CAPITAL STRUCTURE

Question

ILLUSTRATION 10

Blue Ltd., an all equity financed company is considering the repurchase of ₹ 275 lakhs equity shares and to replace it with 15% debentures of the same amount. Current market value of the company is ₹ 1,750 lakhs with its cost of capital of 20%. The company's Earnings before Interest and Taxes (EBIT) are expected to remain constant in future years. The company also has a policy of distributing its entire earnings as dividend.

Assuming the corporate tax rate as 30%, you are required to CALCULATE the impact on the following on account of the change in the capital structure as per Modigliani and Miller (MM) Approach:

(i) Market value of the company

(ii) Overall Cost of capital

(iii) Cost of equity

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 $= \frac{\text{EAT}}{(1-t)} = \frac{₹\ 350\ \text{lakhs}}{(1\text{-}0.3)}$ = ₹ 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) = (Net Income to equity holders / Market value of equity) × 100

= (₹ 321.12 lakhs / ₹ 1,557.50 lakhs) × 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

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

$$\text{So, } K_o = 0.20 \left[1- \left(0.3 \times \frac{₹\ 275 \text{ lakhs}}{₹\ 1,832.5 \text{ lakhs}}\right)\right] = 0.191 \text{ or } 19.10\% \text{ (approx.)}$$

$$\text{Cost of Equity } (K_e) = K_{eu} + (K_{eu} - K_d) \frac{\text{Debt (1-t)}}{\text{Equity}}$$

Where,

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

K_d = Cost of debt

t = Tax rate

$$\text{So, } K_e = 0.20 + \left((0.20-0.15) \times \frac{₹\ 275 \text{ lakhs } (1-0.3)}{₹\ 1,557.5 \text{ lakhs}}\right) = 0.2062 \text{ or } 20.62\%$$

CAPITAL STRUCTURE

QUESTION

8. The following data relates to two companies belonging to the same risk class:

Particulars	A Ltd.	B Ltd.
Expected Net Operating Income	₹ 18,00,000	₹ 18,00,000
12% Debt	₹ 54,00,000	-
Equity Capitalization Rate	-	18

REQUIRED:

(a) Determine the total market value, Equity capitalization rate and weighted average cost of capital for each company assuming no taxes as per M.M. Approach.

(b) Determine the total market value, Equity capitalization rate and weighted average cost of capital for each company assuming 40% taxes as per M.M. Approach.

ANSWER

8. (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×S/V) + (k_d×D/V)	13.23

*Computation of WACC A Ltd

Component of Capital	Amount	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%

ILLUSTRATION 4

The following information is related to Yizi Company Ltd. for the year ended 31st March, 2021:

Equity share capital (of ₹ 10 each)	₹ 50 lakhs
12% Bonds of ₹ 1,000 each	₹ 37 lakhs
Sales	₹ 84 lakhs
Fixed cost (excluding interest)	₹ 6.96 lakhs
Financial leverage	1.49
Profit-volume Ratio	27.55%
Income Tax Applicable	40%

You are required to CALCULATE:

(i) Operating Leverage;

(ii) Combined leverage; and

(iii) Earnings per share.

Show calculations up-to two decimal points.

SOLUTION

Computation of Profits after Tax (PAT)

Particulars	Amount (₹)
Sales	84,00,000
Contribution (Sales × P/V ratio)	23,14,200
Less: Fixed cost (excluding Interest)	(6,96,000)
EBIT (Earnings before interest and tax)	16,18,200
Less: Interest on debentures (12% × ₹37 lakhs)	(4,44,000)
Less: Other fixed Interest (balancing figure)	(88,160)*
EBT (Earnings before tax)	10,86,040
Less: Tax @ 40%	4,34,416
PAT (Profit after tax)	6,51,624

(i) Operating Leverage:

$$= \frac{\text{Contribution}}{\text{EBIT}} = \frac{₹23,14,200}{₹16,18,200} = 1.43$$

(ii) Combined Leverage:

= Operating Leverage × Financial Leverage

= 1.43 × 1.49 = 2.13

Or,

$$\text{Combined Leverage} = \frac{\text{Contribution}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{EBT}}$$

$$\text{Combined Leverage} = \frac{\text{Contribution}}{\text{EBT}} = \frac{₹\ 23,14,200}{₹\ 10,86,040} = 2.13$$

$$^{*}\text{Financial Leverage} = \frac{\text{EBIT}}{\text{EBT}} = \frac{₹16,18,200}{\text{EBT}} = 1.49$$

$$\text{So, EBT} = \frac{₹16,18,200}{1.49} = ₹10,86,040$$

Accordingly, other fixed interest = ₹ 16,18,200 - ₹ 10,86,040 - ₹ 4,44,000

= ₹ 88,160

iii) Earnings per share (EPS):

$$= \frac{\text{PAT}}{\text{No. of shares outstanding}} = \frac{₹\ 6,51,624}{5,00,000 \text{ equity shares}} = ₹\ 1.30$$

ILLUSTRATION 5

Following are the selected financial information of A Ltd. and B Ltd. for the year ended March 31st, 2021:

	A Ltd.	B Ltd.
Variable Cost Ratio	60%	50%
Interest	₹ 20,000	₹ 1,00,000
Operating Leverage	5	2
Financial Leverage	3	2
Tax Rate	30%	30%

You are required to FIND out:

(i) EBIT

(ii) Sales

(iii) Fixed Cost

(iv) Identify the company which is better placed with reasons based on leverages.

