to be considered.

**If Supplier gives a discount of ₹ 10,000, then:**

NPV (in ₹) = + 10,000 – 9,874.7 = + 125.3

In this case, Net Present Value is positive but very small; therefore, this option may not be advisable.

**Option II: Purchase Machinery and Replace Part at the end of Year 2.**

$$\text{NPV (in ₹)} = -1,00,000 + \frac{36,000}{(1.1)} + \frac{36,000}{(1.1)^2} + \frac{36,000}{(1.1)^3} - \frac{30,800}{(1.1)^2} + \frac{54,000}{(1.1)^4}$$

$$= -1,00,000 + 36,000\,(0.9091 + 0.8264 + 0.7513) - (30,800 \times 0.8264) + (54,000 \times 0.6830)$$

$$= -1,00,000 + 36,000\,(2.4868) - 25,453.12 + 36,882$$

$$= -1,00,000 + 89,524.8 - 25,453.12 + 36,882$$

$$\text{NPV} = +953.68$$

Net Present Value is positive, but very low as compared to the investment.

**If the Supplier gives a discount of ₹ 10,000, then:**

NPV (in ₹) = 10,000 + 953.68 = 10,953.68

**Decision:** Option II is worth investing as the net present value is positive and higher as compared to Option I.

**9. Workings:**

**(a) Calculation of annual cash flows** **(₹ in lakh)**

| Year | Sales | VC | FC | Dep. | Profit | Tax | PAT | Dep. | Cash inflow |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 172.80 | 103.68 | 36 | 43.75 | (10.63) | – | – | 43.75 | 33.12 |
| 2 | 259.20 | 155.52 | 36 | 43.75 | 23.93 | 3.99* | 19.94 | 43.75 | 63.69 |
| 3 | 624.00 | 374.40 | 36 | 43.75 | 169.85 | 50.955 | 118.895 | 43.75 | 162.645 |
| 4–5 | 648.00 | 388.80 | 36 | 48.25 | 174.95 | 52.485 | 122.465 | 48.25 | 170.715 |
| 6–8 | 432.00 | 259.20 | 36 | 48.25 | 88.55 | 26.565 | 61.985 | 48.25 | 110.235 |

**(b) Calculation of Depreciation:**

- On Initial equipment $= \frac{₹\,350\ \text{lakh}}{8\ \text{years}} = 43.75\ \text{lakh}$

- On additional equipment $= \frac{(₹\,25 - ₹\,2.5)\ \text{lakh}}{5\ \text{years}} = 4.5\ \text{lakh}$

**(c) *Calculation of tax in 2nd Year:**

| | ₹ in lakh |
|---|---|
| Profit for the year | 23.93 |
| Less: Set off of unabsorbed depreciation in 1st year | (10.63) |
| Taxable profit | 13.30 |
| **Tax @30%** | 3.99 |

**(d) Calculation of Initial cash outflow**

| | ₹ in lakh |
|---|---|
| Cost of New Equipment | 350 |
| *Add:* Working Capital | 40 |
| Outflow | 390 |

**Calculation of NPV** **(₹ in lakh)**

| Year | Cash flows | PV factor @12% | PV of cash-flows | Remark |
|---|---|---|---|---|
| 0 | (390) | 1.000 | (390.00) | Initial equipment cost |

| | | | | |
|---|---|---|---|---|
| 1 | 33.12 | 0.893 | 29.57 | |
| 2 | 63.69 | 0.797 | 50.76 | |
| 3 | 162.645 | 0.712 | 115.80 | |
| 3 | (25.00) | 0.712 | (17.80) | Additional equipment cost |
| 4 | 170.715 | 0.636 | 108.57 | |
| 5 | 170.715 | 0.567 | 96.79 | |
| 6 | 110.235 | 0.507 | 55.89 | |
| 7 | 110.235 | 0.452 | 49.83 | |
| 8 | 110.235 | 0.404 | 44.53 | |
| 8 | 40.00 | 0.404 | 16.16 | Release of working capital |
| 8 | 2.50 | 0.404 | 1.01 | Additional equipment salvage value |
| Net Present Value | | | 161.11 | |

