Content of this document

This is the scanner of Previous year exam questions compiled by CA Aman Agarwal for financial management.

It has covered questions from all the attempts from May 2018 to May 2024 (will keep on updating as soon as suggested answers of subsequent attempts available)

All the solutions provided here are based on suggested answers provided by ICAI in each attempt

Ideal revision strategy

As a part of revision strategy following things need to mandatorily covered in cost and FM

1. **Important Revision Questions**
2. **Study material**
3. **RTP and PYQ compiler**
4. **MCQ Compiler**

Important Links

Google Drive Link for handwritten notes, important revision questions, MCQ PYQ & RTP Compiler and Free test series: https://drive.google.com/file/d/1E25ydrp4iZcXNd-2AjJ8NfCU98nagBE4/view?usp=drive_link

Follow Aman sir on below channels for continuous guidance and revision for Cost, FM and SM

Telegram - https://t.me/costingwithcaaman

Youtube - https://www.youtube.com/@CAAmanAgarwal/

For any doubt and guidance you can directly connect with Aman sir on his personal number - **9289599908**

[To be followed by students who already completed important revision questions and module]

Aman sir has highlighted some questions and adjustments in this compiler **which are to be covered in addition to study material and important revision questions**.

Important questions, points, key adjustment, key treatment are highlighted in green colour

Chapter -1

COST OF CAPITAL

1. TT Ltd. issued 20,000, 10% convertible debenture of Rs. 100 each with a maturity period of 5 years. At maturity the debenture holders will have the option to convert debentures into equity shares of the company in ratio of 1:5 (5 shares for each debenture). The current market price of the equity share is Rs. 20 each and historically the growth rate of the share is 4% per annum. Assuming tax rate is 25%. Compute the cost of 10% convertible debenture using Approximation Method and Internal Rate of Return Method.
PV Factor are as under:

Year	1	2	3	4	5
PV Factor @ 10%	0.909	0.826	0.751	0.683	0.621
PV Factor @ 15%	0.870	0.756	0.658	0.572	0.497

(Nov 2020)

Solution
Determination of Redemption value:
Higher of-
(i) The cash value of debentures   = Rs.100
(ii) Value of equity shares   = 5 shares × Rs. 20 (1+0.04)5
                          = 5 shares × Rs. 24.333
                          = Rs.121.665 rounded to Rs.121.67

Rs.121.67 will be taken as redemption value as it is higher than the cash option and attractive to the investors.

Calculation of Cost of 10% Convertible debenture
(i) Using Approximation Method:

$$K_d = \frac{I(1-t) + \frac{(RV - NP)}{n}}{\frac{(RV + NP)}{2}} = \frac{10(1-05) + \frac{(121.67 - 100)}{5}}{\frac{(121.67 + 100)}{2}} = \frac{7.5 + 4.334}{110.835}$$

= 10.676%

(ii)   Using Internal Rate of Return Method

Year	Cash flows (Rs.)	Discount factor @ 10%	Present Value	Discount factor @ 15%	Present Value (Rs.)
0	100	1.000	(100.00)	1.000	(100.00)
1 to 5	7.5	3.790	28.425	3.353	25.148
5	121.67	0.621	75.557	0.497	60.470
NPV			+3.982		-14.382

$$IRR = L + \frac{NPV_L}{NPV_L - NPV_H} (H - L) = 10\% + \frac{3.982}{3.982 - (-14.382)} (15\% - 10\%)$$

= 0.11084 or 11.084% (approx.)

2.　Book value of capital structure of B Ltd. is as follows:

Sources	Amount
12%, 6,000 Debentures @ Rs. 100 each	Rs. 6,00,000
Retained earnings	Rs. 4,50,000
4,500 Equity shares @ Rs. 100 each	Rs. 4,50,000
	Rs. 15,00,000

Currently, the market value of debenture is Rs. 110 per debenture and equity share is Rs. 180 per share. The expected rate of return to equity shareholder is 24% p.a. Company is paying tax @ 30%.
Calculate WACC on the basis of market value weights.

(Dec. 2021)

Solution

Calculation of Cost of Capital of debentures ignoring market value:

Cost of Debentures (K_d) = 12 (1 - .30) = 8.40%

Computation of Weighted Average Cost of Capital based on Market Value Weights

Source of Capital	Market Value (₹)	Weights to Total Capital	After tax Cost of capital (%)	WACC (%)
Debentures (6,000 nos. × ₹ 110)	6,60,000	0.45(approx.)	8.40	3.78
Equity Shares (4,500 nos. × ₹ 180)	8,10,000	0.55(approx.)	24.00	13.20
	14,70,000	1.00		16.98

Note: Cost of Debenture and Cost of equity considered as given without considering market value. Cost of sources of capital can be computed based on the Market price and accordingly Weighted Average Cost of Capital can be calculated as below:

Calculation of Cost of Capital for each source of capital considering market value of capital:

(1) Cost of Equity share capital:

$$K_e = \frac{\text{Earnings}}{\text{Market Price per share}} = \frac{24\% \times ₹\,100}{₹\,180} = 13.333\%$$

(2) Cost of Debentures $(K_d) = \frac{I(1-t)}{NP} = \frac{₹\,12(1-0.3)}{₹\,110} = 7.636\%$

Computation of Weighted Average Cost of Capital based on Market Value Weights

Source of Capital	Market Value (₹)	Weights to Total Capital	After tax Cost of capital (%)	WACC (%)
Debentures (6,000 nos. × ₹ 110)	6,60,000	0.45(approx.)	7.636	**3.44** (approx.)
Equity Shares (4,500 nos. × ₹ 180)	8,10,000	0.55(approx.)	13.333	**7.33** (approx.)
	14,70,000	1.00		**10.77** (approx.)

3. The Capital structure of PQR Ltd. is as follows:

	Rs.
10% Debenture	3,00,000
12% Preference Shares	2,50,000
Equity Share (face value Rs. 10 per share)	5,00,000
	10,50,000

Additional Information:
(i) Rs. 100 per debenture redeemable at par has 2% floatation cost & 10 years of maturity. The market price per debenture is Rs. 110.
(ii) Rs. 100 per preference share redeemable at par has 3% floatation cost & 10 years of maturity. The market price per preference share is Rs. 108.
(iii) Equity share has Rs. 4 floatation cost and market price per share of Rs. 25. The next year expected dividend is Rs. 2 per share with annual growth of 5%. The firm has a practice of paying all earnings in the form of dividends.
(iv) Corporate Income Tax rate is 30%. Required:
Calculate Weighted Average Cost of Capital (WACC) using market value weights.

(Jan 2021)

Solution
Workings:

1. Cost of Equity (Ke) = $\frac{D_1}{P_0 - F} + g = \frac{Rs.2}{Rs.25 - Rs.4} + 0.05 = 0.145 \ (approx.)$

2. Cost of Debt (Kd) = $\frac{I\,(1-t) + \frac{(RV - NP)}{n}}{\frac{(RV + NP)}{2}}$

$$= \frac{10\,(1 - 0.3) + \frac{(100 - 98)}{10}}{\frac{(100 + 98)}{2}} = \frac{7 + 0.2}{99} = 0.073 \ (approx.)$$

3. Cost of Preference Shares (Kp) = $\frac{PD + \frac{(RV - N\ )}{n}}{\frac{(RV + NP)}{2}}$

$$= \frac{12 + \frac{(100 - 97)}{10}}{\frac{(100 + 97)}{2}} = \frac{12 + 0.3}{98.5} = 0.125 \ (approx.)$$

Calculation of WACC using market value weights

Source of capital	Market Value	Weights	After tax cost of capital	WACC (Ko)
	(Rs.)	(a)	(b)	(c) = (a) × (b)
10% Debentures (Rs. 110 × 3,000)	3,30,000	0.178	0.073	0.013
12% Preference shares (Rs. 108 × 2,500)				
Equity shares (Rs. 25 × 50,000)	12,50,000	0.676	0.145	0.098
	18,50,000	1.00		**0.129**

WACC (Ko) = 0.129 or 12.9% (approx.)

[Cost of debenture and preference shares has been computed using original issue price unlike Q7. Where Kp is computed considering market price of preference share]

4. Following are the information of TT Ltd.:

Particulars	
Earnings per share	Rs. 10
Dividend per share	Rs. 6
Expected growth rate in Dividend	6%
Current market price per share	Rs. 120
Tax Rate	30%
Requirement of Additional Finance	Rs. 30 lakhs
Debt Equity Ratio (For additional finance)	2:1
Cost of Debt	
0-5,00,000	10%
5,00,001 - 10,00,000	9%
Above 10,00,000	8%

Assuming that there is no Reserve and Surplus available in TT Ltd. You are required to:
(a) Find the pattern of finance for additional requirement
(b) Calculate post tax average cost of additional debt
(c) Calculate cost of equity
(d) Calculate the overall weighted average after tax cost of additional finance.

(Jul 2021)

Answer

(a) Pattern of raising additional finance

Equity   1/3 of Rs. 30,00,000   = Rs. 10,00,000

Debt   2/3 of Rs. 30,00,000   = Rs. 20,00,000

The capital structure after raising additional finance:

Particulars		(Rs.)
Shareholder's Funds		
Equity Capital		10,00,000
Debt (Interest at 10% p.a.)		5,00,000
(Interest at 9% p.a.)		5,00,000
(Interest at 8% p.a.)	(20,00,000–10,00,000)	10,00,000
Total Funds		**30,00,000**

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

$K_d = I (1 - t)$

Where,

I = Interest Rate

t = Corporate tax-rate

On First Rs. 5,00,000 = 10% (1 − 0.3) = 7% or 0.07

On Next Rs. 5,00,000 = 9% (1 − 0.3) = 6.3% or 0.063

On Next Rs. 10,00,000 = 8% (1 − 0.3) = 5.6% or 0.056

Average Cost of Debt

$$= \frac{(₹\,5,00,000 \text{x} 0.07) + (₹\,5,00,000 \text{x} 0.063) + (₹10,00,000 \text{x} 0.056)}{₹\,20,00,000} \times 100 = 6.125\%$$

(c) Determination of cost of equity applying Dividend growth model:

$$K_e = \frac{D_1}{P_0} + g$$

Where,

K_e = Cost of equity

D_1 = $D_0\,(1+ g)$

D_0 = Dividend paid

g = Growth rate = 6%

P_0 = Current market price per share = Rs. 120

$$K_e = \frac{₹\,6(1 + 0.06)}{₹\,120} + 0.06 = \frac{₹\,6.36}{₹\,120} + 0.06 = 0.113 \; or \; 11.3\%$$

Computation of overall weighted average after tax cost of additional finance

Particulars	(Rs.)	Weights	Cost of funds	Weighted Cost (%)
Equity	10,00,000	1/3	11.3%	3.767
Debt	20,00,000	2/3	6.125%	4.083
WACC	30,00,000			**7.85**

(Note: In the above solution different interest rate have been considered for different slab of Debt)

Alternative Solution

(a) Pattern of raising additional finance

Equity   1/3 of Rs. 30,00,000   = ₹ 10,00,000

Debt   2/3 of Rs. 30,00,000   = ₹ 20,00,000

The capital structure after raising additional finance:

Particulars	(₹)
Shareholders' Funds	
Equity Capital	10,00,000
Debt (Interest at 8% p.a.)	20,00,000
Total Funds	**30,00,000**

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

$K_d = I (1 - t)$

Where,

I = Interest Rate

t = Corporate tax-rate

K_d = 8% (1 – 0.3) = 5.6%

(c) Determination of cost of equity applying Dividend growth model:

$$K_e = \frac{D_1}{P_0} + g$$

Where,

K_e = Cost of equity

$D_1 = D_0 (1+ g)$

D_0 = Dividend paid

g = Growth rate =6%

P_0 = Current market price per share = ₹ 120

Then, $K_e = \frac{₹\,6\,(\,1+0.06)}{₹\,120} + 0.6 = \frac{₹\,6.36}{₹\,120} + 0.06 = \mathbf{0.113\ or\ 11.3\%}$

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

Particulars	(₹)	Weights	Cost of funds	Weighted Cost (%)
Equity	10,00,000	1/3	11.3%	3.767
Debt	20,00,000	2/3	5.6%	3.733
WACC	30,00,000			**7.50**

(Note: In the above solution single interest rate have been considered for Debt)

5. A company issues:
   • 15% convertible debentures of Rs. 100 each at par with a maturity period of 6 years.

On maturity, each debenture will be converted into 2 equity shares of the company. The risk - free rate of return is 10%, market risk premium is 18% and beta of the company is 1.25. The company has paid dividend of Rs. 12.76 per share. Five year ago, it paid dividend of Rs. 10 per share. Flotation cost is 5% of issue amount.

- 5% preference shares of Rs. 100 each at premium of 10%. These shares are redeemable after 10 years at par. Flotation cost is 6% of issue amount.

Assuming corporate tax rate is 40%.

(i)   Calculate the cost of convertible debentures using the approximation method.

(ii) Use YTM method to calculate cost of preference shares.

Year	1	2	3	4	5	6	7	8	9	10
PVIF 0.03, t	0.971	0.943	0.915	0.888	0.863	0.837	0.813	0.789	0.766	0.744
PVIF 0.05, t	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
PVIFA 0.03, t	0.971	1.913	2.829	3.717	4.580	5.417	6.230	7.020	7.786	8.530
PVIFA 0.05, t	0.952	1.859	2.723	3.546	4.329	5.076	5.786	6.463	7.108	7.722

Interest rate	1%	2%	3%	4%	5%	6%	7%	8%	9%
FVIF i, 5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539
FVIF i, 6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677
FVIF i, 7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828

(May 2022)

Solution

(i) **Calculation of Cost of Convertible Debentures:**

Given that,

$R_F = 10\%$

$R_m - R_f = 18\%$

$B = 1.25$

$D_0 = 12.76$

$D_{-5} = 10$

Flotation Cost = 5%

Using CAPM,

$K_e = R_f + \beta (R_m - R_f)$

$= 10\% + 1.25\,(18\%)$

$= \mathbf{32.50\%}$

Calculation of growth rate in dividend

$12.76 = 10\,(1+g)^5$

$1.276 = (1+g)^5$

$(1+5\%)^5 = 1.276$ .... from FV Table

   g = **5%**

Price of share after 6 years $= \dfrac{D7}{Ke - g} = \dfrac{12.76\,(1.05)\,7}{0.325 - 0.05}$

$P_6 \dfrac{12.76 \times 1.407}{0.275}$

P_6 = 65.28

Redemption Value of Debenture (RV) = 65.28 × 2 = **130.56** (RV)

NP   = 95

n   = 6

$$K_d = \dfrac{INT(1-t) + \dfrac{(RP - NP)}{N}}{\dfrac{(RP - NP)}{2}} \times 100$$

$$= \dfrac{15.(1 - 0.4) + \dfrac{(130.56 - 95)}{6}}{\dfrac{(130.56 + 95)}{2}} \times 100$$

$$= \dfrac{9 + 5.93}{112.78} \times 100$$

K_d = 13.24%

(ii) Calculation of Cost of Preference Shares:
Net Proceeds = 100 (1.1) - 6% of 100 (1.1)

       = 110 - 6.60

       = 103.40

Redemption Value = 100

Year	Cash Flows (Rs.)	PVF @ 3%	PV (Rs.)	PVF @ 5%	PV (Rs.)
0	103.40	1	103.40	1	103.40
1-10	-5	8.530	-42.65	7.722	-38.61
10	-100	0.744	-74.40	0.614	-61.40
			-13.65		**3.39**

$$K_P = 3\% + \frac{5\% - 3\%}{[3.39 - (-13.65)]} \; X \; 13.65$$

$$= 3\% + \frac{2\%}{17.04} \; X \; 13.65$$

K_p = 4.6021%

6. The following is the extract of the Balance Sheet of M/s KD Ltd.:

Particulars	Amount (Rs.)
Ordinary shares (Face Value Rs. 10/- per share)	5,00,000
Share Premium	1,00,000
Retained Profits	6,00,000
8% Preference Shares (Face Value Rs. 25/- per share)	4,00,000
12% Debentures (Face value Rs. 100/- each)	6,00,000

The ordinary shares are currently priced at Rs. 39 ex-dividend and preference share is priced at Rs. 18 cum-dividend. The debentures are selling at 120 percent ex-interest. The applicable tax rate to KD Ltd. is 30 percent. KD Ltd.'s cost of equity has been estimated at 19 percent. Calculate the WACC (weighted average cost of capital) of KD Ltd. on the basis of market value.