SOLUTION

Company A

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

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

Or, 3 (EBIT – 20,000) = EBIT

Or, 2 EBIT = 60,000

Or, EBIT = 30,000

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

Or, Contribution = ₹ 1, 50,000

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

(iii) Fixed Cost = Contribution – EBIT

= ₹ 1, 50,000 – 30,000

Or, Fixed cost = ₹ 1,20,000

Company B

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

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

Or, 2 (EBIT – 1,00,000) = EBIT

Or, 2 EBIT -2,00,000 = EBIT

Or, EBIT = ₹ 2,00,000

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

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

Or, Contribution = ₹ 4,00,000

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

(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)

9. The following particulars relating to Navya Ltd. for the year ended 31st March 2021 is given:

Output	1,00,000 units at normal capacity
Selling price per unit	₹ 40
Variable cost per unit	₹ 20
Fixed cost	₹ 10,00,000

The capital structure of the company as on 31st March, 2021 is as follows:

Particulars	**₹**
Equity share capital (1,00,000 shares of ₹ 10 each)	10,00,000
Reserves and surplus	5,00,000
7% debentures	10,00,000
Current liabilities	5,00,000
Total	**30,00,000**

Navya Ltd. has decided to undertake an expansion project to use the market potential, that will involve ₹ 10 lakhs. The company expects an increase in output by 50%. Fixed cost will be increased by ₹ 5,00,000 and variable cost per unit will be decreased by 10%. The additional output can be sold at the existing selling price without any adverse impact on the market.

The following alternative schemes for financing the proposed expansion programme are planned:

(i) Entirely by equity shares of ₹ 10 each at par.

(ii) ₹ 5 lakh by issue of equity shares of ₹ 10 each and the balance by issue of 6% debentures of ₹ 100 each at par.

(iii) Entirely by 6% debentures of ₹ 100 each at par.

FIND out which of the above-mentioned alternatives would you recommend for Navya Ltd. with reference to the risk and return involved, assuming a corporate tax of 40%.

10. The following details of a company for the year ended 31st March, 2021 are given below:

Operating leverage	2:1
Combined leverage	2.5:1
Fixed Cost excluding interest	₹ 3.4 lakhs
Sales	₹ 50 lakhs
8% Debentures of ₹ 100 each	₹ 30.25 lakhs
Equity Share Capital of ₹ 10 each	34 lakhs
Income Tax Rate	30%

CALCULATE:

(i) Financial Leverage

(ii) P/V ratio and Earning per Share (EPS)

(iii) If the company belongs to an industry, whose assets turnover is 1.5, does it have a high or low assets turnover?

(iv) At what level of sales, the Earning before Tax (EBT) of the company will be equal to zero?

11. You are given the following information of 5 firms of the same industry:

Name of the Firm	Change in Revenue	Change in Operating Income	Change in Earning per share
M	28%	26%	32%
N	27%	34%	26%
P	25%	38%	23%
Q	23%	43%	27%
R	25%	40%	28%

You are required to CALCULATE for all firms:

(i) Degree of operating leverage and

(ii) Degree of combined leverage.

9. Statement showing Profitability of Alternative Schemes for Financing

(₹ in '00,000)

Particulars	Existing	Alternative Schemes		
		(i)	(ii)	(iii)
Equity Share capital (existing)	10	10	10	10
New issues	-	10	5	-
	10	**20**	**15**	**10**
7% debentures	10	10	10	10
6% debentures	-	-	5	10
	20	**30**	**30**	**30**
Debenture interest (7%)	0.7	0.7	0.7	0.7

Debenture interest (6%)	-	-	0.3	0.6
	0.7	**0.7**	**1.0**	**1.3**
Output (units in lakh)	1	1.5	1.5	1.5
Contribution per. unit (₹) (Selling price - Variable Cost)	20	22	22	22
Contribution (₹ lakh)	**20**	**33**	**33**	**33**
Less: Fixed cost	10	15	15	15
EBIT	**10**	**18**	**18**	**18**
Less: Interest (as calculated above)	0.7	0.7	1.0	1.3
EBT	**9.3**	**17.3**	**17**	**16.7**
Less: Tax (40%)	3.72	6.92	6.8	6.68
EAT	5.58	10.38	10.20	10.02
Operating Leverage (Contribution /EBIT)	2.00	1.83	1.83	1.83
Financial Leverage (EBIT/EBT)	1.08	1.04	1.06	1.08
Combined Leverage (Contribution/EBT)	2.15	1.91	1.94	1.98
EPS (EAT/No. of shares) (₹)	5.58	5.19	6.80	10.02
Risk	**-**	**Lowest**	**Lower than option (3)**	**Highest**
Return	**-**	**Lowest**	**Lower than option (3)**	**Highest**

From the above figures, we can see that the Operating Leverage is same in all alternatives though Financial Leverage differs. Alternative (iii) uses the maximum amount of debt and result into the highest degree of financial leverage, followed by alternative (ii). Accordingly, risk of the company will be maximum in these options. Corresponding to this scheme, however, maximum EPS (i.e., ₹ 10.02 per share) will be also in option (iii).