**Advise:** Since the project has a positive NPV, therefore, it should be accepted.

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**11. (i) Calculation of Net Initial Cash Outflows:**

| | ₹ |
|---|---|
| Cost of new machine | 10,00,000 |
| Less: Sale proceeds of existing machine | 2,00,000 |
| Net initial cash outflows | 8,00,000 |

**(ii) Calculation of Base for depreciation**

| **Particulars** | | ₹ |
|---|---|---|
| **WDV of Existing Machine** | | |
| Cost of existing machine | | 3,30,000 |
| Less: Depreciation for year 1 | 66,000 | |
| Depreciation for Year 2 | 52,800 | |
| Depreciation for Year 3 | 42,240 | 1,61,040 |
| **WDV of Existing Machine (i)** | | **1,68,960** |
| **Depreciation base of New Machine** | | |
| Cost of new machine | | 10,00,000 |
| Add: WDV of existing machine | | 1,68,960 |
| Less: Sales value of existing machine | | 2,00,000 |
| **Depreciation base of New Machine (ii)** | | 9,68,960 |
| **Base for incremental depreciation [(ii) – (i)]** | | 8,00,000 |

**(iii) Calculation of annual Profit Before Tax and depreciation**

| Particulars | Existing machine | New Machine | Differential |
|---|---|---|---|
| (1) | (2) | (3) | (4)=(3)–(2) |
| Annual output | 30,000 units | 75,000 units | 45,000 units |
| | ₹ | ₹ | ₹ |
| (A) Sales revenue @ ₹ 15 per unit | 4,50,000 | 11,25,000 | 6,75,000 |
| (B) Less: Cost of Operation | | | |
| Material @ ₹ 4 per unit | 1,20,000 | 3,00,000 | 1,80,000 |
| Labour | | | |
| Old = 3,000 × ₹ 40 | 1,20,000 | | 90,000 |
| New = 3,000 × ₹ 70 | | 2,10,000 | |
| Indirect cash cost | 50,000 | 65,000 | 15,000 |
| Total Cost (B) | 2,90,000 | 5,75,000 | 2,85,000 |
| Profit Before Tax and depreciation (PBTD) (A – B) | 1,60,000 | 5,50,000 | 3,90,000 |

**(iv) Calculation of Incremental Net Present Value:**

| Year | PBTD | Dep. @ 20% | PBT | Tax @ 30% | Net cash flow | PVF @ 12% | PV |
|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4=2-3) | (5) | (6=4-5+3) | (7) | (8=6 x 7) |
| 1 | 3,90,000 | 1,60,000 | 2,30,000 | 69,000.00 | 3,21,000.00 | 0.893 | 2,86,653.00 |
| 2 | 3,90,000 | 1,28,000 | 2,62,000 | 78,600.00 | 3,11,400.00 | 0.797 | 2,48,185.80 |
| 3 | 3,90,000 | 1,02,400 | 2,87,600 | 86,280.00 | 3,03,720.00 | 0.712 | 2,16,248.64 |
| 4 | 3,90,000 | 81,920 | 3,08,080 | 92,424.00 | 2,97,576.00 | 0.636 | 1,89,258.34 |
| 5 | 3,90,000 | 65,536 | 3,24,464 | 97,339.20 | 2,92,660.80 | 0.567 | 1,65,938.67 |
| | | | | | | | 11,06,284.45 |
| Add: PV of Salvage Value of new machine (₹ 40,000 x 0.567) | | | | | | | 22,680.00 |
| Less: Initial Cash Outflow | | | | | | | 8,00,000.00 |
| NPV | | | | | | | 3,28,964.45 |

**Advice:** Since the incremental NPV is positive, existing machine should be replaced.

**Answer**

**(a) Working Notes:**

1. **Annual Depreciation of Machines**

$$\text{Depreciation of Machine 'MX'} = \frac{₹\ 8,00,000 - ₹\ 20,000}{6} = ₹\ 1,30,000$$

$$\text{Depreciation of Machine 'MY '} = \frac{₹\ 10,20,000 - ₹\ 30,000}{6} = ₹\ 1,65,000$$