(Nov. 2022)

[Share premium has been treated same as retained earnings]

Solution

(a) Computation of WACC on the basis of market value

W.N. 1

Cum-dividend price of Preference shares = Rs. 18

Less: Dividend (8/100) x 25   = Rs. 2

∴ Market Price of Preference shares   = Rs. 16

$K_p = \frac{2}{16}$ = 0.125 (or) 12.5%

No. of Preference shares   = $\left(\frac{4,00,000}{25}\right)$ = 16,000

W.N. 2

Market price of Debentures = $\left(\frac{120}{100}\right)$ x 100 = ₹ 120

$K_d = \left(\frac{12(1-0.3)}{120}\right) = 0.07$ (or) 7%

No. of Debentures = $\left(\frac{6,00,000}{100}\right)$ = 6,000

W.N.3

Market Price of Equity shares = Rs.39

K_e (given)   = 19% or 0.19

No. of Equity shares $= \dfrac{5,00,000}{10} = 50,000$

Sources	Market Value (Rs.)	Nos.	Total Market value (Rs.)	Weight	Cost of Capital	Product
Equity Shares	39	50,000	19,50,000	0.6664	0.19	0.1266
Preference Shares	16	16,000	2,56,000	0.0875	0.125	0.0109
Debentures	120	6,000	7,20,000	0.2461	0.07	0.0172
					WACC =	0.1547

WACC = 0.1547 or 15.47%

7. Capital structure of D Ltd. as on 31st March, 2023 is given below:

Particulars	Rs.
Equity share capital (Rs. 10 each)	30,00,000
8% Preference share capital (Rs. 100 each)	10,00,000
12% Debentures (Rs. 100 each)	10,00,000

- Current market price of equity share is Rs. 80 per share. The company has paid dividend of Rs. 14.07 per share. Seven years ago, it paid dividend of Rs. 10 per share. Expected dividend is Rs. 16 per share.
- 8% Preference shares are redeemable at 6% premium after five years. Current market price per preference share is Rs. 104.
- 12% debentures are redeemable at 20% premium after 10 years. Flotation cost is Rs. 5 per debenture.
- The company is in 40% tax bracket.
- In order to finance an expansion plan, the company intends to borrow 15% Long-term loan of Rs. 30,00,000 from bank. This financial decision is expected to increase dividend on equity share from Rs. 16 per share to Rs. 18 per share. However, the market price of equity share is expected to decline from Rs. 80 to Rs. 72 per share, because investors' required rate of return is based on current market conditions.

Required:
(i) Determine the existing Weighted Average Cost of Capital (WACC) taking book value weights.
(ii) Compute Weighted Average Cost of Capital (WACC) after the expansion plan taking book value weights.

Interest Rate	1%	2%	3%	4%	5%	6%	7%
FVIFi,5	1.051	1.104	1.159	1.217	1.276	1.338	1.403
FVIFi,6	1.062	1.126	1.194	1.265	1.340	1.419	1.501
FVIFi,7	1.072	1.149	1.230	1.316	1.407	1.504	1.606

(May 2023)

[Cost of preference shares has been computed using market price unlike Q7. Where Kd and Kp is computed considering original issue price]

Solution

(a)   Growth rate in Dividends

14.07 = 10 x FVIF (i,7 years)

FVIF (i,7 years) = 1.407

FVIF (5%, 7 years) = 1.407

i = 5%

Growth rate in dividend= 5%

(b)   Cost of Equity

$Ke = \frac{D_1}{P_0} + g$

$Ke = \frac{16}{80} + 0.05$

Ke = 25%

(c)   Cost of Preference Shares

$Kp = \frac{PD + \frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}}$

$Kp = \frac{8 + \frac{(106-104)}{5}}{\frac{(106+104)}{2}}$

Kp = 8.4/105

Kp = 8%

(d)   Cost of Debt

$Kd = \frac{I(1-t) + \frac{(RV-NP)}{n}}{\frac{(RV+\ \ )}{2}}$

$Kd = \frac{12\,(1-04) + \frac{(120-95)}{10}}{\frac{(120+95)}{2}}$

Kd = (7.2+2.5)/107.5 = 9.02%

Kd = 9.02%

Calculation of existing Weighted Average Cost of Capital (WACC)

Capital	Amount (Rs.)	Weights	Cost	WACC
Equity Share Capital	30,00,000	0.6	25%	15.00%
Preference Share Capital	10,00,000	0.2	8%	1.60%
Debenture	10,00,000	0.2	9.02%	1.80%
	50,00,000	**1**		**18.40%**

Alternative presentation

(i)   **Computation of existing WACC on book value weights**

Source (1)	Book value (Rs.) (2)	Weight (3)	Cost of capital (%) (4)	Product (2) x (4)
Equity share capital	30,00,000	0.60	25	7,50,000
Preference share capital	10,00,000	0.20	8	80,000
Debentures	10,00,000	0.20	9.02	90,200
Total	**50,00,000**	**1.00**		**9,20,200**

WACC = (Product / Total book value) x 100 = (9,20,200 /50,00,000) x 100 = 18.4%

(ii) **Cost of Long Term Debt =** 15% (1-0.4) = 9%

Revised Ke $= \frac{18}{72} + 0.05 = 30\%$

Calculation of WACC after expansion taking book value weights

Capital	Amount	Weights	Cost	W.C
Equity Share Capital	30,00,000	0.3750	30%	11.25%
Preference Share Capital	10,00,000	0.1250	8%	1.00%
Debenture	10,00,000	0.1250	9.02%	1.13%
Long Term Debt	30,00,000	0.3750	9.00%	3.38%
	80,00,000	1.0000		16.76%

Alternative presentation

(i) **Computation of WACC on book value weights after expansion**

Source (1)	Book value (Rs.) (2)	Weight (3)	Cost of capital (%) (4)	Product (2) x (4)
Equity share capital	30,00,000	0.375	30	9,00,000
Preference share capital	10,00,000	0.125	8	80,000
Debentures	10,00,000	0.125	9.02	90,200
Long term loan	30,00,000	0.375	9	2,70,000
Total	**80,00,000**	**1.00**		**13,40,200**

WACC = (Product / Total book value) x 100 = (13,40,200 / 80,00,000) x 100 = 16.76%

8. Z Ltd. wishes to raise additional fund of Rs. 25,00,000 for meeting its investment plan. It has Rs. 5,25,000 in the form of retained earnings available for investment purposes. Further details are as following:

Combination of debt and equity	2:3
Cost of debt	
Upto Rs. 2,50,000	8% (before tax)
Above Rs. 2,50,000 and to upto Rs. 5,00,000	10% (before tax)
Beyond Rs. 5,00,000	12% (after tax)
Earning of company	Rs. 50,00,000
Retention Ratio	40%
Expected growth of dividend	15%
Market price per share	Rs. 500
Number of outstanding equity shares	1,00,000
Tax Rate	30%

You are required to calculate:
i. Cost of debt
ii. Cost of retained earnings and cost of equity
iii. Weighted average cost of capital

(Nov 2023)

Solution

Equity   60% of Rs. 25,00,000 = Rs. 15,00,000
Debt   40% of Rs. 25,00,000 = Rs. 10,00,000

The capital structure after raising additional finance:

		(Rs.)
Shareholders' funds		
Equity Capital	(Rs. 15,00,000 – Rs. 5,25,000)	9,75,000
Retained earnings		5,25,000
Debt (Interest at 8% p.a.)		2,50,000
(Interest at 10% p.a.)	(Rs. 5,00,000 – Rs. 2,50,000)	2,50,000
(Interest at 12% p.a.)	(Rs. 10,00,000 – Rs. 5,00,000)	5,00,000
Total Funds		25,00,000

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

$K_d = I (1 - t)$

Where,

   I = Interest Rate

   t = tax-rate

   On Rs. 2,50,000 = 8% (1 – 0.3) = 5.6% or 0.056

   On Rs. 2,50,000 = 10% (1 – 0.3) = 7% or 0.07

   On Rs. 5,00,000 = 12% or 0.12

Average Cost of Debt

$$= \frac{(Rs.\,2,50,000\ x\ 0.056) + (Rs.\,2,50,000\ x\ 0.07) + (5,00,000\ x\ 1.12)}{Rs.\,10,00,000}\ x\ 100 = 9.15\%$$

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

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

Where,

D_0 = Dividend paid = 60% of EPS = 60% × Rs. 50 = Rs. 30

g   = Growth rate = 15%

P_0 = Current market price per share = Rs. 500

So, K_e or $K_r = \dfrac{Rs.30\,(1+0.05)}{Rs.500}$ + 0.15 = 0.069 + 0.15 = 21.9%

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

Particulars	(Rs.)	Weights	Cost of funds	Weighted Cost (%)
Equity (including retained earnings)	15,00,000	0.60	21.9%	13.14
Debt	10,00,000	0.40	9.15%	3.66
WACC	25,00,000			16.80

Alternative Presentation

Particulars (1)	(Rs.) (2)	Cost of funds (3)	Product (2) x (3)

Equity (including retained earnings)	15,00,000	21.9%	3,28,500
Debt	10,00,000	9.15%	91,500
Total	25,00,000		4,20,000

WACC = (Product / Total book value) x 100 = (4,20,000 / 25,00,000) x 100 = 16.8%

Alternative Solution for 4(ii) and 4(iii)

If we assume expected growth rate of Dividend as 5%.

(i)   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 = 60% of EPS = 60% × Rs. 50 = Rs. 30
g	= Growth rate = 5%
P_0	= Current market price per share = Rs. 500

So, K_e or $K_r = \frac{Rs.30(1+0.05)}{Rs.500} + 0.05 = 0.063 + 0.05 = 11.3\%$

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

Particulars	(Rs.)	Weights	Cost of funds	Weighted Cost (%)
Equity (including retained earnings)	15,00,000	0.60	11.3%	6.78
Debt	10,00,000	0.40	9.15%	3.66
WACC	25,00,000			10.44

Alternative Presentation

Particulars (1)	(Rs.) (2)	Cost of funds (3)	(2) x (3)
Equity (including retained earnings)	15,00,000	11.3%	1,69,500
Debt	10,00,000	9.15%	91,500
Total	25,00,000		2,61,000

WACC = (Product / Total book value) x 100 = (2,61,000 / 25,00,000) x 100 = 10.44%

9.   The capital structure of Shine Ltd. as on 31.03.2024 is as under:

Particulars	Amount (Rs.)
Equity share capital off 10 each	45,00,000
15% Preference share capital of f 100 each	36,00,000
Retained earnings	32,00,000
13% Convertible Debenture off 100 each	67,00,000
11 % Term Loan	20,00,000
Total	2,00,00,000

Additional information:

a. Company issued 13% Convertible Debentures of ` 100 each on 01.04.2023 with a maturity period of 6 years. At maturity, the debenture holders will have an option to convert the debentures into equity shares of the company in the ratio of 1 : 4 (4 shares for each debenture). The market price of the equity share is ` 25 each as on 31.03.2024 and the growth rate of the share is 6% per annum.

b. Preference stock, redeemable after eight years, is currently selling at ` 150 per share.

c. The prevailing default-risk free interest rate on 10-year GOI treasury bonds is 6%. The average market risk premium is 8% and the Beta (β) of the company is 1.54.

Corporate tax rate is 25% and rate of personal income tax is 20%.

You are required to calculate the cost of:

i.   Equity Share Capital

ii.   Preference Share Capital

iii.   Convertible Debenture

iv.   Retained Earnings

v.   Term Loan

(May 2024)

Solution

(a) (i) Cost of Equity Share capital

As per CAPM Model K_e $= R_f + \beta (R_m - R_f)$

R_f $= 6\%$

$\beta = 1.54$

$R_m - R_f$ $= 8\%$

$K_e = 6\% + 1.54(8\%)$

$K_e = \textbf{18.32\%}$

(ii) Cost of Preference Share capital

n	=	8
Net Proceeds (NP)	=	150
Redemption Value (RV)	=	100
Preference Dividend (PD)	=	15

$$K_p = \frac{PD + \dfrac{(RV-NP)}{n}}{\dfrac{(RV+NP)}{2}}$$

$$K_p = \frac{15 + \left(\dfrac{100-150}{8}\right)}{\left(\dfrac{100+150}{2}\right)}$$

K_p = 7%

Alternatively, if we take NP as 100 and RV as 100, then solution can be done in the following way:

Alternatively, if we take NP as 100 and RV as 100, then solution can be done in the following way:

Cost of Preference Share capital

n	=	8
Net Proceeds (NP)	=	100
Redemption Value (RV)	=	150
Preference Dividend (PD)	=	15

$$K_p = \frac{PD + \dfrac{(RV-NP)}{n}}{\dfrac{(RV+NP)}{2}}$$

$$K_p = \frac{15 + \left(\dfrac{150-100}{8}\right)}{\left(\dfrac{150+100}{2}\right)}$$

K_p = 17%

(iii) Cost of convertible debenture

Cash Redemption Value (RV)	= 100
Share Redemption Value (RV):	
Value of share after 5 years	= 25 x (1.06)^5 = 33.46
Share Redemption Value (RV)	= 33.46 X 4=133.82

Therefore, investor will choose share redemption.

Redemption Value (RV)	= 133.82
Net Proceeds (NP)	= 100
n	= 5
Interest (I)	= 13
Tax (t)	= 25%

$$K_d = \frac{I(1-t)+\dfrac{(RV-NP)}{n}}{\dfrac{(RV+NP)}{2}}$$

$$= \frac{13(1-0.25)+\dfrac{(133.82-100)}{5}}{\dfrac{(133.82+100)}{2}}$$

K_d = **14.13%**

(iv) Cost of Retained Earnings

$K_r = K_e (1-t_p) = 18.32\% \times (1-0.20) = $ **14.66%**

We can also take cost of equity as cost of retained earnings,

Accordingly, $K_r = K_e = $ **18.32%**

(v) Cost of Term Loan

= 11% x (1-0.25) = **8.25%**

Chapter -2

LEVERAGE

1. The following data have been extracted from the books of LM Ltd:
   Sales - Rs.100 lakhs
   Interest Payable per annum - Rs. 10 lakhs
   Operating leverage - 1.2
   Combined leverage - 2.16
   You are required to calculate:
   (i)   The financial leverage,
   (ii)   Fixed cost and
   (iii)   P/V ratio

   (May 2018)

Solution

(i)   Calculation of Financial Leverage:
   Combined Leverage (CL) = Operating Leverage (OL) x Financial Leverage (FL)
   2.16   = 1.2 x FL
   FL = 1.8

(ii)   Calculation of Fixed cost:
   Financial Leverage $= \dfrac{EBIT}{EBT \; i.e.EBIT-Interes}$

   $1.8 \quad = \dfrac{EBIT}{EBIT-10,00,000}$

   1.8 (EBIT – 10,00,000) = EBIT

   1.8 EBIT - 18,00,000 = EBIT

   EBIT $= \dfrac{18,00,000}{0.8} =$ Rs. 22,50,000

   Further,   Operating Leverage $= \dfrac{Contribution}{EBIT}$

   $1.2 = \dfrac{Contribution}{Rs.22,50,000}$

   Contribution   = Rs. 27,00,000
   Fixed Cost   = Contribution – EBIT
                   = Rs. 27, 00,000 – Rs. 22,50,000
   Fixed cost   = Rs. 4,50,000

(iii)   Calculation of P/V ratio:

$$\text{P/V ratio} = \frac{Contribution\ (C)}{Sales\ (S)} \times 100 = \frac{27,00,000}{1,00,00,000} \times 100 = 27\%$$

2. Following is the Balance Sheet of Soni Ltd. as on 31st March, 2018 :

Liabilities	Amount in Rs.
Shareholder's Fund	
Equity Share Capital (Rs. 10 each)	25,00,000
Reserve and Surplus	5,00,000
Non-Current Liabilities (12 Debentures)	50,00,000
Current Liabilities	20,00,000
Total	1,00,00,000
Assets	**Amount in Rs.**
Non-Current Assets	60,00,000
Current Assets	40,00,000
Total	1,00,00,000

Additional Information:
(i)   Variable Cost is 60% of Sales.
(ii)   Fixed Cost p.a. excluding interest Rs. 20,00,000.
(iii)   Total Asset Turnover Ratio is 5 times.
(iv)   Income Tax Rate 25% You are required to:
(1)   Prepare Income Statement
(2)   Calculate the following and comment:
(a)   Operating Leverage
(b)   Financial Leverage
(c)   Combined Leverage

(Nov 2018)

Solution
Workings:-
Total Assets   = ₹ 1 crore
Total Asset Turnover Ratio i.e. $\frac{Total\ Sales}{Total\ Assets}$ = 5
Hence, Total Sales = ₹ 1 Crore x 5   = ₹ 5 crore

(1)   **Income Statement**

	(₹ in crore)
Sales	5
Less: Variable cost @ 60%	3
Contribution	2
Less: Fixed cost (other than Interest)	0 .2
EBIT (Earnings before interest and tax)	1.8
Less: Interest on debentures (12% x 50 lakhs)	0 .06
EBT (Earning before tax)	1.74
Less: Tax 25%	0.435

EAT (Earning after tax)	1.305

(2)   **(a)**   **Operating Leverage**

$$Operating\ Leverage = \frac{Contribution}{EBIT} = \frac{2}{1.8} = 1.11$$

It indicates fixed cost in cost structure. It indicates sensitivity of earnings before interest and tax (EBIT) to change in sales at a particular level.