So, if Navya Ltd. is ready to take a high degree of risk, then alternative (iii) is strongly recommended. In case of opting for less risk, alternative (ii) is the next best option with a reduced EPS of ₹ 6.80 per share. In case of alternative (i), EPS is even lower than the existing option, hence not recommended.

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

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]

11. Calculation of Degree of Operating leverage and Degree of Combined leverage

Firm	Degree of Operating Leverage (DOL) = % change in Operating Income / % change in Revenue	Degree of Combined Leverage (DCL) = % change in EPS / % change in Revenue
M	$\frac{26\%}{28\%} = 0.929$	$\frac{32\%}{28\%} = 1.143$
N	$\frac{34\%}{27\%} = 1.259$	$\frac{26\%}{27\%} = 0.963$
P	$\frac{38\%}{25\%} = 1.520$	$\frac{23\%}{25\%} = 0.920$
Q	$\frac{43\%}{23\%} = 1.870$	$\frac{27\%}{23\%} = 1.174$
R	$\frac{40\%}{25\%} = 1.60$	$\frac{28\%}{25\%} = 1.120$

RISK ANALYSIS IN CAPITAL BUDGETING

ILLUSTRATION 12

DETERMINE the risk adjusted net present value of the following projects:

	X	Y	Z
Net cash outlays (₹)	2,10,000	1,20,000	1,00,000
Project life	5 years	5 years	5 years
Annual Cash inflow (₹)	70,000	42,000	30,000
Coefficient of variation	1.2	0.8	0.4

The Company selects the risk-adjusted rate of discount on the basis of the coefficient of variation:

Coefficient of Variation	Risk-Adjusted discount rate	P.V. Factor 1 to 5 years at risk adjusted discount rate
0.0	10%	3.791
0.4	12%	3.605
0.8	14%	3.433
1.2	16%	3.274
1.6	18%	3.127
2.0	22%	2.864
More than 2.0	25%	2.689

SOLUTION

Statement showing the determination of the risk adjusted net present value

Project	Net cash outlays	Coefficient of variation	Risk adjusted discount rate	Annual cash inflow	PV factor 1-5 years	Discounted cash inflow	Net present value
	(₹)			(₹)		(₹)	(₹)
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii) = (v) × (vi)	(viii) = (vii) – (ii)
X	2,10,000	1.20	16%	70,000	3.274	2,29,180	19,180
Y	1,20,000	0.80	14%	42,000	3.433	1,44,186	24,186
Z	1,00,000	0.40	12%	30,000	3.605	1,08,150	8,150

QUESTION -

5. SG Ltd. is considering a project "Z" with an initial outlay of ₹ 7,50,000 and life of 5 years. The estimates of project are as follows:

	Lower Estimates	Base	Upper Estimates
Sales (units)	4,500	5,000	5,500
	(₹)	(₹)	(₹)
Selling Price p.u.	175	200	225
Variable cost p.u.	100	125	150
Fixed Cost	50,000	75,000	1,00,000

Depreciation included in Fixed cost is ₹ 35,000 and corporate tax is 25%.

Assuming the cost of capital as 15%, DETERMINE NPV in three scenarios i.e worst, base and best case scenario.

PV factor for 5 years at 15% are as follows:

Years	1	2	3	4	5
P.V. factor	0.870	0.756	0.658	0.572	0.497

ANSWER -

5. (i) Calculation of Yearly Cash Inflow

In worst case: High costs and Low price (Selling price) and volume(Sales units) are taken.

In best case: Low costs and High price(Selling price) and volume(Sales units) are taken.

	Worst Case	Base	Best Case
Sales (units) (A)	4,500	5,000	5,500
	(₹)	(₹)	(₹)
Selling Price p.u.	175	200	225
Less: Variable cost p.u.	150	125	100
Contribution p.u. (B)	25	75	125
Total Contribution (A x B)	1,12,500	3,75,000	6,87,500
Less: Fixed Cost	1,00,000	75,000	50,000
EBT	12,500	3,00,000	6,37,500
Less: Tax @ 25%	3,125	75,000	1,59,375
EAT	9,375	2,25,000	4,78,125
Add: Depreciation	35,000	35,000	35,000
Cash Inflow	44,375	2,60,000	5,13,125

(ii) Calculation of NPV in different scenarios

	Worst Case	Base	Best Case
Initial outlay (A) (₹)	7,50,000	7,50,000	7,50,000
Cash Inflow (c) (₹)	44,375	2,60,000	5,13,125
Cumulative PVF @ 15% (d)	3.353	3.353	3.353
PV of Cash Inflow (B = c x d) (₹)	1,48,789.38	8,71,780	17,20,508.13
NPV (B - A) (₹)	(6,01,210.62)	1,21,780	9,70,508.13

QUESTION

6. New Projects Ltd. is evaluating 3 projects, P-I, P-II, P-III. Following information is available in respect of these projects:

	P-I	P-II	P-III
Cost	₹ 15,00,000	₹ 11,00,000	₹ 19,00,000
Inflows-Year 1	6,00,000	6,00,000	4,00,000
Year 2	6,00,000	4,00,000	6,00,000
Year 3	6,00,000	5,00,000	8,00,000
Year 4	6,00,000	2,00,000	12,00,000
Risk Index	1.80	1.00	0.60

Minimum required rate of return of the firm is 15% and applicable tax rate is 40%. The risk free interest rate is 10%.