1. **Calculation of Cash Inflows**

| Machine 'MX' | | | *Years* | | | |
|---|---|---|---|---|---|---|
| | *1* | *2* | *3* | *4* | *5* | *6* |
| Income before Depreciation & Tax | 2,50,000 | 2,30,000 | 1,80,000 | 2,00,000 | 1,80,000 | 1,60,000 |
| *Less:* Depreciation | 1,30,000 | 1,30,000 | 1,30,000 | 1,30,000 | 1,30,000 | 1,30,000 |
| Profit before Tax | 1,20,000 | 1,00,000 | 50,000 | 70,000 | 50,000 | 30,000 |
| *Less :* Tax @ 30% | 36,000 | 30,000 | 15,000 | 21,000 | 15,000 | 9,000 |
| Profit after Tax (PAT) | 84,000 | 70,000 | 35,000 | 49,000 | 35,000 | 21,000 |
| *Add:* Depreciation | 1,30,000 | 1,30,000 | 1,30,000 | 1,30,000 | 1,30,000 | 1,30,000 |
| Cash Inflows | 2,14,000 | 2,00,000 | 1,65,000 | 1,79,000 | 1,65,000 | 1,51,000 |

| Machine 'MY' | | | *Years* | | | |
|---|---|---|---|---|---|---|
| | *1* | *2* | *3* | *4* | *5* | *6* |
| Income before Depreciation & Tax | 2,70,000 | 3,60,000 | 3,80,000 | 2,80,000 | 2,60,000 | 1,85,000 |
| *Less:* Depreciation | 1,65,000 | 1,65,000 | 1,65,000 | 1,65,000 | 1,65,000 | 1,65,000 |
| Profit before Tax | 1,05,000 | 1,95,000 | 2,15,000 | 1,15,000 | 95,000 | 20,000 |
| *Less :* Tax @ 30% | 31,500 | 58,500 | 64,500 | 34,500 | 28,500 | 6,000 |
| Profit after Tax (PAT) | 73,500 | 1,36,500 | 1,50,500 | 80,500 | 66,500 | 14,000 |
| *Add:* Depreciation | 1,65,000 | 1,65,000 | 1,65,000 | 1,65,000 | 1,65,000 | 1,65,000 |
| Cash Inflows | 2,38,500 | 3,01,500 | 3,15,500 | 2,45,500 | 2,31,500 | 1,79,000 |

**(i) Calculation of Payback Period**

**Cumulative Cash Inflows**

| | | | | | | *Years* |
|---|---|---|---|---|---|---|
| | *1* | *2* | *3* | *4* | *5* | *6* |
| Machine 'MX' | 2,14,000 | 4,14,000 | 5,79,000 | 7,58,000 | 9,23,000 | 10,74,000 |
| Machine 'MY' | 2,38,500 | 5,40,000 | 8,55,500 | 11,01,000 | 13,32,500 | 15,11,500 |

**Pay-back Period for 'MX'**

$$= 4 + \frac{(8,00,000 - 7,58,000)}{1,65,000}$$

= 4.25 years or 4 years and 3 months.

**Pay-back Period for 'MY'**

$$= 3 + \frac{(10,20,000 - 8,55,500)}{2,45,500} = 3 + 0.67 = 3.67 \text{ years}$$

Or, 3 years and 8 months.