(b)   **Financial Leverage**

$$Financial\ Leverage = \frac{EBIT}{EBT} = \frac{1.8}{1.74} = 1.03$$

The financial leverage is very comfortable since the debt service obligation is small vis-à-vis EBIT.

(c)   **Combined Leverage**

$$Combined\ Leverage = \frac{Contribution}{EBIT}\ X\ \frac{EBIT}{EBT} = 1.11\ x\ 1.03 = 1.15$$

Or

$$\frac{Contribution}{EBT} = \frac{2}{1.74} = 1.15$$

The combined leverage studies the choice of fixed cost in cost structure and choice of debt in capital structure. It studies how sensitive the change in EPS is vis-à-vis change in sales.

The leverages x operating, financial and combined are measures of risk.

3. The capital structure of the Shiva Ltd. consists of equity share capital of Rs. 20,00,000 (Share of Rs. 100 per value) and Rs. 20,00,000 of 10% Debentures, sales increased by 20% from 2,00,000 units to 2,40,000 units, the selling price is Rs. 10 per unit; variable costs amount to Rs. 6 per unit and fixed expenses amount to Rs. 4,00,000. The income tax rate is assumed to be 50%.

(a) You are required to calculate the following:
(i) The percentage increase in earnings per share;
(ii) Financial leverage at 2,00,000 units and 2,40,000 units.
(iii) Operating leverage at 2,00,000 units and 2,40,000 units.
(b) Comment on the behaviour of operating and Financial leverages in relation to increase in production from 2,00,000 units to 2,40,000 units.

(May 2019)

Solution

(a)

Sales in units	2,00,000	2,40,000
	।	(₹)
Sales Value @ ₹ 10 Per Unit	20,00,000	24,00,000
Variable Cost @ ₹ 6 per unit	(12,00,000)	(14,40,000)
Contribution	8,00,000	9,60,000

Fixed expenses	(4,00,000)	(4,00,000)
EBIT	4,00,000	5,60,000
Debenture Interest	(2,00,000)	(2,00,000)
EBT	2,00,000	3,60,000
Tax @ 50%	(1,00,000)	(1,80,000)
Profit after tax (PAT)	1,00,000	1,80,000
No of Share	20,000	20,000
Earnings per share (EPS)	5	9
(i)The percentage Increase in **EPS**	$\frac{4}{5} \times 100 = 80\%$	
(ii) **Financial Leverage** = $\frac{EBIT}{EBT}$	$\frac{₹4,00,000}{₹2,00,000} = 2$	$\frac{₹5,60,000}{₹3,60,000} = 1.56$
(iii) **Operating leverage**= $\frac{Contribution}{EBIT}$	$\frac{₹8,00,000}{₹4,00,000} = 2$	$\frac{₹9,60,000}{₹5,60,000} = 1.71$

(b) When production is increased from 2,00,000 units to 2,40,000 units both financial leverage and operating leverages reduced from 2 to 1.56 and 1.71 respectively. Reduction in financial leverage and operating leverages signifies reduction in business risk and financial risk.

4. The Balance Sheet of Gitashree Ltd. is given below:

Liabilities	(Rs.)
Shareholders' fund	
Equity share capital of Rs. 10 each Rs. 1,80,000	
Retained earnings Rs. 60,000	2,40,000
Non-current liabilities 10% debt	2,40,000
Current liabilities	1,20,000
	6,00,000
Assets	
Fixed Assets	4,50,000
Current Assets	1,50,000
	6,00,000

The company's total asset turnover ratio is 4. Its fixed operating cost is Rs. 2,00,000 and its variable operating cost ratio is 60%. The income tax rate is 30%.
Calculate:
(i)   (a) Degree of Operating leverage.
         (b) Degree of Financial leverage.
         (c) Degree of Combined leverage.
(ii)   Find out EBIT if EPS is (a) Rs. 1 (b) Rs. 2 and (c) Rs. 0.

(Nov 2019)

Solution

Working Notes:

Total Assets =   ₹ 6,00,000

Total Asset Turnover Ratio i.e. $= \frac{Total\ Sales}{Total\ Assets} = 4$

Hence, Total Sales   =   ₹ 6,00,000 x 4 = ₹ 24,00,000

Computation of Profits after Tax (PAT)

Particulars	(₹)
Sales	24,00,000
Less: Variable operating cost @ 60%	14,40,000
Contribution	9,60,000
Less: Fixed operating cost (other than Interest)	2,00,000
EBIT (Earning before interest and tax)	7,60,000
Less: Interest on debt (10% x 2,40,000)	24,000
EBT (Earning before tax)	7,36,000
Less: Tax 30%	2,20,800
EAT (Earning after tax)	5,15,200

(i)   **(a)   Degree of Operating Leverage**

Degree of Operating leverage $= \frac{Contribution}{EBIT} = \frac{9,60,000}{₹\ 7,60,000} = 1.263\ (approx)$

(b)   Degree of Financial Leverage

Degree of Financial Leverage $= \frac{EBIT}{EBT} = \frac{9,60,000}{₹\ 7,60,000} = 1.033\ (approx)$

(c)   Degree of Combined Leverage

Degree of Combined Leverage $= \frac{Contribution}{EBIT} \times \frac{EBIT}{EBT} = \frac{Contribution}{EBT} = \frac{9,60,000}{₹\ 7,60,000} = 1.304\ (approx)$

Or

Degree of Combined Leverage =   Degree of Operating Leverage x Degree of Financial Leverage

=   1.263 x 1.033 = 1.304 (approx.)

(ii)   (a)   If EPS is Re. 1

$EPS = \frac{(EBIT - Interest)(1 - tax)}{No\ of\ equity\ shares}$

Or, $1 = \frac{(EBIT\ ₹24,000)(1 - 0.30)}{18,000}$

Or, EBIT = ₹ 49,714 (approx.)

(b)   If EPS is ₹ 2

$$2 = \frac{(EBIT - ₹24,000)(1 - 0.30)}{18,000}$$

Or, EBIT = ₹ 75,429 (approx.)

(c)   If EPS is ₹ 0

$$1 = \frac{(EBIT - ₹24,000)(1 - 0.30)}{18,000}$$

Or, EBIT = ₹ 24,000

Alternatively, if EPS is 0 (zero), EBIT will be equal to interest on debt i.e. ₹ 24,000.

5. The following data is available for Stone Ltd. :

	(Rs.)
Sales	5,00,000
(-) Variable cost @ 40%	2,00,000
Contribution	3,00,000
(-) Fixed cost	2,00,000
EBIT	1,00,000
(-) Interest	25,000
Profit before tax	75,000

Using the concept of leverage, find out
(i)   The percentage change in taxable income if EBIT increases by 10%.
(ii)   The percentage change in EBIT if sales increases by 10%.
(iii)   The percentage change in taxable income if sales increases by 10%.
Also verify the results in each of the above case.

(Nov 2020)

Solution
(i)   Degree of Financial Leverage = $\frac{EBIT}{EBT}$ = $\frac{Rs.1,00,000}{Rs.75,000}$ = 1.333 times

So, If EBIT increases by 10% then Taxable Income (EBT) will be increased by 1.333 × 10
= 13.33% (approx.)

Verification

Particulars	Amount (Rs.)
New EBIT after 10% increase (Rs. 1,00,000 + 10%)	1,10,000
Less: Interest	25,000
Earnings before Tax after change (EBT)	85,000

Increase in Earnings before Tax = Rs. 85,000 - Rs. 75,000 = Rs. 10,000
So, percentage change in Taxable Income (EBT) = $\frac{Rs.10,000}{Rs.75,000}$ x 100 **= 13.333%, hence verified**

(ii)   Degree of Operating Leverage = $\frac{Contribution}{EBT}$ = $\frac{Rs.3,00,000}{Rs.1,00,000}$ **= 3 times**

So, if sale is increased by 10% then EBIT will be increased by 3 × 10 **= 30%**

Verification

Particulars	Amount (Rs.)
New Sales after 10% increase (Rs. 5,00,000 + 10%)	5,50,000
Less: Variable cost (40% of Rs. 5,50,000)	2,20,000
Contribution	3,30,000

Less: Fixed costs   2,00,000
Earnings before interest and tax after change (EBIT)   1,30,000
Increase in Earnings before interest and tax (EBIT) = Rs. 1,30,000 - Rs. 1,00,000 = Rs. 30,000

So, percentage change in EBIT = $\frac{Rs.30,000}{Rs.1,00,000}$ x100 = **30%, hence verified.**

(iii)   Degree of Combined Leverage = $\frac{Contribution}{EBT}$ = $\frac{Rs.3,00,000}{Rs.75,000}$ = **4 times**

So, if sale is increased by 10% then Taxable Income (EBT) will be increased by 4 × 10 = **40%**
Verification

Particulars	Amount (Rs.)
New Sales after 10% increase (Rs. 5,00,000 + 10%)	5,50,000
Less: Variable cost (40% of Rs. 5,50,000)	2,20,000
Contribution	3,30,000
Less: Fixed costs	2,00,000
Earnings before interest and tax (EBIT)	1,30,000
Less: Interest	25,000
Earnings before tax after change (EBT)	1,05,000
Increase in Earnings before tax (EBT) = Rs. 1,05,000 - Rs. 75,000 = Rs. 30,000	

So, percentage change in Taxable Income (EBT) = $\frac{Rs.30,000}{Rs.75,000}$ x 100 = 40%, hence verified

6. Information of A Ltd. is given below:
    •   Earnings after tax: 5% on sales
    •   Income tax rate: 50%
    •   Degree of Operating Leverage: 4 times
    •   10% Debenture in capital structure: Rs. 3 lakhs
    •   Variable costs: Rs. 6 lakhs
    Required:
    (i)   From the given data complete following statement:

Sales	XXXX
Less: Variable costs	Rs. 6,00,000
Contribution	XXXX
Less: Fixed costs	XXXX
EBIT	XXXX
Less: Interest expenses	XXXX
EBT	XXXX
Less: Income tax	XXXX
EAT	XXXX

    (ii)   Calculate Financial Leverage and Combined Leverage.
    (iii)   Calculate the percentage change in earning per share, if sales increased by 5%.

(Dec. 2021)

Solution

(i) **Working Notes**

Earning after tax (EAT)is 5% of salesIncome tax is 50%

So, EBT is 10% of Sales

Since Interest Expenses is Rs. 30,000

EBIT = 10% of Sales + Rs.30,000 .... (Equation i)

Now Degree of operating leverage = 4

So, $\frac{Contribution}{EBIT} = 4$

Or, Contribution = 4 EBIT
Or, Sales – Variable Cost = 4 EBIT

Or, Sales – Rs. 6,00,000 = 4 EBIT .... (Equation ii)

Replacing the value of EBIT of equation (i) in Equation (ii) We get, Sales – Rs. 6,00,000 = 4 (10% of Sales + Rs. 30,000) Or, Sales – Rs. 6,00,000 = 40% of Sales + Rs. 1,20,000

Or, 60% of Sales = Rs. 7,20,000

So, Sales = $\frac{₹\,7,20,000}{60\%} = ₹\,12,00,000$

Contribution = Sales – Variable Cost = Rs. 12,00,000 – Rs. 6,00,000 = Rs. 6,00,000

EBIT = $\frac{₹\,6,00,000}{4} = ₹\,1,50,000$

Fixed Cost = Contribution – EBIT = Rs. 6,00,000 – Rs. 1,50,000 = Rs. 4,50,000

EBT = EBIT – Interest = Rs. 1,50,000 – Rs. 30,000 = **Rs. 1,20,000**
EAT = 50% of Rs. 1,20,000 = Rs. 60,000

Income Statement

Particulars	(Rs.)
Sales	**12,00,000**
Less: Variable cost	6,00,000
Contribution	6,00,000
Less: Fixed cost	4,50,000
EBIT	**1,50,000**
Less: Interest	30,000
EBT	**1,20,000**
Less: Tax (50%)	60,000
EAT	60,000

(ii) Financial Leverage = $\frac{EBIT}{EBT} = \frac{1,50,000}{1,20,000} = 1.25\ Times$

Combined Leverage = Operating Leverage × Financial Leverage

$$= 4 \times 1.25 = \textbf{5 times}$$

Or,

Combined Leverage $= \dfrac{Contribution}{EBIT} \; x \; \dfrac{EBIT}{EBT}$

Combined Leverage $= \dfrac{Contribution}{EBT} = \dfrac{₹\,6,00,000}{₹\,1,20,000} = 5 \; times$

(iii) Percentage Change in Earnings per share

Combined Leverage $= \dfrac{\%\,Change\;in\;EPS}{\%\,chang\;\;in\;Sales} = 5 = \dfrac{\%\,chang\;\;in\;EPS}{5\%}$

$\therefore$ % Change in EPS = **25%**

Hence, if sales increased by 5 %, EPS will be increased by 25 %.