REQUIRED:

(i) Find out the risk-adjusted discount rate (RADR) for these projects.

(ii) Which project is the best?

ANSWER

6. (i) The risk free rate of interest and risk factor for each of the projects are given. The risk adjusted discount rate (RADR) for different projects can be found on the basis of CAPM as follows:

Required Rate of Return $= I_{Rf} + (ke\text{-}I_{RF})$ Risk Factor

For P-I : RADR $= 0.10 + (0.15 - 0.10)\ 1.80 = 19\%$

For P-II : RADR $= 0.10 + (0.15 - 0.10)\ 1.00 = 15\ \%$

For P-III : RADR $= 0.10 + (0.15 - 0.10)\ 0.60 = 13\ \%$

(ii) The three projects can now be evaluated at 19%, 15% and 13% discount rate as follows:

Project P-I

Annual Inflows	₹ 6,00,000
PVAF (19 %, 4)	2.639
PV of Inflows (₹ 6,00,000 x 2.639)	₹ 15,83,400
Less: Cost of Investment	₹ 15,00,000
Net Present Value	₹ **83,400**

Project P-II

Year	Cash Inflow (₹)	PVF (15%,n)	PV (₹)
1	6,00,000	0.870	5,22,000
2	4,00,000	0.756	3,02,400

3	5,00,000	0.658	3,29,000
4	2,00,000	0.572	1,14,400
Total Present Value			12,67,800
Less: Cost of Investment			11,00,000
Net Present Value			**1,67,800**

Project P-III

Year	Cash Inflow (₹)	PVF (13%,n)	PV (₹)
1	4,00,000	0.885	3,54,000
2	6,00,000	0.783	4,69,800
3	8,00,000	0.693	5,54,400
4	12,00,000	0.613	7,35,600
Total Present Value			21,13,800
Less: Cost of Investment			19,00,000
Net Present Value			**2,13,800**

Project P-III has highest NPV. So, it should be accepted by the firm.

ILLUSTRATION 17

A company is presently having credit sales of ₹ 12 lakh. The existing credit terms are 1/10, net 45 days and average collection period is 30 days. The current bad debts loss is 1.5%. In order to accelerate the collection process further as also to increase sales, the company is contemplating liberalization of its existing credit terms to 2/10, net 45 days. It is expected that sales are likely to increase by 1/3 of existing sales, bad debts increase to 2% of sales and average collection period to decline to 20 days. The contribution to sales ratio of the company is 22% and opportunity cost of investment in receivables is 15 percent (pre-tax). 50 per cent and 80 percent of customers in terms of sales revenue are expected to avail cash discount under existing and liberalization scheme respectively. The tax rate is 30%.

ADVISE, should the company change its credit terms? (Assume 360 days in a year).

SOLUTION

Working Notes:

(i) Calculation of Cash Discount

Cash Discount = Total credit sales × % of customers who take up discount × Rate

$$\text{Present Policy} = \frac{12,00,000 \times 50 \times .01}{100} = ₹\ 6,000$$

Proposed Policy = 16,00,000 × 0.80 × 0.02 = ₹ 25,600

(ii) Opportunity Cost of Investment in Receivables

Present Policy = 9,36,000 × (30/360) × (70% of 15)/100 = 78,000 × 10.5/100 = ₹ 8,190

Proposed Policy = 12,48,000 × (20/360) × 10.50/100 = ₹ 7,280

Statement showing Evaluation of Credit Policies

Particulars	Present Policy	Proposed Policy
Credit Sales	12,00,000	16,00,000
Variable Cost @ 78%* of sales	9,36,000	12,48,000
Bad Debts @ 1.5% and 2%	18,000	32,000

Cash Discount	6,000	25,600
Profit before tax	2,40,000	2,94,400
Tax @ 30%	72,000	88,320
Profit after Tax	1,68,000	2,06,080
Opportunity Cost of Investment in Receivables	8,190	7,280
Net Profit	1,59,810	1,98,800

*Only relevant or variable costs are considered for calculating the opportunity costs on the funds blocked in receivables. Since 22% is contribution, hence the relevant costs are taken to be 78% of the respective sales.

Advise: Proposed policy should be adopted since the net benefit is increased by (₹ 1,98,800 – 1,59,810) ₹ 38,990.

Q2. The following data relating to an auto component manufacturing company is available for the year 2020-21:

Raw material held in storage	20 days
Receivables' collection period	30 days
Conversion process period	10 days
(raw material – 100%, other costs – 50% complete)	
Finished goods storage period	45 days
Credit period from suppliers	60 days
Advance payment to suppliers	5 days
Total cash operating expenses per annum	₹ 800 lakhs

75% of the total cash operating expenses are for raw material. 360 days are assumed in a year.

You are required to CALCULATE:

(i) Each item of current assets and current liabilities,

(ii) The working capital requirement, if the company wants to maintain a cash balance of Rs. 10 lakhs at all times

Q7. The management of Trux Company Ltd. is planning to expand its business and consults you to prepare an estimated working capital statement. The records of the company reveals the following annual information:

	(₹)
Sales – Domestic at one month's credit	18,00,000
Export at three month's credit (sales price 10% below domestic price)	8,10,000
Materials used (suppliers extend two months credit)	6,75,000
Lag in payment of wages – ½ month	5,40,000
Lag in payment of manufacturing expenses (cash) – 1 month	7,65,000
Lag in payment of Administration Expenses – 1 month	1,80,000
Selling expenses payable quarterly in advance	1,12,500
Income tax payable in four installments, of which one falls in the next financial year	1,68,000

Rate of gross profit is 20%. Ignore work-in-progress and depreciation.