**(ii) Calculation of Net Present Value (NPV)**

| | | Machine 'MX' | | Machine 'MY' | |
|---|---|---|---|---|---|
| *Year* | *PV Factor* | *Cash Inflows* ₹ | *Present Value* ₹ | *Cash Inflows* ₹ | *Present Value* ₹ |
| 0 | 1.000 | (8,00,000) | (8,00,000) | (10,20,000) | (10,20,000) |
| 1 | 0.909 | 2,14,000 | 1,94,526 | 2,38,500 | 2,16,797 |
| 2 | 0.826 | 2,00,000 | 1,65,200 | 3,01,500 | 2,49,039 |
| 3 | 0.751 | 1,65,000 | 1,23,915 | 3,15,500 | 2,36,941 |
| 4 | 0.683 | 1,79,000 | 1,22,257 | 2,45,500 | 1,67,677 |
| 5 | 0.621 | 1,65,000 | 1,02,465 | 2,31,500 | 1,43,762 |
| 6 | 0.564 | 1,51,000 | 85,164 | 1,79,000 | 1,00,956 |
| Scrap Value | 0.564 | 20,000 | 11,280 | 30,000 | 16,920 |
| Net Present Value (NPV) | | | 4,807 | | 1,12,092 |

**(iii) Recommendation**

| | Machine 'MX' | Machine 'MY' |
|---|---|---|
| Ranking according to Pay-back Period | II | I |
| Ranking according to Net Present Value (NPV) | II | I |

**Advise:** Since Machine 'MY' has higher ranking than Machine 'MX' according to both parameters, i.e. Payback Period as well as Net Present Value, therefore, Machine 'MY' is recommended.

**SOLUTION**

**(a) Calculation of Net Operating Cycle period of XYZ Ltd.**

Raw Material storage period (R)=

$$\frac{\text{Average stock of raw material}}{\text{Average Cost of Raw Material Consumption per day}}$$

$$= \frac{₹\,50,000}{₹\,6,00,000 \div 360\,\text{days}} = \frac{₹\,50,000}{1,667} = 30\ \text{days}$$

Work-in-progress inventory holding period (W)

$$= \frac{\text{Average Work-in-progress inventory}}{\text{Average Cost of Production per day}}$$

$$= \frac{₹\,30,000}{₹\,5,00,000 \div 360\,\text{days}} = \frac{₹\,30,000}{1,389} = 22\ \text{days}$$





Finished Goods storage period (F)

$$= \frac{\text{Average stock of finished goods}}{\text{Average Cost of Goods Sold per day}}$$

$$= \frac{₹40,000}{₹8,00,000 \div 360\,\text{days}} = \frac{₹40,000}{2,222} = 18\ \text{days}$$

Receivables (Debtors) collection period (D) = 45 days

Credit Period allowed by creditors © = 30 days

Net Operating Cycle = R + W + F+ D – C = 30 + 22 + 18 + 45 – 30 = 85 days

**(b)** Number of Operating Cycles in a year $= \frac{\text{No. of days in a year}}{\text{Operating Cycle period}}$

$$= \frac{360\,\text{days}}{85\,\text{days}} = 4.23\ \text{times}$$

**SOLUTION**

**Statement of Working Capital requirements (cash cost basis)**

| | (₹) | (₹) |
|---|---|---|
| **A. Current Assets** | | |
| Inventory: | | |
| -Raw materials $\left(\frac{₹\,9,00,000}{12\text{months}} \times 1\text{ month}\right)$ | 75,000 | |
| -Finished Goods $\left(\frac{₹25,80,000}{12\text{months}} \times 1\text{ month}\right)$ | 2,15,000 | |
| Receivables (Debtors) $\left(\frac{₹29,40,000}{12\text{months}} \times 2\text{months}\right)$ | 4,90,000 | |
| Sales Promotion expenses paid in advance $\left(\frac{₹1,20,000}{12\text{ months}} \times 3\text{ months}\right)$ | 30,000 | |
| Cash balance | 1,00,000 | 9,10,000 |
| Gross Working Capital | | 9,10,000 |
| **B. Current Liabilities:** | | |
| Payables: | | |
| -Creditors for materials $\left(\frac{₹\,9,00,000}{12\text{months}} \times 2\text{ month}\right)$ | 1,50,000 | |
| Wages outstanding $\left(\frac{₹\,7,20,000}{12\text{months}} \times 1\text{ month}\right)$ | 60,000 | |
| Manufacturing expenses outstanding $\left(\frac{₹\,9,60,000}{12\text{months}} \times 1\text{ month}\right)$ | 80,000 | |
| Administrative expenses outstanding $\left(\frac{₹\,2,40,000}{12\text{months}} \times 1\text{ month}\right)$ | 20,000 | 3,10,000 |
| Net working capital (A - B) | | 6,00,000 |
| *Add*: Safety margin @ 20% | | 1,20,000 |
| Total Working Capital requirements | | 7,20,000 |