7. The information related to XYZ Company Ltd. for the year ended 31st March, 2020 are as follows:

Equity Share Capital of Rs. 100 each	Rs. 50 Lakhs
12% Bonds of Rs. 1000 each	Rs. 30 Lakhs
Sales	Rs. 84 Lakhs
Fixed Cost (Excluding Interest)	Rs. 7.5 Lakhs
Financial Leverage	1.39
Profit-Volume Ratio	25%
Market Price per Equity Share	Rs. 200
Income Tax Rate Applicable	30%

You are required to compute the following:

(i)   Operating Leverage

(ii)   Combined Leverage

(iii)   Earning per share

(iv)   Earning Yield

(Jan 2021)

Solution

Workings:

1.   **Profit Volume Ratio** $= \dfrac{Contribution}{Sales} \times 100$

So, $25 = \dfrac{Contribution}{Rs.84,00,000} \times 100$

Contribution $= \dfrac{Rs.84,00,000 \; x \; 25}{100} = $ Rs. 21,00,000

2.   **Financial leverage** $= \dfrac{EBIT}{EBT}$

Or, 1.39 $= \dfrac{Rs.13,50,000 \; (as \; Calculated \; above)}{EBT}$

EBT   = Rs. 9,71,223

3. Income Statement

Particulars	(Rs.)
Sales	84,00,000
Less: Variable Cost (Sales - Contribution)	(63,00,000)
Contribution	21,00,000
Less: Fixed Cost	(7,50,000)
EBIT	13,50,000
Less: Interest (EBIT - EBT)	(3,78,777)
EBT	9,71,223
Less: Tax @ 30%	(2,91,367)
Profit after Tax (PAT)	6,79,856

(i) Operating Leverage $= \dfrac{Contribution}{Earnings\ before\ interest\ and\ tax\ (EBI)}$

$$= \dfrac{Rs.21,00,000}{Rs.13,50,000} = \textbf{1.556 (approx.)}$$

(ii) Combined Leverage = Operating Leverage x Financial Leverage
= 1.556 x 1.39 **= 2.163 (approx.)**

Or, $\dfrac{Contribution}{EBT}$ $\quad$ $\dfrac{Rs.21,00,000}{Rs.9,71,223} = \textbf{2.162 (approx.)}$

(iii) Earnings per Share (EPS)
EPS $= \dfrac{PAT}{No.of\ Share} = \dfrac{Rs.6,79,856}{50,000} = \boldsymbol{Rs.\,13.597}$

(iv) Earning Yield
$\dfrac{EPS}{Market\ price}$ x 100 $= \dfrac{Rs.13.597}{Rs.200}$ x 100 **= 6.80%** (approx.)

Note: The question has been solved considering Financial Leverage given in the question as the base for calculating total interest expense including the interest of 12% Bonds of Rs. 30 Lakhs. The question can also be solved in other alternative ways.

8. A company had the following balance sheet as on 31st March, 2021:

Liabilities	Rs. in Crores	Assets	Rs. in Crores
Equity Share Capital (75 lakhs Shares of Rs. 10 each)	7.50	Building	12.50
Reserves and Surplus	1.50	Machinery	6.25
15% Debentures	15.00	Current Assets	
Current Liabilities	6.00	Stock	3.00
		Debtors	3.25
		Bank Balance	5.00
	30.00		30.00

The additional information given is as under:
Fixed cost per annum (excluding interest)   Rs. 6 crores

Variable operating cost ratio	60%
Total assets turnover ratio	2.5
Income-tax rate	40%

Calculate the following and comment:

(i)   Earnings per share
(ii)   Operating Leverage
(iii)   Financial Leverage
(iv)   Combined Leverage

(Jul 2021)

Solution

Total Assets   = Rs. 30 crores
Total Asset Turnover Ratio = 2.5
Hence, Total Sales = 30 x 2.5 = Rs. 75 crores

Computation of Profit after Tax (PAT)

Particulars	(Rs. in crores)
Sales	75.00
Less: Variable Operating Cost @ 60%	45.00
Contribution	30.00
Less: Fixed Cost (other than Interest)	6.00
EBIT/PBIT	24.00
Less: Interest on Debentures (15% □ 15)	2.25
EBT/PBT	21.75
Less: Tax @ 40%	8.70
EAT/ PAT	13.05

(i)   Earnings per Share

$$EPS = \frac{PAT}{Number\ of\ Equity\ Share} = \frac{13.05}{0.75} = ₹\ 17.40$$

It indicates the amount the company earns per share. Investors use this as a guide while valuing the share and making investment decisions. It is also an indicator used in comparing firms within an industry or industry segment.

(ii)   Operating Leverage

$$Operating\ Leverage = \frac{Contribution}{EBIT} = \frac{30}{24} = 1.25$$

It indicates the choice of technology and fixed cost in cost structure. It is level specific. When firm operates beyond operating break-even level, then operating leverage is low. It indicates sensitivity of earnings before interest and tax (EBIT) to change in sales at a particular level.

(iii)   Financial Leverage

$$Financial\ Leverage = \frac{EBIT}{PBT} = \frac{24}{21.75} = 1.103$$

The financial leverage is very comfortable since the debt service obligation is small vis-à-vis EBIT.

(iv) Combined Leverage

Combined Leverage = $\dfrac{Contribution}{PBT}$ = $\dfrac{30}{21.75}$ = 1.379

Or,

= Operating Leverage × Financial Leverage

= 1.25 x 1.103 = 1.379

The combined leverage studies the choice of fixed cost in cost structure and choice of debt in capital structure. It studies how sensitive the change in EPS is vis-à-vis change in sales. The leverages operating, financial and combined are used as measurement of risk.

9. Details of a company for the year ended 31st March, 2022 are given below:

Sales	Rs. 86 lakhs
Profit Volume (P/V) Ratio	35%
Fixed Cost excluding interest expenses	Rs. 10 lakhs
10% Debt	Rs. 55 lakhs
Equity Share Capital of Rs. 10 each	Rs. 75 lakhs
Income Tax Rate	40%

Required:

(i) Determine company's Return on Capital Employed (Pre-tax) and EPS.

(ii) Does the company have a favourable financial leverage?

(iii) Calculate operating and combined leverages of the company.

(iv) Calculate percentage change in EBIT, if sales increases by 10%.

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

(May 2022)

Solution

Income Statement

Particulars	Amount (Rs.)
Sales	86,00,000
Less: Variable cost (65% of 86,00,000)	55,90,000
Contribution (35% of 86,00,000)	30,10,000
Less: Fixed costs	10,00,000
Earnings before interest and tax (EBIT)	20,10,000
Less: Interest on debt (@ 10% on Rs. 55 lakhs)	5,50,000
Earnings before tax (EBT)	14,60,000
Tax (40%)	5,84,000
PAT	8,76,000

(i) **ROCE (Pre-tax) =** $\dfrac{EBIT}{Capital\ employed}\ x\ 100\ =\ \dfrac{EBIT}{Equity+Debt}\ x\ 100$

$\dfrac{₹\ 20,10,000}{₹\ (75,00,000+55,00,000)}\ x\ 100\ =\ 15.46\ \%$

EPS (PAT/No. of equity shares) **1.168 or Rs. 1.17**

(ii) ROCE is 15.46% and Interest on debt is 10%. Hence, it has a **favourable financialleverage.**

(iii) Calculation of Operating, Financial and Combined leverages:

Operating Leverage $= \dfrac{Contribution}{EBIT} = \dfrac{₹\,30,10,000}{₹\,20,10,000} = 1.497\,(approx).$

Financial Leverage $= \dfrac{EBIT}{EBIT} = \dfrac{₹\,30,10,000}{₹\,14,60,000} = 1.377\,(approx).$

Combined Leverage $= \dfrac{Contributon}{EBT} = \dfrac{₹\,30,10,000}{₹\,14,60,000} = 2.062\,(approx).$

Or, = Operating Leverage × Financial Leverage = 1.497 × 1.377 **= 2.06 (approx.)**

(iv) Operating leverage is 1.497. So, if sales are increased by 10%.
EBIT will be increased by 1.497 × 10% i.e. 14.97% (approx.)

(v) Since the combined Leverage is 2.062, sales have to drop by 100/2.062 i.e. 48.50% tobring EBT to Zero.

Accordingly, New Sales   = ₹ 86,00,000 × (1 - 0.4850)

         = Rs. 86,00,000 × 0.515

         = Rs. 44,29,000 (approx.)

Hence, at Rs. 44,29,000 sales level, EBT of the firm will be equal to Zero.

10. The following information is available for SS Ltd.

Profit volume (PV) ratio	30%
Operating leverage	2.00
Financial leverage	1.50
Loan	Rs. 1,25,000
Post-tax interest rate	5.6%
Tax rate	30%
Market Price per share (MPS)	Rs. 140
Price Earnings Ratio (PER)	10

You are required to:

(1) Prepare the Profit-Loss statement of SS Ltd. And

(2) Find out the number of equity shares.

(Nov. 2022)

Solution

(1) **Preparation of Profit – Loss StatementWorking Notes:**

1.	Post tax interest	5.60%
	Tax rate	30%
	Pre tax interest rate = (5.6/70) x 100	8%
	Loan amount	Rs. 1,25,000
	Interest amount = 1,25,000 x 8%	Rs. 10,000

Financial Leverage (FL) $= \left(\dfrac{EBIT}{EBT}\right) = \left(\dfrac{EBIT}{EBIT - Interest}\right) = \left(\dfrac{EBIT}{(EBIT - 10,000)}\right)$

$1.5 = \left(\dfrac{EBIT}{(EBIT - 10,000)}\right)$

1.5 EBIT -15000 = EBIT

1.5 EBIT – EBIT = 15,000

0.5 EBIT = 15,000

∴ EBIT = Rs. 30,000
EBT = EBIT – Interest = 30,000 – 10,000 = Rs. 20,000

2.   Operating Leverage (OL) $= \dfrac{Contribution}{EBIT}$

$2 = \dfrac{Contribution}{30,000}$

Contribution   = Rs. 60,000

3.,   **Fixed cost** = Contribution – Profit

= 60,000 – 30,000 = **Rs. 30,000**

4.   **Sales** $= \dfrac{Contribution}{PV\ Ratio}$

$\dfrac{60,000}{30\%} = ₹\,1,40,000$

5.   If PV ratio is 30%, then the variable cost is 70% on sales.
          ∴**Variable cost** = 2,00,000 x 70% = ₹ **1,40,000**

Profit – Loss Statement

Particulars	₹
Sales	2,00,000
Less: Variable cost	1,40,000
Contribution	60000
Less: Fixed cost	30,000
EBIT	30,000
Less: Interest	10,000
EBT	20,000
Less: Tax @ 30%	6,000
EAT	**14,000**

(2) Calculation of no. of Equity shares
Market Price per Share (MPS) = Rs.140
Price Earnings Ratio (PER) = 10

WKT,

EPS = $\frac{MPS}{PER}$ = $\frac{140}{10}$ = ₹ 14

Total earnings (EAT) = Rs. 14,000

∴ No. of Equity Shares = 14,000 / 14 = **1000**

11. Following information is given for X Ltd.:

Total contribution (Rs.)	4,25,000
Operating leverage	3.125
15% Preference shares (Rs. 100 each)	1,000
Number of equity shares	2,500
Tax rate	50%

Calculate EPS of X Ltd., if 40% decrease in sales will result EPS to zero.

(May 2023)

Solution

(i)   Operating Leverage (OL) = $\frac{Contribution}{EBIT}$ or, 3.125 = $\frac{Rs.4,25,000}{EBIT}$ Or EBIT = Rs. 1,36,000

(ii)   Degree of Combined Leverage (CL) = $\frac{\% \ Change \ in \ EPS}{\% \ Change \ in \ Sales}$ = $\frac{100}{40}$ = 2.5

(iii)   Combined Leverage = OL × FL = 3.125 × FL
       So, Financial Leverage = 2.5 /3.125 = 0.8

(iv)   Financial Leverage = $\frac{EBIT}{EBT}$ = $\frac{1,36,000}{EBT}$ = 0.8
       So, EBT = $\frac{1,36,000}{0.80}$ = Rs. 1,70,000

Calculation of EPS of X Ltd

Particulars	(Rs.)
EBT	1,70,000
Less: Tax (50%)	85,000
EAT	85,000
Preference Dividend	15,000
Net Earnings for Equity Shareholders	70,000
Number of equity shares	2,500
EPS	28

12. The following details of Shiva Ltd. for the year ended 31 st March,2023 are given below:

Operating Leverage	1.4
Combined Leverage	2.8
Fixed Cost (Excluding Interest)	Rs. 2.04 lakhs
Sales	Rs. 30 lakhs
12% Debentures of Rs. 10 each	Rs. 21.25 lakhs
Equity Share Capital of Rs. 10 each	Rs. 17.00 lakhs

Income Tax Rate	30%

Required:
(i)   Calculate P/V ratio and Earning Per Share (EPS)
(ii)   If the company belongs to an industry, whose assets turnover is 1.5, does it have a high or low assets turnover?
(iii) Financial Leverage

(Nov 2023)

Solution

(i)   P/V Ratio and Earning per share (EPS)

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

$1.4 \quad = \dfrac{C}{C - 2,04,000}$

Or, C = 1.4 (C – 2,04,000)
Or, C = 1.4 C – 2,85,600
Or, Contribution = Rs. 7,14,000

Now, P/V ratio = $\dfrac{Contribution\ (C)}{Sales\ (S)} \times 100 = \dfrac{7,14,000}{30,00,000} \times 100 = 23.8\%$

Therefore, P/V Ratio = 23.80%

EBT = Contribution – Fixed Cost – Interest
       = Rs. 7,14,000 – Rs. 2,04,000 – (12% × Rs. 21,25,000)
       = Rs. 5,10,000 – Rs. 2,55,000
       = Rs. 2,55,000

PAT = EBT(1-T) = Rs. 2,55,000(1-0.3) = Rs. 1,78,500

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

EPS = $\dfrac{Rs.1,78,500}{1,70,000\ shares}$ = Rs. 1.05

(ii)   Assets turnover

Assets turnover = $\dfrac{Sales}{Total\ Assets*} = \dfrac{Rs.30,00,000}{Ra.17,00,000 + Rs.21,25,000}$ = 0.7843

0.7843 < 1.5 means lower than industry turnover.
*Total Asset = Equity share capital + 12% Debentures

(iii)   Financial leverage

Combined Leverage	= Operating Leverage (OL) x Financial Leverage (FL)
2.8	= 1.4 x FL
Or, FL	= 2
Financial Leverage	= 2

13. Alpha Limited has provided following information:

Equity Share Capital	25,000 Shares @ Rs. 100 per Share
15% Debentures	10,000 Debentures @ Rs. 750/- per Debenture
Sales	50 Lakhs units @ Rs. 20 per unit
Variable Cost	Rs. 12.50 per unit
Fixed Costs	Rs. 175.00 Lakhs

Due to recent policy changes and entry of foreign competitors in the sector, Alpha Limited expects the sales may decline by 15-20%, However, selling price and other costs will remain the same. Corporate Taxes will continue@20%.

You are required to calculate the decrease in Earnings per share, Degree of Operating Leverage and Financial Leverage separately if sales are declined by (i) 15%; and (ii) 20%;

(May 2024)

Solution

Income Statement with required calculations

Particulars	(₹) Existing	(₹) Sales declined by 15%	(₹) Sales declined by 20%
Sales in units	50,00,000	42,50,000	40,00,000
Sales price per unit	20	20	20
Variable Cost per unit	(12.50)	(12.50)	(12.50)
Contribution per unit	7.5	7.5	7.5
Contribution	3,75,00,000	3,18,75,000	3,00,00,000
Fixed expenses	(1,75,00,000)	(1,75,00,000)	(1,75,00,000)
EBIT	2,00,00,000	1,43,75,000	1,25,00,000
Debenture Interest	(11,25,000)	(11,25,000)	(11,25,000)
EBT	1,88,75,000	1,32,50,000	1,13,75,000
Tax @ 20%	(37,75,000)	(26,50,000)	(22,75,000)
Profit after tax (PAT)	1,51,00,000	1,06,00,000	91,00,000
No. of shares	25,000	25,000	25,000
Earnings per share (EPS) $= \dfrac{PAT}{No.\ of\ shares}$	$\dfrac{₹1,51,00,000}{25,000}$ $= ₹604$	$\dfrac{₹1,06,00,000}{25,000}$ $= ₹424$	$\dfrac{₹91,00,000}{25,000}$ $= ₹364$
(i) Decrease in EPS		$= ₹180$ **Or** % Decrease in EPS $= \dfrac{180}{604} \times 100$ $= 29.80\%$	$= ₹240$ **Or** % Decrease in EPS $= \dfrac{240}{604} \times 100$ $= 39.73\%$
(ii) Operating leverage $= \dfrac{Contribution}{EBIT}$ Or		$= \dfrac{₹3,18,75,000}{₹1,43,75,000}$ $= 2.22$ **Or** $28.125/15 =$	$= \dfrac{₹3,00,00,000}{₹1,25,00,000}$ $= 2.40$ **Or** $37.50/20$ **1.875**

Degree of Operating leverage $= \dfrac{\text{Percentage change in EBIT}}{\text{Percentage change in sales}}$		**1.875**	
(iii) Financial Leverage $= \dfrac{\text{EBIT}}{\text{EBT}}$ Or Degree of Financial Leverage $= \dfrac{\text{Percentage change in EPS}}{\text{Percentage change in EBIT}}$		$= \dfrac{₹1,43,75,000}{₹1,32,50,000}$ **= 1.08** **Or** 29.80/28.125 **= 1.06**	$= \dfrac{₹1,25,00,000}{₹1,13,75,000}$ **= 1.10** **Or** 39.735/37.50 **= 1.06**

1. Stopgo Ltd, an all equity financed company, is considering the repurchase of Rs. 200 lakhs equity and to replace it with 15% debentures of the same amount. Current market Value of the company is Rs. 1140 lakhs and it's cost of capital is 20%. It's Earnings before Interest and Taxes (EBIT) are expected to remain constant in future. It's entire earnings are distributed as dividend. Applicable tax rate is 30 per cent.