The company keeps one month's stock of raw materials and finished goods (each) and believes in keeping ₹ 2,50,000 available to it including the overdraft limit of ₹ 75,000 not yet utilized by the company.

The management is also of the opinion to make 10% margin for contingencies on computed figure.

You are required to prepare the estimated working capital statement for the next year.

Sol 2. Since WIP is 100% complete in terms of material and 50% complete in terms of other cost, the same has been considered for number of days for WIP inventory i.e. 10 days for material and 5 days for other costs respectively.

Particulars	For Raw Material	For Other Costs	Total
Cash Operating expenses	$\frac{75}{100} \times 800 = 600$	$\frac{25}{100} \times 800 = 200$	800.00
Raw Material Stock Holding	$\frac{20}{360} \times 600 = 33.33$	-	33.33
WIP Conversion	$\frac{10}{360} \times 600 = 16.67$	$\frac{5}{360} \times 200 = 2.78$	19.45
Finished Goods Stock Holding	$\frac{45}{360} \times 600 = 75$	$\frac{45}{360} \times 200 = 25$	100.00
Receivable Collection Period	$\frac{30}{360} \times 600 = 50$	$\frac{30}{360} \times 200 = 16.67$	66.67

Advance to suppliers	$\frac{5}{360} \times 600 = 8.33$	-	8.33
Credit Period from suppliers	$\frac{60}{360} \times 600 = 100$	-	100.00

Computation of working capital

	₹ in lakhs
Raw Material Stock	33.33
WIP	19.45
Finished Goods stock	100.00
Receivables	66.67
Advance to Suppliers	8.33
Cash	10.00
	237.78
Less: Payables (Creditors)	100.00
Working capital	133.78

Sol 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		1,75,000
Total Current Assets		7,54,570

B. Current Liabilities:		
(i) Payables (Creditors) for materials (2 months) $\left(\frac{₹6,75,000}{12\text{months}} \times 2\text{months}\right)$		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.

CHAPTER -
FINANCIAL ANALYSIS AND PLANNING RATIO ANALYSIS

ILLUSTRATION 4

From the following ratios and information given below, PREPARE Trading Account, Profit and Loss Account and Balance Sheet of Aebece Company:

Fixed Assets	*₹40,00,000*
Closing Stock	*₹4,00,000*

Stock turnover ratio	*10*
Gross profit ratio	*25 percent*
Net profit ratio	*20 percent*
Net profit to capital	*1/5*
Capital to total liabilities	*1/2*
Fixed assets to capital	*5/4*
Fixed assets/Total current assets	*5/7*

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

Or, Opening Stock = ₹ 80,000

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

8. Gig Ltd. has furnished the following information relating to the year ended 31st March, 2020 and 31st March, 2021: *(₹)*

	31st March, 2020	31st March, 2021
Share Capital	40,00,000	40,00,000
Reserve and Surplus	20,00,000	25,00,000
Long term loan	30,00,000	30,00,000

- Net profit ratio: 8%
- Gross profit ratio: 20%
- Long-term loan has been used to finance 40% of the fixed assets.
- Stock turnover with respect to cost of goods sold is 4.
- Debtors represent 90 days sales.
- The company holds cash equivalent to 1½ months cost of goods sold.
- Ignore taxation and assume 360 days in a year.

You are required to PREPARE Balance Sheet as on 31st March, 2021 in the following format:

Liabilities	(₹)	Assets	(₹)
Share Capital	-	Fixed Assets	-
Reserve and Surplus	-	Sundry Debtors	-
Long-term loan	-	Closing Stock	-
Sundry Creditors	-	Cash in hand	-

9. Following information relates to Temer Ltd.:

Debtors Velocity	3 months
Creditors Velocity	2 months
Stock Turnover Ratio	1.5
Gross Profit Ratio	25%
Bills Receivables	₹ 25,000
Bills Payables	₹ 10,000
Gross Profit	₹ 4,00,000
Fixed Assets turnover Ratio	4

Closing stock of the period is ₹ 10,000 above the opening stock.

DETERMINE:

(i) Sales and cost of goods sold

(ii) Sundry Debtors

(iii) Sundry Creditors

(iv) Closing Stock

(v) Fixed Assets

ANSWERS/SOLUTIONS

8. (i) Change in Reserve & Surplus = ₹ 25,00,000 – ₹ 20,00,000 = ₹ 5,00,000

So, Net profit = ₹ 5,00,000

Net Profit Ratio = 8%

$\therefore$ Sales = $\frac{5,00,000}{8\%}$ = ₹ 62,50,000

(ii) Cost of Goods sold

= Sales – Gross profit Margin

= ₹ 62,50,000 – 20% of ₹ 62,50,000

= ₹ 50,00,000

(iii) Fixed Assets = $\frac{₹\ 30,00,000}{40\%}$ = ₹ 75,00,000

(iv) Stock = $\frac{\text{Cost of Goods Sold}}{\text{Stock Turnover ratio}} = \frac{50,00,000}{4}$ = ₹ 12,50,000

(v) Debtors = $\frac{62,50,000}{360} \times 90$ = ₹ 15,62,500

(vi) Cash Equivalent = $\frac{50,00,000}{12} \times 1.5$ = ₹ 6,25,000

Balance Sheet as on 31st March 2021

Liabilities	(₹)	Assets	(₹)
Share Capital	40,00,000	Fixed Assets	75,00,000
Reserve and Surplus	25,00,000	Sundry Debtors	15,62,500
Long-term loan	30,00,000	Closing Stock	12,50,000
Sundry Creditors (Balancing Figure)	14,37,500	Cash in hand	6,25,000
	1,09,37,500		1,09,37,500

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

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

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

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.