**Working Notes:**

| (i) | **Computation of Annual Cash Cost of Production** | (₹) |
|---|---|---|
| | Material consumed | 9,00,000 |
| | Wages | 7,20,000 |
| | Manufacturing expenses | 9,60,000 |
| | Total cash cost of production | 25,80,000 |
| **(ii)** | **Computation of Annual Cash Cost of Sales:** | **(₹)** |
| | Total Cash cost of production as in (i) above | 25,80,000 |
| | Administrative Expenses | 2,40,000 |
| | Sales promotion expenses | 1,20,000 |
| | Total cash cost of sales | 29,40,000 |

**SOLUTION**

This question can be solved using two approaches:

(i) To assess the impact of double shift for long term as a matter of production policy.

(ii) To assess the impact of double shift to mitigate the immediate demand for next year only.

The first approach is more appropriate and fulfilling the requirement of the question.

**(i) Assessment of impact of double shift for long term as a matter of production policy:**

**Comparative Statement of Working Capital Requirement**

| | Single Shift (24,000) | | | Double Shift (48,000) | | |
|---|---|---|---|---|---|---|
| | Unit | Rate (₹) | Amount (₹) | Unit | Rate (₹) | Amount (₹) |
| **Current Assets** | | | | | | |
| Inventories: | | | | | | |
| Raw Materials | 6,000 | 6.00 | 36,000 | 12,000 | 5.40 | 64,800 |





| | | | | | | |
|---|---|---|---|---|---|---|
| Work-in-Progress | 2,000 | 11.00 | 22,000 | 2,000 | 9.40 | 18,800 |
| Finished Goods | 4,500 | 16.00 | 72,000 | 9,000 | 12.40 | 1,11,600 |
| Sundry Debtors | 6,000 | 16.00 | 96,000 | 12,000 | 12.40 | 1,48,800 |
| Total Current Assets: (A) | | | 2,26,000 | | | 3,44,000 |
| **Current Liabilities** | | | | | | |
| Creditors for Materials | 4,000 | 6.00 | 24,000 | 8,000 | 5.40 | 43,200 |
| Creditors for Wages | 1,000 | 5.00 | 5,000 | 2,000 | 4.00 | 8,000 |
| Creditors for Expenses | 1,000 | 5.00 | 5,000 | 2,000 | 3.00 | 6,000 |
| Total Current Liabilities: (B) | | | 34,000 | | | 57,200 |
| Working Capital: (A) – (B) | | | 1,92,000 | | | 2,86,800 |

Additional Working Capital requirement = ₹ 2,86,800 – ₹ 1,92,000 = ₹ 94,800

**Workings:**

(1) Statement of cost at single shift and double shift working

| | 24,000 units | | 48,000 Units | |
|---|---|---|---|---|
| | Per unit (₹) | Total (₹) | Per unit (₹) | Total (₹) |
| Raw materials | 6.00 | 1,44,000 | 5.40 | 2,59,200 |
| 1. Wages - Variable | 3.00 | 72,000 | 3.00 | 1,44,000 |
| Fixed | 2.00 | 48,000 | 1.00 | 48,000 |
| Overheads - Variable | 1.00 | 24,000 | 1.00 | 48,000 |
| Fixed | 4.00 | 96,000 | 2.00 | 96,000 |
| Total cost | 16.00 | 3,84,000 | 12.40 | 5,95,200 |
| Profit | 2.00 | 48,000 | 5.60 | 2,68,800 |
| | 18.00 | 4,32,000 | 18.00 | 8,64,000 |

(2) Sales in units 2020-21 $= \frac{\text{Sales}}{\text{Unit selling price}} = \frac{₹\,4,32,000}{₹\,18} = 24,000$ units