    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) Hypothesis:

    (i)   The market value of the company

    (ii)   It's cost of capital, and

    (iii)   It's cost of equity

                                                                                    (May 2018)

Solution

Working Note

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

$$\frac{Net\ income\ (NI)\ for\ equity\ holders}{0.20} = \text{Rs. 1,140 lakhs}$$

Therefore, Net Income to equity–holders = Rs. 228 lakhs

EBIT = Rs. 228 lakhs / 0.7 = Rs. 325.70 lakhs

	All Equity (Rs. In lakhs)	Debt of Equity (Rs. In lakhs)
EBIT	325.70	325.70
Interest on Rs.200 lakhs @ 15%	--	30.00
EBT	325.70	295.70
Tax @ 30 %	97.70	88.70
Income available to equity holders	228	207

(i)   Market value of levered firm = Value of unlevered firm + Tax Advantage

                    = Rs. 1,140 lakhs + (Rs.200 lakhs x 0.3)

                            = Rs. 1,200 lakhs

The impact is that the market value of the company has increased by Rs. 60 lakhs (Rs. 1,200 lakhs – Rs. 1,140 lakhs)

Calculation of Cost of Equity

K_e = (Net Income to equity holders / Equity Value) X 100

= (207 lakhs / 1200 lakhs – 200 lakhs) X 100

= (207/ 1000) X 100

= 20.7 %

(ii)   Cost of Capital

Components	Amount (Rs. In	Cost of Capital	Weight	WACC %

	lakhs)	%		
Equity	1000	20.7	83.33	17.25
Debt	200	(15% X 0.7) =10.5	16.67	1.75
	1200			19.00

The impact is that the WACC has fallen by 1% (20% - 19%) due to the benefit of tax relief on debt interest payment.

(iii)   Cost of Equity is 20.7% [As calculated in point (i)]

The impact is that cost of equity has risen by 0.7% i.e. 20.7% - 20% due to the presence of financial risk.

Further, Cost of Capital and Cost of equity can also be calculated with the help of formulas as below, though there will be no change in final answers.

Cost of Capital (K_o) = K_{eu}(1-tL) Where,

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

T = Tax rate

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

$K_o = 0.2 \times \left(1 - \frac{Rs.200\ lakh}{Rs.1,200\ lak} \times 0.3\right)$

So, Cost of capital = 0.19 or 19%

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

Where,

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

K_d = Cost of debt

t   = Tax rate

$K_e = 0.20 + \left((0.20 - 0.15)x\ \frac{Rs.200\ lakh\ x\ 0.7}{Rs.1,000\ lakh}\right)$

K_e = 0.20 + 0.007 = 0.207 or 20.7%

So, Cost of Equity = 20.70%

2.   Sun Ltd. is considering two financing plans. Details of which are as under:

(i)   Fund's requirement – Rs. 100 Lakhs

(ii)   Financial Plan

Plan	Equity	Debt
I	100%	-
II	25%	75%

(iii)   Cost of debt – 12% p.a.

(iv)   Tax Rate – 30%

(v)   Equity Share Rs. 10 each, issued at a premium of Rs. 15 per share

(vi)   Expected Earnings before Interest and Taxes (EBIT) Rs. 40 Lakhs

You are required to compute:

(i)   EPS in each of the plan

(ii)   The Financial Break Even Point

(iii)   Indifference point between Plan I and II

(May 2018)

Solution

Computation of Earnings Per Share (EPS)

Plans	I (₹)	II (₹)
Earnings before interest & tax (EBIT)	40,00,000	40,00,000
Less: Interest charges (12% of ₹75 lakh)	--	(9,00,000)
Earnings before tax (EBT)	40,00,000	31,00,000
Less: Tax @ 30%	(12,00,000)	(9,30,000)
Earnings after tax (EAT)	28,00,000	21,70,000
No. of equity shares (@₹10+₹15)	4,00,000	1,00,000
E.P.S (₹)	7.00	21.70

(ii) Computation of Financial Break-even Points

Plan 'I' = 0 – Under this plan there is no interest payment, hence the financial break- even point will be zero.

Plan 'II' = ₹ 9,00,000 - Under this plan there is an interest payment of ₹9,00,000, hence the financial break -even point will be ₹9 lakhs

(iii) Computation of Indifference Point between Plan I and Plan II:

Indifference point is a point where EBIT of Plan-I and Plan-II are equal. This can be calculated by applying the following formula:

$\{(EBIT - I_1)(1 - T)\} / E_1 = \{(EBIT - I_2)(1 - T)\} / E_2$

So $\dfrac{EBIT\ (1-0.3)}{4,00,000\ shares} = \dfrac{(EBIT - ,00,000)(1-0.3)}{1,00,000\ Shares}$

Or, 2.8 EBIT – 25,20,000 = 0.7EBIT

Or, 2.1EBIT = 25,20,000

EBIT   =12,00,000

3.   Y Limited requires Rs. 50,00,000 for a new project. This project is expected to yield earnings before interest and taxes of Rs. 10,00,000. While deciding about the financial plan, the company considers the objective of maximizing earnings per' share. It has two alternatives to finance the project - by raising debt Rs. 5,00,000 or Rs. 20,00,000 and the balance, in each case, by issuing Equity Shares. The company's share is currently selling at Rs. 300, but is expected to decline to Rs. 250 in case the funds are borrowed in excess of Rs. 20,00,000. The funds can be borrowed at the rate of 12 percent upto Rs. 5,00,000 and at 10 percent over Rs. 5,00,000. The tax rate applicable to the company is 25 percent. Which form of financing should the company choose?

(Nov 2018)

Solution

Plan I =   Raising Debt of Rs 5 lakh + Equity of Rs 45 lakh.

Plan II=   Raising Debt of Rs. 20 lakh + Equity of Rs. 30 lakh.

Calculation of Earnings per share (EPS)

Particulars	Financial Plans	
	Plan I	Plan II
	Rs.	Rs.
Expected EBIT	10,00,000	10,00,000
Less: Interest (Working Note 1)	(60,000)	(2,10,000)

Earnings before taxes	9,40,000	7,90,000
Less: Taxes @ 25%	(2,35,000)	(1,97,500)
Earnings after taxes (EAT)	7,05,000	5,92,500
Number of shares (Working Note 2)	15,000	10,000
Earnings per share (EPS)	47	59.25

Financing Plan II (i.e. Raising debt of Rs. 20 lakh and issue of equity share capital of Rs. 30 lakh) is the option which maximises the earnings per share.

Working Notes:
1. **Calculation of interest on Debt.**
    Plan I   (Rs. 5,00,000 x 12%)   Rs. 60,000
    Plan II   (Rs. 5,00,000 x 12%)   Rs. 60,000   Rs. 2,10,000
                (Rs. 15,00,000 x 10%)   Rs. 1,50,000

2. **Number of equity shares to be issued**

    Plan I: $\dfrac{Rs.45,00,000}{Rs.300 \text{ (Market Price of share)}}$ = 15,000 shares

    Plan II: $\dfrac{Rs.30,00,000}{Rs.300 \text{ (Market Price of share)}}$ = 10,000 shares

(*Alternatively, interest on Debt for Plan II can be 20,00,000 X 10% i.e. Rs. 2,00,000. accordingly, the EPS for the Plan II will be Rs.60)

4. The following data relate to two companies belonging to the same risk class :

Particulars	A Ltd.	B Ltd.
Expected Net Operating Income	Rs. 18,00,000	Rs. 18,00,000
12% Debt	Rs. 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.

(Nov 2018)

Solution
(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 (Vu) = [NOI/ke] = 18,00,000/0.18 = ₹ 1,00,00,000
Ke of Unlevered Firm (given) = 0.18
Ko of Unlevered Firm (Same as above = ke as there is no debt) =
0.18 Market Value of 'A Ltd' [Levered Firm (I)]

Total Value of Levered Firm (VL) = Vu + (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 (ko)	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 (ko)]* ko = (ke×S/V) + (kd×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	81,60,000			0.18

*Kd = 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 (Vu) = [NOI (1 - t)/ke] = 18,00,000 (1 – 0.40)] / 0.18
₹60,00,000

Ke of unlevered Firm (given) = 0.18

Ko of unlevered Firm (Same as above = ke as there is no debt) = 0.18

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

Total Value of Levered Firm (VL) = Vu + (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. Ke = Ko)

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 (ko)* ko = (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

*Kd= 12% (1- 0.4) = 12% × 0.6 = 7.2%
WACC = 13.23%

5. J Ltd. is considering three financing plans. The-key information is as follows:
    (a)   Total investment to be raised Rs. 4,00,000.
    (b)   Plans showing the Financing Proportion:

Plans	Equity	Debt	Preference Shares
X	100%	-	-
Y	50%	50%	-
Z	50%	-	50%

    (c)   Cost of Debt   10%
           Cost of preference shares   10%
    (d)   Tax Rate   50%
    (e)   Equity shares of the face value of Rs.10 each will be issued at a premium of Rs. 10 per share.
    (f)   Expected EBIT is Rs. 1,00,000.

    You are required to compute the following for each plan :
    (i)   Earnings per share (EPS)
    (ii)   Financial break even point
    (iii) Indifference Point between the plans and indicate if any of the plans dominate.

                                                                    (Nov 2020)

6. Earnings before interest and tax of a company are Rs. 4,50,000. Currently the company has 80,000 Equity shares of Rs. 10 each, retained earnings of Rs. 12,00,000. It pays annual interest of Rs. 1,20,000 on 12% Debentures. The company proposes to take up an expansion scheme for which it needs additional fund of Rs. 6,00,000. It is anticipated that

after expansion, the company will be able to achieve the same return on investment as at present.

It can raise fund either through debts at rate of 12% p.a. or by issuing Equity shares at par. Tax rate is 40%.

Required:

Compute the earning per share if:

(i)   The additional funds were raised through debts.

(ii)   The additional funds were raised by issue of Equity shares.

Advise whether the company should go for expansion plan and which sources of finance should be preferred.

(Dec. 2021)

Solution

Working Notes:

(1)   Capital employed before expansion plan:

	(Rs.)
Equity shares (Rs. 10 × 80,000 shares)	8,00,000
Debentures {(Rs. 1,20,000/12) x 100}	10,00,000
Retained earnings	12,00,000
Total capital employed	**30,00,000**

(2) **Earnings before interest and tax (EBIT)** = 4,50,000

(3)   Return on Capital Employed (ROCE):

$$\text{ROCE} = \frac{EBIT}{Capital\ employed} \times 100 = \frac{4,50,000}{30,00,000} \times 100 = 15\%$$

(4) Earnings before interest and tax (EBIT) after expansion scheme:

After expansion, capital employed = Rs. 30,00,000 + Rs. 6,00,000 = Rs. 36,00,000

Desired EBIT   = 15% x Rs. 36,00,000 = **Rs. 5,40,000**

(i) & (ii)   Computation of Earnings Per Share (EPS) under the following options:

	Present situation	Expansion scheme Additional funds raised as	
		Debt (i)	Equity (ii)
	(Rs.)	(Rs.)	(Rs.)
Earnings before Interest and Tax (EBIT)	4,50,000	5,40,000	5,40,000
Less: Interest - Old Debt	1,20,000	1,20,000	1,20,000
- New Debt	--	**72,000** (Rs. 6,00,000 x 12%)	--
Earnings before Tax (EBT)	3,30,000	3,48,000	4,20,000
Less: Tax (40% of EBT)	1,32,000	1,39,200	1,68,000

PAT/EAT	1,98,000	**2,08,800**	**2,52,000**
No. of shares outstanding	80,000	80,000	1,40,000
Earnings per Share (EPS)	2.475 $\left(\frac{1,98,000}{80,000}\right)$	**2.610** $\left(\frac{2,08,000}{80,000}\right)$	**1.800** $\left(\frac{2,52,000}{80,000}\right)$

Advise to the Company: When the expansion scheme is financed by additional debt, the EPS is higher. Hence, the company **should finance the expansion** scheme by **raising debt**.

7. A Limited and B Limited are identical except for capital structures. A Ltd. has 60 per cent debt and 40 per cent equity, whereas B Ltd. has 20 per cent debt and 80 per cent equity. (All percentages are in market-value terms.) The borrowing rate for both companies is 8 per cent in a no-tax world, and capital markets are assumed to be perfect.

   (a) (i) If X, owns 3 per cent of the equity shares of A Ltd., determine his return if the Company has net operating income of Rs. 4,50,000 and the overall capitalization rate of the company, (Ko) is 18 per cent.
   (ii) Calculate the implied required rate of return on equity of A Ltd.

   (b) B Ltd. has the same net operating income as A Ltd.
      (i)   Calculate the implied required equity return of B Ltd.
      (ii)   Analyse why does it differ from that of A Ltd.

   (Jan 2021)

Solution

(a)   Value of A Ltd. $= \frac{NOI}{Ko} = \frac{Rs.4,50,000}{18\%} = Rs.\,25,00,000$

(i)   Return on Shares of X on A Ltd.

Particulars	Amount (Rs.)
Value of the company	25,00,000
Market value of debt (60% x Rs. 25,00,000)	15,00,000
Market value of shares (40% x Rs. 25,00,000)	10,00,000

Particulars	Amount (Rs.)
Net operating income	4,50,000
Interest on debt (8% × Rs. 15,00,000)	1,20,000
Earnings available to shareholders	3,30,000
Return on 3% shares (3% × Rs. 3,30,000)	9,900

(ii)   Implied required rate of return on equity of A Ltd. $= \frac{Rs.3,30,000}{Rs.10,00,000} =$ **33%**

(b)   (i) Calculation of Implied rate of return of B Ltd.

Particulars	Amount (Rs.)
Total value of company	25,00,000
Market value of debt (20% × Rs. 25,00,000)	5,00,000
Market value of equity (80% × Rs. 25,00,000)	20,00,000

Particulars	Amount (Rs.)
Net operating income	4,50,000
Interest on debt (8% × Rs. 5,00,000)	40,000
Earnings available to shareholders	4,10,000

Implied required rate of return on equity = $\dfrac{Rs.4,10,000}{Rs.\ 20,00,000}$ = 20.5%

(ii)   Implied required rate of return on equity of B Ltd. is lower than that of A Ltd. because B Ltd. uses less debt in its capital structure. As the equity capitalisation is a linear function of the debt-to-equity ratio when we use the net operating income approach, the decline in required equity return offsets exactly the disadvantage of not employing so much in the way of "cheaper" debt funds.

8.   The details about two companies R Ltd. and S Ltd. having same operating risk are given below:

Particulars	R Ltd.	S Ltd.
Profit before interest and tax	Rs. 10 lakhs	Rs. 10 lakhs
Equity share capital Rs. 10 each	Rs. 17 lakhs	Rs. 50 lakhs
Long term borrowings @ 10%	Rs. 33 lakhs	-
Cost of Equity (Ke)	18%	15%

You are required to:
(1)   Calculate the value of equity of both the companies on the basis of M.M. Approach without tax.
(2)   Calculate the Total Value of both the companies on the basis of M.M. Approach without tax.