CHAPTER - COST OF CAPITAL

6. Kalyanam Ltd. has an operating profit of ₹ 34,50,000 and has employed Debt which gives total Interest Charge of ₹ 7,50,000. The firm has an existing Cost of Equity and Cost of Debt as 16% and 8% respectively. The firm has a new proposal before it, which requires funds of ₹ 75 Lakhs and is expected to bring an additional profit of ₹ 14,25,000. To finance the proposal, the firm is expecting to issue an additional debt at 8% and will not be issuing any new equity shares in the market. Assume no tax culture.

   You are required to CALCULATE the Weighted Average Cost of Capital (WACC) of Kalyanam Ltd.:

   (i) Before the new Proposal

   (ii) After the new Proposal.

6. SOLUTON -

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

$= \frac{₹\ 34,50,000 - ₹\ 7,50,000}{0.16} = ₹\ 1,68,75,000$

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

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

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

$= \frac{₹\ 48,75,000 - ₹\ 13,50,000}{₹\ 1,68,75,000} = \frac{₹\ 35,25,000}{₹\ 1,68,75,000} = 0.209 \text{ or } 20.9\%$

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

Sources	Amount (₹)	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	Amount (₹)	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 %**

CHAPTER - DIVIDEND DECISIONS

8. Aakash Ltd. has 10 lakh equity shares outstanding at the start of the accounting year 2021. The existing market price per share is ₹ 150. Expected dividend is ₹ 8 per share. The rate of capitalization appropriate to the risk class to which the company belongs is 10%.

   (i) CALCULATE the market price per share when expected dividends are: (a) declared, and (b) not declared, based on the Miller – Modigliani approach.

   (ii) CALCULATE number of shares to be issued by the company at the end of the accounting year on the assumption that the net income for the year is ₹ 3 crore, investment budget is ₹ 6 crores, when (a) Dividends are declared, and (b) Dividends are not declared.

   (iii) PROOF that the market value of the shares at the end of the accounting year will remain unchanged irrespective of whether (a) Dividends are declared, or (ii) Dividends are not declared.

SOLUTION:

8. (i) Calculation of market price per share

According to Miller – Modigliani (MM) Approach:

$$P_o = \frac{P_1 + D_1}{1 + K_e}$$

Where,

Existing market price (P_o) = ₹ 150

Expected dividend per share (D_1) = ₹ 8

Capitalization rate (k_e) = 0.10

Market price at year end (P_1) = to be determined

(a) If expected dividends are declared, then

$$₹\ 150 = \frac{P_1 + ₹\ 8}{1 + 0.10}$$

$$\therefore \quad P_1 = ₹\ 157$$

(b) If expected dividends are not declared, then

$$₹\ 150 = \frac{P_1 + 0}{1 + 0.10}$$

$$\therefore \quad P_1 = ₹\ 165$$

(ii) Calculation of number of shares to be issued

	(a) Dividends are declared (₹ lakh)	(b) Dividends are not Declared (₹ lakh)
Net income	300	300
Total dividends	(80)	-
Retained earnings	220	300
Investment budget	600	600
Amount to be raised by new issues	380	300
Relevant market price (₹ per share)	157	165
No. of new shares to be issued (in lakh) (₹ 380 ÷ 157; ₹ 300 ÷ 165)	2.42	1.82

(iii) Calculation of market value of the shares

	(a)	(b)
	Dividends are declared	**Dividends are not Declared**
Existing shares (in lakhs)	10.00	10.00
New shares (in lakhs)	2.42	1.82
Total shares (in lakhs)	12.42	11.82
Market price per share (₹)	157	165
Total market value of shares at the end of the year (₹ in lakh)	12.42 × 157 **= 1,950 (approx.)**	11.82 × 165 **= 1,950 (approx.)**

Hence, it is proved that the total market value of shares remains unchanged irrespective of whether dividends are declared, or not declared.

ILLUSTRATION 17

X Limited is considering purchasing of new plant worth ₹80,00,000. The expected net cash flows after taxes and before depreciation are as follows:

Year	Net Cash Flows (₹)
1	14,00,000
2	14,00,000
3	14,00,000
4	14,00,000
5	14,00,000
6	16,00,000
7	20,00,000
8	30,00,000
9	20,00,000
10	8,00,000

The rate of cost of capital is 10%.