(3) Stock of Raw Materials in units on 31.3.2021

$= \frac{\text{Value of Stock}}{\text{Cost per unit}} = \frac{₹\,36,000}{6} = 6,000$ units

(4) Stock of work-in-progress in units on 31.3.2021

$= \frac{\text{Value of work-in-progress}}{\text{Prime Cost per unit}} = \frac{₹\,22,000}{(₹\,6 + ₹\,5)} = 2,000$ units

(5) Stock of finished goods in units 2020-21

$= \frac{\text{Value of Stock}}{\text{Total Cost per unit}} = = \frac{₹\,72,000}{₹\,16} = 4,500$ units

**(ii) Assessment of the impact of double shift to mitigate the immediate demand for next year only & not as part of policy implementation.**

In this approach, working capital shall be computed as if we are calculating the same for the next / second year with double production. Whereas, in the first approach to implement double-shift as part of policy implementation, we calculated comparative analysis of working capital requirement for single & double shift within the same year.

**Workings:**

(6) Calculation of no. of units to be sold:

| | |
|---|---|
| No. of units to be Produced | 48,000 |
| Add: Opening stock of finished goods | 4,500 |
| Less: Closing stock of finished goods | (9,000) |
| No. of units to be Sold | 43,500 |

(7) Calculation of Material to be consumed and materials to be purchased in units:

| | |
|---|---|
| No. of units Produced | 48,000 |
| Add: Closing stock of WIP | 2,000 |
| Less: Opening stock of WIP | (2,000) |
| Raw Materials to be consumed in units | 48,000 |

| | |
|---|---|
| Add: Closing stock of Raw material | 12,000 |
| Less: Opening stock of Raw material | (6,000) |
| Raw Materials to be purchased (in units) | 54,000 |

(8) Credit allowed by suppliers:

$$= \frac{\text{No. of units to purchased} \times \text{Cost per unit}}{12 \text{ months}} \times 2 \text{ months}$$

$$= \frac{54{,}000 \times ₹\,5.40}{12 \text{ months}} \times 2 \text{ months} = ₹\,48{,}600$$

**Comparative Statement of Working Capital Requirement**

| | Single Shift (Current Year – 24,000 units) | | | Double Shift (Next Year – 48,000 units) | | |
|---|---|---|---|---|---|---|
| | Unit | Rate (₹) | Amount (₹) | Unit | Rate (₹) | Amount (₹) |
| **Current Assets** | | | | | | |
| Inventories: | | | | | | |
| Raw Materials | 6,000 | 6.00 | 36,000 | 12,000 | 5.40 | 64,800 |
| Work-in-Progress | 2,000 | 11.00 | 22,000 | 2,000 | 9.40 | 18,800 |
| Finished Goods | 4,500 | 16.00 | 72,000 | 9,000 | 12.40 | 1,11,600 |
| Sundry Debtors | 6,000 | 16.00 | 96,000 | 12,000 | 12.40 | 1,48,800 |
| Total Current Assets: (A) | | | 2,26,000 | | | 3,44,000 |
| **Current Liabilities** | | | | | | |
| Creditors for Materials | 4,000 | 6.00 | 24,000 | 9,000 | 5.40 | 48,600 |
| Creditors for Wages | 1,000 | 5.00 | 5,000 | 2,000 | 4.00 | 8,000 |
| Creditors for Expenses | 1,000 | 5.00 | 5,000 | 2,000 | 3.00 | 6,000 |
| Total Current Liabilities: (B) | | | 34,000 | | | 62,600 |
| Working Capital: (A) – (B) | | | 1,92,000 | | | 2,81,400 |

Additional Working Capital requirement = ₹ 2,81,400 – ₹ 1,92,000 = ₹ 89,400

**Notes:**

(i) The quantity of material in process will not change due to double shift working since work started in the first shift will be completed in the second shift.

(ii) It is given in the question that the WIP is valued at prime cost hence, it is assumed that the WIP is 100% complete in respect of material and labour.

(iii) In absence of any information on proportion of credit sales to total sales, debtors quantity has been doubled for double shift. Hence, the units have been taken as 12,000 only.