(Jul 2021)

Solution

(1)   Computation of value of equity on the basis of MM approach without tax

Particulars	R Ltd.(Rs. in lakhs)	S Ltd.(Rs. in lakhs)
Profit before interest and taxes	10	10
Less: Interest on debt (10% × **Rs.** 33,00,000)	3.3	-
Earnings available to Equity shareholders	6.7	10
Ke	18%	15%
Value of Equity (Earnings available to Equity shareholders/Ke)	**37.222**	**66.667**

(2)   Computation of total value on the basis of MM approach without tax

Particulars	R Ltd.(Rs. in lakhs)	S Ltd.(Rs. in lakhs)
Value of Equity (S) (as calculated above)	37.222	66.667
Debt (D)	33	-
Value of Firm (V) = S + D	**70.222**	**66.667**

9.   The particulars relating to Raj Ltd. for the year ended 31 st March, 2022 are given as follows:

Output (units at normal capacity)	1,00,000
Selling price per unit	Rs. 40
Variable cost per unit	Rs. 20
Fixed cost	Rs. 10,00,000

The capital structure of the company as on 31st March, 2022 is as follows:

Particulars	Amount in Rs.
Equity share capital (1,00,000 shares of Rs. 10 each)	10,00,000
Reserves and surplus	5,00,000
Current liabilities	5,00,000
Total	20,00,000

Raj Ltd. has decided to undertake an expansion project to use the market potential that will involve Rs. 20 lakhs. The company expects an increase in output by 50%. Fixed cost will be increased by Rs. 5,00,000 and variable cost per unit will be decreased by 15%. 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 program are planned:

		(Amount in Rs.)
Alternative	Debt	Equity Shares
1	5,00,000	Balance
2	10,00,000	Balance
3	14,00,000	Balance

Current market price per share is Rs. 200.
Slab wise interest rate for fund borrowed is as follows:

Fund limit	Applicable interest rate
Up-to Rs. 5,00,000	10%
OverRs. 5,00,000 and up-to Rs. 10,00,000	15%
Over Rs. 10,00,000	20%

Find out which of the above-mentioned alternatives would you recommend for Raj Ltd. with reference to the EPS, assuming a corporate tax rate is 40%?

(May 2022)

Solution

Alternative 1	=	Raising Debt of Rs. 5 lakh + Equity of Rs. 15 lakh
Alternative 2	=	Raising Debt of Rs. 10 lakh + Equity of Rs. 10 lakh
Alternative 3	=	Raising Debt of Rs. 14 lakh + Equity of Rs. 6 lakh

Calculation of Earnings per share (EPS)

Particulars	FINANCIAL ALTERNATIVES		
	Alternative 1	Alternative 2	Alternative 3
	(Rs.)	(Rs.)	(Rs.)
Expected EBIT [W. N. (a)]	19,50,000	19,50,000	19,50,000

Less: Interest [W. N. (b)]	(50,000)	(1,25,000)	(2,05,000)
Earnings before taxes (EBT)	**19,00,000**	**18,25,000**	**17,45,000**
Less: Taxes @ 40%	7,60,000	7,30,000	6,98,000
Earnings after taxes (EAT)	**11,40,000**	**10,95,000**	**10,47,000**
Number of shares [W. N. (d)]	1,07,500	1,05,000	1,03,000
Earnings per share (EPS)	**10.60**	**10.43**	**10.17**

Conclusion: Alternative 1 (i.e. Raising Debt of Rs. 5 lakh and Equity of Rs. 15 lakh) is recommended which maximises the earnings per share.

Working Notes (W.N.):

(a) Calculation of Earnings before Interest and Tax (EBIT)

Particulars		
Output (1,00,000 + 50%)	(A)	1,50,000
Selling price per unit		Rs. 40
Less: Variable cost per unit (Rs. 20 – 15%)		Rs. 17
Contribution per unit	(B)	Rs. 23
Total contribution	**(A x B)**	Rs. **34,50,000**
Less: Fixed Cost (Rs. 10,00,000 + Rs. 5,00,000)		Rs. 15,00,000
EBIT		Rs. **19,50,000**

(b) Calculation of interest on Debt

Alternative		(Rs.)	Total (Rs.)
1	(Rs. 5,00,000 x 10%)		50,000
2	(Rs. 5,00,000 x 10%)	50,000	
	(Rs. 5,00,000 x 15%)	75,000	1,25,000
3	(Rs. 5,00,000 x 10%)	50,000	
	(Rs. 5,00,000 x 15%)	75,000	
	(Rs. 4,00,000 x 20%)	80,000	2,05,000

(c) Number of equity shares to be issued

$$\text{Alternative 1} = \frac{₹ (20,00,000 - 5,00,000)}{₹ 200 \text{ (Market price of share)}} = \frac{15,00,000}{₹ 200} = 7,500 \text{ shares}$$

$$\text{Alternative 2} = \frac{₹ (20,00,000 - 10,00,000)}{₹ 200 \text{ (Market price of share)}} = \frac{10,00,000}{₹ 200} = 5,000 \text{ shares}$$

$$\text{Alternative 3} = \frac{₹ (20,00,000 - 14,00,000)}{₹ 200 \text{ (Market price of share)}} = \frac{6,00,000}{₹ 200} = 3,000 \text{ shares}$$

(d) Calculation of total equity shares after expansion program

	Alternative 1	Alternative 2	Alternative 3
Existing no. of shares	1,00,000	1,00,000	1,00,000
Add: issued under expansion program	7,500	5,000	3,000
Total no. of equity shares	**1,07,500**	**1,05,000**	**1,03,000**

10. The following are the costs and values for the firms A and B according to the traditional approach.

	Firm A	Firm B
Total value of firm, V (in Rs.)	50,000	60,000
Market value of debt, D (in Rs.)	0	30,000
Market value of equity, E (in Rs.)	50,000	30,000
Expected net operating income (in Rs.)	5,000	5,000
Cost of debt (in Rs.)	0	1,800
Net Income (in Rs.)	5,000	3,200
Cost of equity, Ke = NI/V	10.00%	10.70%

(i) Compute the Equilibrium value for Firm A and B in accordance with the M-M approach. Assume that (a) taxes do not exist and (b) the equilibrium value of Ke is 9.09%.

(ii) Compute Value of Equity and Cost of Equity for both the firms.

(Nov. 2022)

Solution

(i) **Computation of Equilibrium value of Firms A & B under MM Approach:**

As per MM approach K_O is equal to K_{eu}

$\therefore K_O = K_{eu} (1 - t) = 9.09 (1 - 0) = 9.09$

Particulars	A	B
EBIT (NOI) (Rs.)	5000	5000
$K_{O\ (\%)}$	9.09	9.09
Equilibrium value (Rs.) (NOI/Ko) X 100	55005.5	55005.5
	$\dfrac{5,000}{9.09} \times 100$	$\dfrac{5,000}{9.09} \times 100$

(ii) Computation of value of equity and cost of equity of Firms A & B

Particulars	A	B
Equilibrium value (Rs.)	55,005.5	55,005.5
Less: Value of Debt	-	30,000
Value of Equity	55,005.5	25,005.5

Cost of Equity of Firm A (unlevered) = 9.09

Cost of Debt of Firm B (K_d) (levered) = (1800/30000) x 100 = 6% Cost of Equity

of Firm B (Levered) = $K_O + (K_O - K_d) \times$ (Debt / Equity)

= 9.09 + (9.09 – 6) x (30000/25005.5)

= 9.09 + 3.09 x 1.2 = 9.09 + 3.71 = **12.80%(OR)**

$$\text{Cost of Equity of Firm B (Levered)} = \left(\frac{NI}{Value\ of\ Equity}\right) x 100$$

$$\left(\frac{3200}{25005.5}\right) x\ 100\ =\ 12.8\%$$

11. The following information pertains to CIZA Ltd.:

	Rs.
Capital Structure:	
Equity share capital (Rs. 10 each)	8,00,000
Retained earnings	20,00,000
9% Preference share capital (Rs. 100 each)	12,00,000
12% Long-term loan	10,00,000
Interest coverage ratio	8
Income tax rate	30%
Price – earnings ratio	25

The company is proposed to take up an expansion plan, which requires an additional investment of Rs. 34,50,000. Due to this proposed expansion, earnings before interest and taxes of the company will increase by Rs. 6,15,000 per annum. The additional fund can be raised in following manner:
• By issue of equity shares at present market price, or
• By borrowing 16% Long-term loans from bank.
You are informed that Debt-equity ratio (Debt/ Shareholders' fund) in the range of 50% to 80% will bring down the price-earnings ratio to 22 whereas; Debt-equity ratio over 80% will bring down the price-earnings ratio to 18.

Required:
Advise which option is most suitable to raise additional capital so that the Market Price per Share (MPS) is maximized.

(May 2023)

Solution
Working notes:
(i)   **Interest Coverage ratio = 8**
$$\frac{EBIT}{Interest} = 8$$
$$\frac{EBIT}{1,20,000} = 8$$
So, EBIT = Rs. 9,60,000

(ii)   **Proposed Earnings Before Interest & Tax = 9,60,000 + 6,15,000 = Rs. 15,75,000**
       Option 1: Equity option
       Debt = Rs. 10,00,000
       Shareholders Fund = 8,00,000+20,00,000+12,00,000+34,50,000 = Rs. 74,50,000
       Debt Equity ratio(Debt/Shareholders fund) = $\frac{10,00,000}{74,50,000}$= 13.42%

       P/E ratio in this case will be 25 times

Option 2: Debt option

Debt = 10,00,000+34,50,000 = Rs. 44,50,000

Shareholders Fund = 8,00,000+20,00,000+12,00,000 = Rs. 40,00,000

Debt Equity ratio(Debt/Shareholders fund) = $\frac{44,50,000}{40,00,000}$ = 111.25%

Debt equity ratio has crossed the limit of 80% hence PE ratio in this case will remain at 18 times.

Number of Equity Shares to be issued = Rs. 34,50,000/ Rs. 150 = 23,000

(iii) Calculation of Earnings per Share and Market Price per share

Particulars	Rs.
Current Earnings Before Interest & Tax	9,60,000
Less: Interest	1,20,000
Earnings Before Tax	8,40,000
Less: Taxes	2,52,000
Earnings After Tax	5,88,000
Less: Preference Dividend (@9%)	1,08,000
Net earnings for Equity shareholders	4,80,000
Number of equity shares	80,000
Earnings Per Share	6
Price-earnings ratio	25
Market Price per share	150

Calculation of EPS and MPS under two financial options

Particulars	Financial Options	
	Option I	Option II
	Equity Shares Issued (Rs.)	16% Long Term Debt Raised (Rs.)
Earnings before interest and Tax (EBIT)	15,75,000	15,75,000
Less: Interest on old debentures @ 12%	1,20,000	1,20,000
Less: Interest on additional loan (new) @ 16% on Rs. 34,50,000	NIL	5,52,000
Earnings before tax	14,55,000	9,03,000
Less: Taxes @ 30%	4,36,500	2,70,900
(EAT/Profit after tax)	**10,18,500**	**6,32,100**
Less: Preference Dividend (@9%)	1,08,000	1,08,000
Net Earnings available to Equity shareholders	**9,10,500**	**5,24,100**
Number of Equity Shares	1,03,000	80,000
Earnings per Share (EPS)	8.84	6.55
Price/ Earnings ratio	25	18
Market price per share (MPS)	**221**	**117.9**

Advise: Equity option has higher Market Price per Share therefore company should raise additional fund through equity option.

12. The data of K Textiles Lid, are given as follows:

Particulars	Amount (Rs.)
Profit Before Interest and Tax	50,00,000
Less: Interest on debentures @ 10%	10,00,000
Profit before tax	40,00,000
Less: Income tax @ 50%	20,00,000
Profit after tax	20,00,000
No. of equity shares (Rs. 10 each)	10,00,000
EPS	2
PE Ratio	10
Market price per share	20

The Company is planning to start a new project needs to be having a total capital outlay of Rs. 40,00,000. You are informed that a debt equity ratio [D/D+E] higher than 36% pushes the K_e (cost of equity) up to 12.5%, means reducing the PE ratio to 8 and rises the interest rate on additional amount borrowed to 12%. Retained earnings of the company is Rs. 1.4 crores.

Find out the probable price of share if:

• The additional funds are raised as a loan

• The amount is raised by issuing equity shares.

(Nov. 2023)

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.   Return on Capital Employed = $\frac{EBIT}{Capital\ Employed} = \frac{Rs.50,00,000}{Rs.3,40,000}$ = 14.70%

       Capital Employed   = Debt + Equity

                                 = Rs. 1,00,00,000 + (Rs. 1,00,00,000 + Rs. 1,40,00,000)

                                 = Rs. 3,40,00,000

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

                                 = (Rs. 3,40,00,000 + Rs. 40,00,000) x 14.70% = Rs. 55,86,000

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

       Option1: Loan option

       Debt   = Rs. 1,00,00,000 + Rs. 40,00,000 = Rs. 1,40,00,000

       Equity   = Rs. 2,40,00,000

       Debt Equity ratio= $\frac{1.4\ cr.}{1.4\ cr.+2.40\ cr.}$ = 36.84%

       Debt equity ratio has crossed the limit of 36%, hence, PE ratio in this case will be 8 times and additional borrowing will be at the rate of 12%.

Option2: Equity option

Debt = Rs. 1,00,00,000

Equity = Rs. 2,40,00,000 + Rs. 40,00,000 = Rs. 2,80,00,000

Debt Equity ratio = $\frac{1\,cr}{1\,cr.+2.8\,cr.}$ = 26.32%

Debt equity ratio has not crossed the limit of 36% hence PE ratio in this case will remain at 10 times.

4.   Number of equity shares to be issued in case of equity option @ Rs. 20 per share = Rs. 40,00,000 / Rs. 20 = 2,00,000

Calculation of EPS and MPS under two financial options

Particulars	Financial Options	
	Option I	Option II
	12% additional loan of 40,00,000	**10,00,000 equity shares @ Rs. 10 and 2,00,000 equity shares @ Rs. 20**
	(Rs.)	(Rs.)
Profit before interest and Tax (PBIT)	55,86,000	55,86,000
Less: Interest on old debentures @ 10%	10,00,000	10,00,000
Less: Interest on additional loan (new) @ 12% on Rs. 40,00,000	4,80,000	Nil
Profit before tax	41,06,000	45,86,000
Less: Taxes @ 50%	20,53,000	22,93,000
Earnings for equity shareholders (EAT/Profit after tax)	20,53,000	22,93,000
Number of Equity Shares	10,00,000	12,00,000
Earnings per Share (EPS)	2.05	1.91
Price/ Earnings ratio	8	10
Market price per share (MPS)	16.42	19.11
Particulars	Financial Options	

13. Following data is available in respect of Levered and Unlevered companies having same business risk:

Capital employed = Rs. 2,00,000, EBIT = Rs. 25,000 and Ke = 12.5%

Sources	Levered Company (f)	Unlevered Company (`)
Debt (@8%)	75,000	Nil
Equity	1,25,000	2,00,000

An investor is holding 12% shares in levered company. Calculate the increase in annual earnings of investor if he switches over his holding from Levered to Unlevered company.