You are required to CALCULATE:

(i) Pay-back period

(ii) Net present value at 10 discount factor

(iii) Profitability index at 10 discount factor

(iv) Internal rate of return with the help of 10% and 15% discount factor

The following present value table is given for you:

Year	Present value of ₹1 at 10% discount rate	Present value of ₹1 at 15% discount rate
1	0.909	0.87
2	0.826	0.756
3	0.751	0.658
4	0.683	0.572
5	0.621	0.497
6	0.564	0.432

7	*0.513*	*0.376*
8	*0.467*	*0.327*
9	*0.424*	*0.284*
10	*0.386*	*0.247*

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:

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

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

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

ILLUSTRATION 18

HMR Ltd. is considering replacing a manually operated old machine with a fully automatic new machine. The old machine had been fully depreciated for tax purpose but has a book value of ₹ 2,40,000 on 31st March 2021. The machine has begun causing problems with breakdowns and it cannot fetch more than ₹ 30,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered ₹ 1,00,000 for the old machine as a trade in on the new machine which has a price (before allowance for trade in) of ₹ 4,50,000. The expected life of new machine is 10 years with salvage value of ₹ 35,000.

Further, the company follows straight line depreciation method but for tax purpose, written down value method depreciation @ 7.5% is allowed taking that this is the only machine in the block of assets.

Given below are the expected sales and costs from both old and new machine:

	Old machine (₹)	New machine (₹)
Sales	8,10,000	8,10,000
Material cost	1,80,000	1,26,250
Labour cost	1,35,000	1,10,000
Variable overhead	56,250	47,500
Fixed overhead	90,000	97,500
Depreciation	24,000	41,500
PBT	3,24,750	3,87,250
Tax @ 30%	97,425	1,16,175
PAT	2,27,325	2,71,075

From the above information, ANALYSE whether the old machine should be replaced or not if required rate of return is 10%? Ignore capital gain tax.

PV factors @ 10%:

Year	1	2	3	4	5	6	7	8	9	10
PVF	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386

SOLUTION

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.

ILLUSTRATION 19

XYZ Ltd. is presently all equity financed. The directors of the company have been evaluating investment in a project which will require ₹270 lakhs capital expenditure on new machinery. They expect the capital investment to provide annual cash flows of ₹42 lakhs indefinitely which is net of all tax adjustments. The discount rate which it applies to such investment decisions is 14% net.

The directors of the company believe that the current capital structure fails to take advantage of tax benefits of debt and propose to finance the new project with undated perpetual debt secured on the company's assets. The company intends to issue sufficient debt to cover the cost of capital expenditure and the after tax cost of issue.

The current annual gross rate of interest required by the market on corporate undated debt of similar risk is 10%. The after tax costs of issue are expected to be ₹10 lakhs. Company's tax rate is 30%.

You are REQUIRED to:

(i) Calculate the adjusted present value of the investment,

(ii) Calculate the adjusted discount rate and

(iii) Explain the circumstances under which this adjusted discount rate may be used to evaluate future investments.

SOLUTION

(i) Calculation of Adjusted Present Value of Investment (APV)

Adjusted PV = Base Case PV + PV of financing decisions associated with the project

Base Case NPV for the project:

(-) ₹ 270 lakhs + (₹ 42 lakhs / 0.14)	= (-) ₹ 270 lakhs + ₹ 300 lakhs
	= ₹ 30
Issue costs	= ₹ 10 lakhs
Thus, the amount to be raised	= ₹ 270 lakhs + ₹ 10 lakhs
	= ₹ 280 lakhs
Annual tax relief on interest payment	= ₹ 280 X 0.1 X 0.3
	= ₹ 8.4 lakhs in perpetuity
The value of tax relief in perpetuity	= ₹ 8.4 lakhs / 0.1
	= ₹ 84 lakhs

Therefore, APV = Base case PV – Issue Costs + PV of Tax Relief on debt interest

= ₹ 30 lakhs – ₹ 10 lakhs + 84 lakhs = ₹ 104 lakhs

(ii) Calculation of Adjusted Discount Rate (ADR)

Annual Income / Savings required to allow an NPV to zero

Let the annual income be x.

(-) ₹280 lakhs X (Annual Income / 0.14) = (-) ₹104 lakhs

Annual Income / 0.14	= (-) ₹ 104 + ₹ 280 lakhs
Therefore, Annual income	= ₹ 176 X 0.14 = ₹ 24.64 lakhs
Adjusted discount rate	= (₹ 24.64 lakhs / ₹280 lakhs) X 100
	= 8.8%

(iii) Useable circumstances

This ADR may be used to evaluate future investments only if the business risk of the new venture is identical to the one being evaluated here and the project is to be financed by the same method on the same terms. The effect on the company's cost of capital of introducing debt into the capital structure cannot be ignored.

11. Xavly Ltd. has a machine which has been in operation for 3 years. The machine has a remaining estimated useful life of 5 years with no salvage value in the end. Its current market value is ₹ 2,00,000. The company is considering a proposal to purchase a new model of machine to replace the existing machine. The relevant information is as follows:

	Existing Machine	New Machine
Cost of machine	₹ 3,30,000	₹ 10,00,000
Estimated life	8 years	5 years
Salvage value	Nil	₹ 40,000
Annual output	30,000 units	75,000 units
Selling price per unit	₹ 15	₹ 15
Annual operating hours	3,000	3,000
Material cost per unit	₹ 4	₹ 4
Labour cost per hour	₹ 40	₹ 70
Indirect cash cost per annum	₹ 50,000	₹ 65,000

The company uses written down value of depreciation @ 20% and it has several other machines in the block of assets. The Income tax rate is 30 per cent and Xavly Ltd. does not make any investment, if it yields less than 12 per cent.