(iv) It is assumed that all purchases are on credit.

(v) The valuation of work-in-progress based on prime cost (i.e. material & labor) as per the policy of the company is as under.

| | **Single shift (₹)** | **Double shift (₹)** |
|---|---|---|
| Materials | 6.00 | 5.40 |
| Wages – Variable | 3.00 | 3.00 |
| Fixed | 2.00 | 1.00 |
| | 11.00 | 9.40 |

6. **Calculation of Net Working Capital requirement:**

| | (₹) | (₹) |
|---|---|---|
| **A. Current Assets:** | | |
| Inventories: | | |
| - Raw material stock (Refer to Working note 3) | 6,64,615 | |
| - Work in progress stock (Refer to Working note 2) | 5,00,000 | |
| - Finished goods stock (Refer to Working note 4) | 13,60,000 | |
| Receivables (Debtors) (Refer to Working note 5) | 25,10,769 | |
| Cash and Bank balance | 25,000 | |
| Gross Working Capital | 50,60,384 | 50,60,384 |
| **B. Current Liabilities:** | | |
| Creditors for raw materials (Refer to Working note 6) | 7,15,740 | |
| Creditors for wages (Refer to Working note 7) | 91,731 | |
| | 8,07,471 | 8,07,471 |
| Net Working Capital (A - B) | | 42,52,913 |

**Working Notes:**

1. **Annual cost of production**

| | (₹) |
|---|---|
| Raw material requirements {(1,04,000 units × ₹ 80)+ ₹3,20,000} | 86,40,000 |
| Direct wages {(1,04,000 units × ₹ 30) + ₹60,000} | 31,80,000 |

| | |
|---|---|
| Overheads (exclusive of depreciation) {(1,04,000 × ₹ 60)+ ₹1,20,000} | 63,60,000 |
| Gross Factory Cost | 1,81,80,000 |
| *Less:* Closing W.I.P | (5,00,000) |
| Cost of Goods Produced | 1,76,80,000 |
| *Less:* Closing Stock of Finished Goods (₹1,76,80,000 × 8,000/1,04,000) | (13,60,000) |
| Total Cash Cost of Sales | 1,63,20,000 |

2. **Work in progress stock**

| | (₹) |
|---|---|
| Raw material requirements (4,000 units × ₹ 80) | 3,20,000 |
| Direct wages (50% × 4,000 units × ₹ 30) | 60,000 |
| Overheads (50% × 4,000 units × ₹ 60) | 1,20,000 |
| | 5,00,000 |

3. **Raw material stock**

It is given that raw material in stock is average 4 weeks consumption. Since, the company is newly formed, the raw material requirement for production and work in progress will be issued and consumed during the year.

Hence, the raw material consumption for the year (52 weeks) is as follows:

| | (₹) |
|---|---|
| For Finished goods (1,04,000 × ₹ 80) | 83,20,000 |
| For Work in progress (4,000 × ₹ 80) | 3,20,000 |
| | 86,40,000 |

Raw material stock $\frac{₹\,86,40,000}{52\text{ weeks}} \times 4\text{ weeks}$ i.e. ₹ 6,64,615

4. **Finished goods stock:** 8,000 units @ ₹ 170 per unit = ₹ 13,60,000

5. **Debtors for sale:** $1,63,20,000 \times \frac{8}{52} = ₹\,25,10,769$

6. **Creditors for raw material:**

| | |
|---|---|
| Material Consumed (₹ 83,20,000 + ₹ 3,20,000) | ₹ 86,40,000 |
| Add: Closing stock of raw material | ₹ 6,64,615 |
| Purchases of Raw Material | ₹ 93,04,615 |

Credit allowed by suppliers = $\frac{₹\,93,04,615}{52\ \text{weeks}} \times 4\ \text{weeks} = ₹\ 7,15,740$

7. **Creditors for wages**

Outstanding wage payment = $\frac{₹\,31,80,000}{52\ \text{weeks}} \times 1.5\ \text{weeks} = ₹\ 91,731$