(May 2024)

Solution

1. **Valuation of firms**

Particulars	Levered Firm (₹)	Unlevered Firm (₹)
EBIT	25,000	25,000
Less: Interest on debt (8% × ₹ 75,000)	6,000	Nil
Earnings available to Equity shareholders	19,000	25,000
K_e	12.5%	12.5%
Value of Equity (S) (Earnings available to Equity shareholders/ K_e)	1,52,000	2,00,000
Debt (D)	75,000	Nil
Value of Firm (V) = S + D	2,27,000	2,00,000

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 (₹ 1,52,000 x 12%)	18,240
Borrow money (₹ 75,000 x 12%)	9,000
Buy shares in Unlevered company	27,240

3. **Change in Return**   ₹

Income from shares in Unlevered company	
(₹ 27,240 x 12.5%)	3,405
Less: Interest on loan (₹ 9,000 x 8%)	720
Net Income from unlevered firm	2,685
Less: Income from Levered firm (₹ 18,240 x 12.5%)	2,280
Incremental Income due to arbitrage	405

Solution can also be done in the following way:

Valuation of firms

Particulars	Levered Firm (₹)	Unlevered Firm (₹)
EBIT	25,000	25,000
Less: Interest on debt (8% × ₹ 75,000)	6,000	Nil
Earnings available to Equity shareholders	19,000	25,000
K_e	12.5%	12.5%
Value of Equity (S) (Earnings available to Equity shareholders/ K_e)	1,52,000	2,00,000
Debt (D)	75,000	Nil
Value of Firm (V) = S + D	2,27,000	2,00,000

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.

Arbitrage Process:

If investor have 12% shares of levered company, value of investment in equity shares is 12% of ₹ 1,52,000 i.e. ₹ 18,240 and return will be 12% of ₹19,000 = ₹ 2,280.

Alternate Strategy will be:

Sell 12% shares of levered firm for ₹ 18,240 and borrow 12% of levered firm's debt i.e. ₹ 9,000 (12% of ₹ 75,000) and invest the money i.e. 12% in unlevered firm's stock:

Total resources /Money investor have = ₹ 18,240 + ₹ 9,000 = ₹ 27,240 and investor invest 12% of ₹ 2,00,000 = ₹ 24,000

Surplus cash available with investor is = ₹ 27,240 – ₹ 24,000 = ₹ 3,240

Investor return = 12% EBIT of unlevered firm – Interest to be paid on borrowed funds

i.e. = 12% of ₹ 25,000 – 8% of ₹ 9,000 = ₹ 3,000 – ₹ 720 = ₹ 2,280

Now, return remains the same i.e. ₹ 2,280 which investor is getting from levered company before investing in unlevered company but still have ₹ 3,240 excess money available with investor. Hence, investor is better off by doing arbitrage.

Chapter -4

DIVIDEND DECISION

1. Following information relating to Jee Ltd. are given:

Particulars	
Profit after tax	Rs. 10,00,000
Dividend payout ratio	50%
Number of Equity Shares	50,000
Cost of Equity	10%
Rate of Return on Investment	12%

(i)   What would be the market value per share as per Walter's Model?
(ii)   What is the optimum dividend payout ratio according to Walter's Model and Market value of equity share at that payout ratio?

(Nov 2018)

Solution
(i) Walter's model is given by –
P = $\frac{D+(E-D)(r/Ke)}{Ke}$
Where,
P = Market price per share,
E = Earnings per share = `10,00,000 ÷ 50,000 = ` 20
D = Dividend per share = 50% of 20 = ` 10
r = Return earned on investment = 12%
Ke = Cost of equity capital = 10%

$$\therefore P = \frac{10+(20-1\ )x\frac{0.12}{0.10}}{0.10} = \frac{22}{0.10} = `220$$

(ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is Nil. So, at a payout ratio of zero, the market value of the company's share will be:-

$$P = \frac{0+(20-0)x\frac{0.12}{0.10}}{0.10} = \frac{24}{0.10} = `240$$

2. Following figures and information were extracted from the company A Ltd.

Earnings of the company	Rs. 10,00,000
Dividend paid	Rs. 6,00,000
No. of shares outstanding	2,00,000
Price Earnings Ratio	10
Rate of return on investment	20%

You are required to calculate:
(i)   Current Market price of the share

(ii)   Capitalisation rate of its risk class
(iii)   What should be the optimum pay-out ratio?
(iv)   What should be the market price per share at optimal pay-out ratio? (use Walter's Model)

(Nov 2019)

Solution

(i) Current Market price of shares (applying Walter's Model)
- The EPS of the firm is ₹ 5 (i.e., Rs 10,00,000 / 2,00,000).
- Rate of return on Investment (r) = 20%.
- The Price Earnings (P/E) Ratio is given as 10, so capitalization rate (Ke), may be taken at the inverse of P/E Ratio. Therefore, Ke is 10% or .10 (i.e., 1/10).
- The firm is distributing total dividends of ₹ 6,00,000 among 2,00,000 shares, giving a dividend per share of ₹ 3.

The value of the share as per Walter's model may be found as follows: Walter's model is given by-

$$P = \frac{D + \frac{r}{Ke}(E - D)}{Ke}$$

Where,
P = Market price per share.
E = Earnings per share = ₹ 5
D = Dividend per share = ₹ 3
R = Return earned on investment = 20 %
Ke = Cost of equity capital = 10% or .10

$$P = \frac{3 + \frac{0.20}{0.10}(5 - 3)}{0.10} = 70$$

Current Market Price of shares can also be calculated as follows:

Price Earnings (P/E) Ratio = $\frac{Market\ Price\ of\ Shar}{Earnings\ per\ Shar}$

Or, 10   = $\frac{Market\ Price\ of\ Shar}{10,00,000/2,00,000}$

Or, 10   = $\frac{Market\ Price\ of\ Sha}{5}$

Market Price of Share   = ₹ 50

(ii) Capitalization rate (Ke) of its risk class is 10% or .10 (i.e., 1/10).

(iii) Optimum dividend pay-out ratio

According to Walter's model when the return on investment is more than the cost of equity capital (10%), the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil or 0 (zero).

(iv) Market price per share at optimum dividend pay-out ratio

At a pay-out ratio of zero, the market value of the company's share will be:

$$P = \frac{0 + \frac{0.20}{0.10}(5 - 0)}{0.10} \quad 100$$

3. The following figures are extracted from the annual report of RJ Ltd.:

Net Profit	Rs. 50 Lakhs
Outstanding 13% preference shares	Rs. 200 Lakhs
No. of Equity Shares	6 Lakhs
Return on Investment	25%
Cost of Capital (Ke)	15%

You are required to compute the approximate dividend pay-out ratio by keeping the share price at Rs. 40 by using Walter's Model.

(Nov 2020)

Solution

Particulars	` in lakhs
Net Profit	50
Less: Preference dividend (` 200,00,000 x 13%)	26
Earning for equity shareholders	24

Therefore, earning per share = ` 24 lakh /6 lakh shares = ` 4

Let, the dividend per share be D to get share price of ` 40

$$P = \frac{D + \frac{r}{Ke}(E - D)}{Ke}$$

$$Rs.\,40 = \frac{D + \frac{0.25}{0.15}(Rs.\,4 - D)}{0.15}$$

$$6 = \frac{0.15D + 1 - 0.25D}{0.15}$$

0.1 D = 1 – 0.9
D = Rs. 1

D/P ratio = $\frac{DPS}{EPS} \times 100 = \frac{Rs.1}{Rs.4} \times 100 = 25\%$

So, the required dividend pay-out ratio will be = 25%

4. X Ltd. is a multinational company. Current market price per share is Rs. 2,185. During the F.Y. 2020-21, the company paid Rs. 140 as dividend per share. The company is expected to grow @ 12% p.a. for next four years, then 5% p.a. for an indefinite period. Expected rate of return of shareholders is 18% p.a.
   (i)   Find out intrinsic value per share.
   (ii)   State whether shares are overpriced or underpriced.

Year	1	2	3	4	5
Discounting Factor @ 18%	0.847	0.718	0.608	0.515	0.436

(Dec. 2021)

Solution

As per Dividend discount model, the price of share is calculated as follows:

$$P = \frac{D1}{(1 + Ke)1} + \frac{D2}{(1 + Ke)2} + \frac{D3}{(1 + Ke)3} + \frac{D4}{(1 + Ke)4} + \frac{D4\,(1 + g)}{(Ke - g)} \; x \; \frac{1}{(1 + Ke)4}$$

Where,

P = Price per share

K_e = Required rate of return on equity

g = Growth rate

$$p = \frac{₹\,140 \; x \; 1.12}{(1 + 0.18)1} + \frac{₹\,156.80 \; x \; 1.12}{(1 + 0.18)2} + \frac{₹175.62 \; x \; 1.12}{(1 + 0.18)3} + \frac{₹\,196.69 \; x \; 1.12}{(1 + 0.18)4}$$
$$+ \frac{₹\,220.29\,(1 + 0.05)}{(0.18 - 0.05)} \; x \; \frac{1}{(1 + 0.18)4}$$

P= 132.81 + 126.10 + 119.59 + 113.45 + 916.34 = ` 1,408.29

Intrinsic value of share is ` 1,408.29 as compared to latest market price of `2,185. **Market price of share is over-priced by ` 776.71.**

5. The following information is taken from ABC Ltd.

Net Profit for the year	Rs. 30,00,000
12% Preference share capital	Rs. 1,00,00,000
Equity share capital (Share of Rs. 10 each)	Rs. 60,00,000
Internal rate of return on investment	22%
Cost of Equity Capital	18%
Retention Ratio	75%

Calculate the market price of the share using:

(1)   Gordon's Model

(2)   Walter's Model

(Jan 2021)

Solution

Market price per share by-

(1)   Gordon's Model:

Present market price per share (Po)* = $\frac{D_0\,(1+g)}{K_e - g}$

OR

Present market price per share (Po) = $\frac{D_1}{K_e - g}$

Where,

P_o = Present market price per share.

g = Growth rate (br) = 0.75 X 0.22 = 0.165

b = Retention ratio (i.e., % of earnings retained)

r = Internal rate of return (IRR)

D_0 = E x (1 – b) = 3 X (1 – 0.75) = 0.75

E = Earnings per share

Po $\frac{0.75\,(1+0.165)}{0.18-0.165}$ = $\frac{0.874}{0.015}$ = ` 58.27 approx.

*Alternatively, Po can be calculated as $\frac{E\,(1-b)}{K-b} = $ ` 50.

(2)   Walter's Model:

$$P = \frac{D + \frac{r}{Ke}(E-D)}{Ke}$$

$$= \frac{0.75 + \frac{0.22}{0.18}(3-0.75)}{0.18} = Rs.\,19.44$$

Workings:
1.   Calculation of Earnings per share

Particulars	Amount (`)
Net Profit for the year	30,00,000
Less: Preference dividend (12% of ` 1,00,00,000)	(12,00,000)
Earnings for equity shareholders	18,00,000
No. of equity shares (` 60,00,000/`10)	6,00,000
Therefore, Earnings per share	` 18,00,000/6,00,000
$\frac{Earning\ for\ equity\ shareholders}{No.of\ equity\ shares}$	= ` 3.00

2.   Calculation of Dividend per share

Particulars	
Earnings per share	` 3
Retention Ratio (b)	75%
Dividend pay-out ratio (1-b)	25%
Dividend per share	
(Earnings per share x Dividend pay-out ratio)	` 3 x 0.25 = ` 0.75

6. The following information relates to LMN Ltd.

Earning of the company	Rs. 30,00,000
Dividend pay-out ratio	60%
No. of shares outstanding	5,00,000
Rate of return on investment	15%
Equity capitalized rate	13%

Required:
(i)   Determine what would be the market value per share as per Walter's model.
(ii)   Compute optimum dividend pay-out ratio according to Walter's model and the market value of company's share at that pay-out ratio.

(Jul 2021)

Solution
  Calculation of market value per share as per Walter's model

$$P = \frac{D + \frac{r}{Ke}(E - D)}{Ke}$$

Where,

P	= Market price per share.
E	= Earnings per share = ` 30,00,000/5,00,000 = ` 6
D	= Dividend per share = ` 6 x 0.60 = ` 3.6
r	= Return earned on investment = 15%
Ke	= Cost of equity capital = 13%

$$P = \frac{3.6 + \frac{0.15}{0.13}(6 - 3.6)}{0.13} = ₹\,49$$

(ii) According to Walter's model, when the return on investment (r) is more than the cost of equity capital (Ke), the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil.

So, at a pay-out ratio of zero, the market value of the company's share will be:

$$P = \frac{0 + \frac{0.15}{0.13}(6 - 0)}{0.13} = ₹\,53.254$$

7. Following information are given for a company:

Earnings per share	Rs. 10
P/E ratio	12.5
Rate of return on investment	12%
Market price per share as per Walter's Model	Rs. 130

You are required to calculate:
(i)   Dividend payout ratio.
(ii)   Market price of share at optimum dividend payout ratio.
(iii) P/E ratio, at which the dividend policy will have no effect on the price of share.
(iv)   Market price of share at this P/E ratio.
(v)   Market price of share using Dividend growth model.

(May 2023)

Solution
(i) The EPS of the firm is ` 10, r =12%. The P/E Ratio is given at 12.5 and the cost of capital (Ke) may be taken as the inverse of P/E ratio. Therefore, Ke is 8% (i.e., 1/12.5). The value of the share is ` 130 which may be equated with Walter Model as follows:

$$P = \frac{D + \frac{r}{Ke}(E - D)}{Ke}$$

$$Or$$
$$P = \frac{D + \frac{12\%}{8\%}(10 - D)}{8\%}$$

or [D+1.5(10-D)]/0.08=130
or D+15-1.5D=10.4
or -0.5D=-4.6
So, D = ` 9.2
The firm has a dividend pay-out of 92% (i.e., 9.2/10).

(ii)   Since the rate of return of the firm (r) is 12% and it is more than the Ke of 8%, therefore, by distributing 92% of earnings, the firm is not following an optimal dividend policy. The optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be:

$$P = \frac{0 + \frac{12\%}{8\%}(10 - D)}{8\%}$$

P = ` 187.5
So, theoretically the market price of the share can be increased by adopting a zero pay-out.

(iii)   The P/E ratio at which the dividend policy will have no effect on the value of the share is such at which the Ke would be equal to the rate of return (r) of the firm. The Ke would be 12% (= r) at the P/E ratio of 1/12%=8.33. Therefore, at the P/E ratio of 8.33, the dividend policy would have no effect on the value of the share.

(iv)   If the P/E is 8.33 instead of 12.5, then the Ke which is the inverse of P/E ratio, would be 12% and in such a situation ke= r and the market price, as per Walter's model would be:

$$P = \frac{D + \frac{r}{Ke}(E - D)}{Ke} = \frac{9.2 + \frac{0.12}{0.12}(10 - 9.2)}{0.12} \text{ Rs. } 83.33$$

(v)   Dividend Growth Model applying growth on dividend
K_e = 8%, r = 12%, D0 = 9.2, b = 0.08
g = b.r
g = 0.08 x 0.12=0.96%
D_1 = D_0 (1+g) = 9.2 (1+0.0096) = ` 9.2883
P = $\frac{D1}{(Ke-g)}$ = 9.2883/(0.08 – 0.0096) = 9.2883/0.0704 = ` 131.936

Alternative Alternatively, without applying growth on dividend
P = $\frac{E(1-b)}{Ke-br}$ = $\frac{10(1-0.08)}{0.08-(0.08 \, x \, 0.12)}$ = Rs. 130.68

8.   (i)EPS of a company is Rs. 60 and Dividend payout ratio is 60%. Multiplier is 5. Determine price per share as per Graham & Dodd model.
(ii) Last year's dividend is Rs. 6.34, adjustment factor is 45%, target payout ratio is 60% and current year's EPS is Rs. 12. Compute current year's dividend using Linter's model.
(Nov. 2023)

Solution

(i)   Price per share (P) = $m\left(D + \frac{E}{3}\right)$

Where,

m = Multiplier
D = Dividend
E = EPS

$P = 5\left(60 \times 06 + \frac{60}{3}\right)$

P = 5(36 + 20) = ` 280

(ii) $D_1 = D_0 + [(EPS \times \text{Target payout}) - D_0] \times \text{Adjustment factor}$

$D_1 = 6.34 + [(12 \times 60\%) - 6.34] \times 0.45$

$D_1 = 6.34 + 0.387 = $ ` 6.727

9. INFO Ltd is a listed company having share capital of Rs. 2400 Crores of Rs. 5 each. During the year 2022-23

Dividend distributed	1000%
Expected Annual growth rate in dividend	14%
Expected rate of return on its equity capital	18%

Required:

(a)   Calculate price of share applying Gordon's growth Model.