ADVISE Xavly Ltd. whether the existing machine should be replaced or not.

PV factors @12%:

Year	1	2	3	4	5
PVF	0.893	0.797	0.712	0.636	0.567

12. A & Co. is contemplating whether to replace an existing machine or to spend money on overhauling it. A & Co. currently pays no taxes. The replacement machine costs ₹ 90,000 now and requires maintenance of ₹ 10,000 at the end of every year for eight years. At the end of eight years it would have a salvage value of ₹ 20,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value falls each year as follows:

Year	Maintenance (₹)	Salvage (₹)
Present	0	40,000
1	10,000	25,000
2	20,000	15,000
3	30,000	10,000
4	40,000	0

The opportunity cost of capital for A & Co. is 15%.

REQUIRED:

When should the company replace the machine?

(Note: Present value of an annuity of Re. 1 per period for 8 years at interest rate of 15% : 4.4873; present value of Re. 1 to be received after 8 years at interest rate of 15% : 0.3269).

13. A chemical company is presently paying an outside firm ₹ 1 per gallon to dispose off the waste resulting from its manufacturing operations. At normal operating capacity, the waste is about 50,000 gallons per year.

After spending ₹ 60,000 on research, the company discovered that the waste could be sold for ₹ 10 per gallon if it was processed further. Additional processing would, however, require an investment of ₹ 6,00,000 in new equipment, which would have an estimated life of 10 years with no salvage value. Depreciation would be calculated by straight line method.

Except for the costs incurred in advertising ₹ 20,000 per year, no change in the present selling and administrative expenses is expected, if the new product is sold. The details of additional processing costs are as follows:

Variable : ₹ 5 per gallon of waste put into process.

Fixed : (Excluding Depreciation) ₹ 30,000 per year.

There will be no losses in processing, and it is assumed that the total waste processed in a given year will be sold in the same year. Estimates indicate that 50,000 gallons of the product could be sold each year.

The management when confronted with the choice of disposing off the waste or processing it further and selling it, seeks your ADVICE. Which alternative would you recommend? Assume that the firm's cost of capital is 15% and it pays on an average 50% Tax on its income.

You should consider Present value of Annuity of ₹ 1 per year @ 15% p.a. for 10 years as 5.019.

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.

12. A & Co.

Equivalent cost of (EAC) of new machine

		₹
(i)	Cost of new machine now	90,000
	Add: PV of annual repairs @ ₹ 10,000 per annum for 8 years (₹ 10,000 × 4.4873)	44,873
		1,34,873
	Less: PV of salvage value at the end of 8 years (₹20,000×0.3269)	6,538
		1,28,335
	Equivalent annual cost (EAC) (₹ 1,28,335/4.4873)	28,600

PV of cost of replacing the old machine in each of 4 years with new machine

Scenario	Year	Cash Flow	PV @ 15%	PV
		(₹)		(₹)
Replace Immediately	0	(28,600)	1.00	(28,600)
		40,000	1.00	40,000
				11,400
Replace in one year	1	(28,600)	0.870	(24,882)
	1	(10,000)	0.870	(8,700)
	1	25,0000	0.870	21,750
				(11,832)
Replace in two years	1	(10,000)	0.870	(8,700)
	2	(28,600)	0.756	(21,622)
	2	(20,000)	0.756	(15,120)
	2	15,000	0.756	11,340
				(34,102)
Replace in three years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(28,600)	0.658	(18,819)
	3	(30,000)	0.658	(19,740)
	3	10,000	0.658	6,580
				(55,799)
Replace in four years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(30,000)	0.658	(19,740)
	4	(28,600)	0.572	(16,359)
	4	(40,000)	0.572	(22,880)
				(82,799)

Advice: The company should replace the old machine immediately because the PV of cost of replacing the old machine with new machine is least.

13. Evaluation of Alternatives:

Savings in disposing off the waste

Particulars	(₹)
Outflow (50,000 × ₹ 1)	50,000
Less: tax savings @ 50%	25,000
Net Outflow per year	**25,000**

Calculation of Annual Cash inflows in Processing of waste Material

Particulars	Amount (₹)	Amount (₹)
Sale value of waste (₹ 10 × 50,000 gallon)		5,00,000
Less: Variable processing cost (₹ 5 × 50,000 gallon)	2,50,000	
Less: Fixed processing cost	30,000	
Less: Advertisement cost	20,000	
Less: Depreciation	60,000	(3,60,000)
Earnings before tax (EBT)		**1,40,000**
Less: Tax @ 50%		(70,000)
Earnings after tax (EAT)		70,000
Add: Depreciation		60,000
Annual Cash inflows		**1,30,000**

Total Annual Benefits = Annual Cash inflows + Net savings (adjusting tax) in disposal cost

= ₹ 1,30,000 + ₹ 25,000 = ₹ 1,55,000

Calculation of Net Present Value

Year	Particulars	Amount (₹)
0	Investment in new equipment	(6,00,000)
1 to 10	Total Annual benefits × PVAF (10 years, 15%)	
	₹ 1,55,000 × 5.019	7,77,945
	Net Present Value	1,77,945

Recommendation: Processing of waste is a better option as it gives a positive Net Present Value.

Note- Research cost of ₹ 60,000 is not relevant for decision making as it is sunk cost.