**7. Preparation of Statement of Working Capital Requirement for Trux Company Ltd.**

| | | (₹) | (₹) |
|---|---|---|---|
| **A.** | **Current Assets** | | |
| (i) | Inventories: | | |
| | Material (1 month) $\left(\frac{₹6,75,000}{12\text{months}} \times 1\ \text{month}\right)$ | 56,250 | |
| | Finished goods (1 month) $\left(\frac{₹21,60,000}{12\text{months}} \times 1\ \text{month}\right)$ | 1,80,000 | 2,36,250 |
| (ii) | Receivables (Debtors) | | |
| | For Domestic Sales $\left(\frac{₹15,17,586}{12\text{months}} \times 1\text{month}\right)$ | 1,26,466 | |
| | For Export Sales $\left(\frac{₹\,7,54,914}{12\text{months}} \times 3\text{months}\right)$ | 1,88,729 | 3,15,195 |

| | | | |
|---|---|---|---|
| (iii) | Prepayment of Selling expenses $\left(\frac{₹1,12,500}{12 \text{months}} \times 3 \text{months}\right)$ | | 28,125 |
| (iii) | Cash in hand & at bank (net of overdraft) | | 1,75,000 |
| | Total Current Assets | | 7,54,570 |
| **B.** | **Current Liabilities:** | | |
| (i) | Payables (Creditors) for materials (2 months) $\left(\frac{₹6,75,000}{12 \text{months}} \times 2 \text{ month}\right)$ | | 1,12,500 |
| (ii) | Outstanding wages (0.5 months) $\left(\frac{₹5,40,000}{12 \text{months}} \times 0.5 \text{month}\right)$ | | 22,500 |
| (iii) | Outstanding manufacturing expenses $\left(\frac{₹7,65,000}{12 \text{months}} \times 1 \text{ month}\right)$ | | 63,750 |
| (iv) | Outstanding administrative expenses $\left(\frac{₹1,80,000}{12 \text{months}} \times 1 \text{month}\right)$ | | 15,000 |
| (v) | Income tax payable | | 42,000 |
| | Total Current Liabilities | | 2,55,750 |
| | Net Working Capital (A – B) | | 4,98,820 |
| Add: | 10% contingency margin | | 49,882 |
| | Total Working Capital required | | 5,48,702 |

**Working Notes:**

**1. Calculation of Cost of Goods Sold and Cost of Sales**

| | Domestic (₹) | Export (₹) | Total (₹) |
|---|---|---|---|
| Domestic Sales | 18,00,000 | 8,10,000 | 26,10,000 |
| Less: Gross profit @ 20% on domestic sales and 11.11% on export sales (Working note-2) | 3,60,000 | 90,000 | 4,50,000 |
| Cost of Goods Sold | 14,40,000 | 7,20,000 | 21,60,000 |
| Add: Selling expenses (Working note-3) | 77,586 | 34,914 | 1,12,500 |
| Cash Cost of Sales | 15,17,586 | 7,54,914 | 22,72,500 |

**2. Calculation of gross profit on Export Sales**

Let domestic selling price is ₹ 100. Gross profit is ₹ 20, and then cost per unit is ₹ 80

Export price is 10% less than the domestic price i.e. ₹ 100–(1-0.1)= ₹ 90

Now, gross profit will be = ₹ 90 - ₹ 80 = ₹ 10

So, Gross profit ratio at export price will be = $\frac{₹\ 10}{₹\ 90} \times 100 = 11.11\%$

**3. Apportionment of Selling expenses between Domestic and Exports sales:**

Apportionment on the basis of sales value:

Domestic Sales $= \frac{₹\ 1,12,500}{₹\ 26,10,000} \times ₹\ 18,00,000 = ₹\ 77,586$

Exports Sales $= \frac{₹\ 1,12,500}{₹\ 26,10,000} \times ₹\ 8,10,000 = ₹\ 34,914$

## 4. Assumptions

(i) It is assumed that administrative expenses is related to production activities.

(ii) Value of opening and closing stocks are equal.