(b)   What will be the price of share if the Annual growth rate in dividend is only 10%? According to Gordon's growth Model, if Internal Rate of Return is 25%, then what should be the optimum dividend payout ratio in case of growing stage of company? Comment.

(Nov. 2023)

Solution

In the present situation, the current MPS is as follows:

$$P = \frac{D_0(1+g)}{Ke-g}$$

Where

P = Market price per share
D0 = current year dividend
g = growth rate of dividends
Ke = cost of equity capital/ expected rate of return

$$P = \frac{50(1+0.14)}{0.18-0.14} = \text{` } 1425$$

(b)   The impact of changes in growth rate to 10% on MPS will be as follows:

$$P = \frac{50(1+0.10)}{0.18-0.10} = \text{` } 687.5$$

(c)   If Internal rate of return, r = 25% and Ke = 18%

As per Gordon's model, when r > Ke, optimum dividend payout ratio is 'Zero'. When IRR is greater than cost of capital, the price per share increases and dividend pay-out decreases.

10. Vista Limited's retained earnings per share for the year ending 31.03.2023 being 40% is `3.60 per share. Company is foreseeing a growth rate of 10% per annum in the next two years. After that the growth rate is expected to stabilize at 8% per annum. Company will maintain its existing pay-out ratio. If the investor's required rate of return is 15%, Calculate the intrinsic value per share as of date using Dividend Discount model.

(May 2024)

Solution

As per Dividend discount model, the price of share is calculated as follows:

Retained earning per share = ₹ 3.60

Dividend per share, $D_0 = \frac{₹\,3.60}{40\%} \times 60\% = ₹5.40$

$$P = \frac{D_1}{(1+K_e)^1} + \frac{D_2}{(1+K_e)^2} + \frac{D_3}{(K_e-g)} \times \frac{1}{(1+K_e)^2}$$

Where,

P = Price per share

K_e = Required rate of return on equity

g = Growth rate

$$P = \frac{5.4 \times 1.1}{(1+0.15)^1} + \frac{5.94 \times 1.1}{(1+0.15)^2} + \frac{6.534 \times 1.08}{(0.15-0.08)} \times \frac{1}{(1+0.15)^2}$$

P = 5.17 + 4.94 + 76.23 = ₹86.33

Intrinsic value of share is ₹ 86.33

Chapter -5

INVESTMENT DECISION

1. XYZ Ltd. is presently all equity financed. The directors of the company have been evaluating investment in a project which will require Rs. 270 lakhs capital expenditure on new machinery. They expect the capital investment to provide annual cash flows of Rs. 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 Rs. 10 lakhs. Company's tax rate is 30%.

    You are required to calculate:

    (i)   The adjusted present value of the investment,
    (ii)   The adjusted discount rate and
    (iii)   Explain the circumstances under which this adjusted discount rate may be used to evaluate future investments.

    (May 2018)

    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:

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

    Therefore, APV = Base case PV – Issue Costs + PV of Tax Relief on debt interest
    = Rs. 30 lakhs – Rs. 10 lakhs + 84 lakhs = Rs. 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.

(-) Rs.280 lakhs X (Annual Income / 0.14)	= (-) Rs.104 lakhs
Annual Income / 0.14	= (-) Rs. 104 + Rs. 280 lakhs
Therefore, Annual income	= Rs. 176 X 0.14 = Rs. 24.64 lakhs
Adjusted discount rate	= (Rs. 24.64 lakhs / Rs.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.

2.   Maruti Ltd. requires a plant costing Rs. 200 Lakhs for a period of 5 years. The company can use the plant for the stipulated period through leasing arrangement or the requisite amount can be borrowed to buy the plant. In case of leasing, the company received a proposal to pay annual lease rent of Rs. 48 Lakhs at the end of each year for a period of 5 years.

In case of purchase, the company would have a 12 %, 5 years loan to be paid in equated annual installment, each installment becoming due in the beginning of each year. It is estimated that plant can be sold for Rs. 40 Lakhs at the end of 5th year. The company uses straight line method of depreciation. Corporate tax rate is 30 %. Cost of Capital after tax for the company is 10%.

The PVIF @ 10% and 12% for the five years are given below:

Year	1	2	3	4	5
PVIF @ 10	0.909	0.826	0.751	0.683	0.621
PVIF @ 12	0.893	0.797	0.712	0.636	0.567

You are required to advise whether the plant should be purchased or taken on lease.

(May 2018)

Solution

Purchase Option

Loan installment = Rs. 200 lakhs / (1 + PVIFA 12%, 4)
              = Rs. 200 lakhs / (1 + 3.038) = Rs. 49.53 lakhs
Interest payable = (Rs. 49.53 X 5) – Rs. 200 lakhs = Rs. 47.65 lakhs

Working note:

Amortisation of Loan Installment

Year	Loan amount (Rs. In Lakhs)	Installment (Rs. In Lakhs)	Interest (Rs. In Lakhs)	Principal (Rs. In Lakhs)	O/S Amount (Rs. In Lakhs)
0	200	49.53	0.00	49.53	150.47
1	150.47	49.53	18.06	31.47	119.00
2	119.00	49.53	14.28	35.25	83.75
3	83.75	49.53	10.05	39.48	44.27
4	44.27	49.53	*5.26	44.27	-

Calculation of PV of outflow under Purchase Option

(Rs. In Lakhs)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
End	Debt Payment	Int. of the o/s Principal	Dep.	Tax Shield [(3) +(4)]x	Net Cash outflows (2) – (5)	PV factors @ 10%	PV

				0.3			
0	49.53	0.00	0.00	0.00	49.53	1.000	49.53
1	49.53	18.06	32.00	15.02	34.51	0.909	31.37
2	49.53	14.28	32.00	13.88	35.65	0.826	29.44
3	49.53	10.05	32.00	12.61	36.92	0.751	27.72
4	49.53	*5.26	32.00	11.18	38.35	0.683	26.19
5	49.53	0	32.00	9.60	(9.60)	0.621	(5.96)
		47.65	160.00				158.29
	Less: PV of Salvage Value (Rs.40 lakhs x 0.621) =						24.84
	Total PV of Outflow						133.45

*Balancing Figure

Leasing Option

PV of Outflows under lease @ 10%   = Rs. 48 lakhs x (1-0.30) x 3.790

                                          = Rs. 127.34 lakhs

Decision: The plant should be taken on lease because the PV of outflows is less as compared to purchase option.

3. PD Ltd. an existing company, is planning to introduce a new product with projected life of 8 years. Project cost will be Rs. 2,40,00,000. At the end of 8 years no residual value will be realized. Working capital of Rs. 30,00,000 will be needed. The 100% capacity of the project is 2,00,000 units p.a. but the Production and Sales Volume is expected are as under :

Year   Number of Units

1   60,000 units

2.   80,000 units

3-5   1,40,000 units

6-8   1,20,000 units

Other Information:

(i)   Selling price per unit Rs. 200

(ii)   Variable cost is 40 of sales.

(iii)   Fixed cost p.a. Rs. 30,00,000.

(iv)   In addition to these advertisement expenditure will have to be incurred as under:

Year	1	2	3-5	6-8
Expenditure (Rs.)	50,00,000	25,00,000	10,00,000	5,00,000

(v)   Income Tax is 25%.

(vi)   Straight line method of depreciation is permissible for tax purpose.

(vii)   Cost of capital is 10%.

(viii) Assume that loss cannot be carried forward.

Present Value Table

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

Advise about the project acceptability.

(Nov 2018)

Solution

Computation of initial cash outlay(COF)

	(₹ in lakhs)

Project Cost	240
Working Capital	30
	270

Calculation of Cash Inflows(CIF):

Years	1	2	3-5	6-8
Sales in units	60,000	80,000	1,40,000	1,20,000
	₹	₹	₹	₹
Contribution (₹200 x 60% x No. of Unit)	72,00,000	96,00,000	1,68,00,000	1,44,00,000
Less: Fixed cost	30,00,000	30,00,000	30,00,000	30,00,000
Less: Advertisement	50,00,000	25,00,000	10,00,000	5,00,000
Less: Depreciation (24000000/8) = 30,00,000	30,00,000	30,00,000	30,00,000	30,00,000
Profit /(loss)	(38,00,000)	11,00,000	98,00,000	79,00,000
Less: Tax @ 25%	NIL	2,75,000	24,50,000	19,75,000
Profit/(Loss) after tax	(38,00,000)	8,25,000	73,50,000	59,25,000
Add: Depreciation	30,00,000	30,00,000	30,00,000	30,00,000
Cash inflow	(8,00,000)	38,25,000	1,03,50,000	89,25,000

(Note: Since variable cost is 40%, Contribution shall be 60% of sales)

Computation of PV of CIF

Year	CIF	PV Factor	₹
	₹	@ 10%	
1	(8,00,000)	0.909	(7,27,200)
2	38,25,000	0.826	31,59,450
3	1,03,50,000	0.751	77,72,850
4	1,03,50,000	0.683	70,69,050
5	1,03,50,000	0.621	64,27,350
6	89,25,000	0.564	50,33,700
7	89,25,000	0.513	45,78,525
8	89,25,000		
Working Capital	30,00,000	0.467	55,68,975
			3,88,82,700
	PV of COF		2,70,00,000
		NPV	1,18,82,700

Recommendation: Accept the project in view of positive NPV.

4. Door Ltd. is considering an investment of Rs. 4,00,000. This investment is expected to generate substantial cash inflows over the next five years. Unfortunately, the annual cash flows from this investment is uncertain, and the following profitability distribution has been established.

Annual Cash Flow (Rs.)	Probability
50,000	0.3
1,00,000	0.3
1,50,000	0.4

At the end of its 5 years life, the investment is expected to have a residual value of Rs. 40,000.

The cost of capital is 5%

(i)   Calculate NPV under the three different scenarios.

(ii)   Calculate Expected Net Present Value.

(iii)   Advise Door Ltd. on whether the investment is to be undertaken.

Year	1	2	3	4	5
DF @ 5%	0.952	0.907	0.864	0.823	0.784

(Nov 2019)

Solution

(i)   Calculation of NPV under three different scenarios

(Amount in Rs.)

Particulars	1st Scenario	2nd Scenario	3rd Scenario
Annual Cash Flow	50,000	1,00,000	1,50,000
PV of cash inflows			
(Annual Cash Flow × 4.33*)	2,16,500	4,33,000	6,49,500
PV of Residual Value			
(Rs. 40,000 × 0.784)	31,360	31,360	31,360
Total PV of Cash Inflow	2,47,860	4,64,360	6,80,860
Initial investment	4,00,000	4,00,000	4,00,000
NPV	(1,52,140)	64,360	2,80,860

* .952 + .907 + .864 + .823 + .784 = 4.33

(ii)   Calculation of Expected Net present Value under three different scenarios

Particulars	1st Scenario	2nd Scenario	3rd Scenario	Total (Rs.)
Annual Cash Flow	Rs. 50,000	Rs. 1,00,000	Rs. 1,50,000	
Probability	0.3	0.3	0.4	
Expected Value	Rs. 15,000	Rs. 30,000	Rs. 60,000	1,05,000
PV of Expected value (1,05,000 × 4.33)				4,54,650
PV of Residual Value (40,000 × 0.784)				31,360
Total PV of Cash Inflow				4,86,010
Initial investment				4,00,000
Expected Net Present Value				86,010

(iii)   Since the expected net present value of the Investment is positive, the Investment should be undertaken.

5. A company has Rs. 1,00,000 available for investment and has identified the following four investments in which to invest.

Project	Investment (Rs.)	NPV (Rs.)
C	40,000	20,000
D	1,00,000	35,000
E	50,000	24,000
F	60,000	18,000

You are required to optimize the returns from a package of projects within the capital spending limit if-
(i)   The projects are independent of each other and are divisible.
(ii)   The projects are not divisible.

(Nov 2019)

Solution

(i)Optimizing returns when projects are independent and divisible. Computation of NPVs per Re.1 of Investment and Ranking of the Projects

Project	Investment (₹)	NPV (₹)	NPV per Re. 1 Invested (₹)	Ranking
C	40,000	20,000	0.50	1
D	1,00,000	35,000	0.35	3
E	50,000	24,000	0.48	2
F	60,000	18,000	0.30	4

Building up of a Package of Projects based on their Rankings

Project	Investment (₹)	NPV (₹)
C	40,000	20,000
E	50,000	24,000
D (1/10th of Project)	10,000	3,500
Total	1,00,000	47,500

The company would be well advised to invest in Projects C, E and D (1/10 th) and reject Project F to optimise return within the amount of ₹ 1,00,000 available for investment.

(ii) Optimizing returns when projects are indivisible.

Package of Project	Investment (₹)	Total NPV (₹)
C and E	90,000 (40,000 + 50,000)	44,000 (20,000 + 24,000)
C and F	1,00,000 (40,000 + 60,000)	38,000 (20,000 + 18,000)
Only D	1,00,000	35,000

The company would be well advised to invest in Projects C and E to optimise return within the amount of ₹ 1,00,000 available for investment.

6. Loft Ltd. is considering an investment in new technology that will reduce operating costs through increasing efficiency. The new technology will cost Rs. 5,00,000 and have a four year life at the end of which it will have a residual value of Rs. 50,000.

An annual license fee of Rs. 52,000 is payable to operate the machine. The purchase can be financed by 10% loan payable in equal installments at the end of each of four years. The depreciation is to be charged as per reducing balance method. The rate of depreciation is 25% per annum.

Alternatively, Loft Ltd. could lease the new technology. The Company would pay four annual lease rentals of Rs. 1,90,000 per year. The annual lease rentals include the cost of license fee. Tax rate is 30%. Compute the incremental cash flows under each option. What would be the appropriate rate at which these cash flows have to be discounted? Discount the incremental cash flows under each option and decide which option is better - buy or lease?

Year	1	2	3	4
DF @ 7%	0.935	0.873	0.816	0.763
DF @ 10%	0.909	0.826	0.751	0.683

(Nov 2019)

Solution

(1) The buy or lease decision means computation of NPV arising from lease decision i.e. computation of valuation advantage of lease over buy. If the value is positive then we go for lease, otherwise we buy.

(2) The valuation process involves – a) finding incremental cash flow of lease over buy, and then, b) discounting the incremental cash flow by net of tax interest rate of equivalent loan (to purchase the asset in question).

If we go for lease, there would be cash outflow in the form of net of tax lease rent from year 1 to 4. Net of tax lease rent per annum = Rs. 1,90,000 x (1-.30) = Rs. 1,33,000.

Again, if the equipment had been purchases there would have been tax saving of depreciation = Depreciation x tax rate. Here, the tax saving or tax shield is available for 4 years. But under lease the benefit accrues to lessor. For lessee it is a negative cash flow as advantage is not available to him under lease arrangement as lessor is considered the legal owner of the asset for claiming depreciation under Income tax law. The depreciation schedule and tax shield on depreciation are given in table 1.

Table 1

Year	Cost/ opening balance (Rs.)	Depreciation @ 25% (Rs.)	Closing balance (Rs.)	Tax shield (Rs.)
1	5,00,000	1,25,000	3,75,000	37,500
2	3,75,000	93,750	2,81,250	28,125
3	2,81,250	70,312.50	2,10,937.50	21,093.75
4	2,10,937.50	52,734.38	1,58,203.12	15,820.31

(3) Further, if the equipment had been purchased there would have been tax saving of interest on loan = interest on loan x tax rate. Here, the tax saving or tax shield is available for 4 years. For lessee it is a negative cash flow as advantage is not available to him under lease arrangement.

The loan amount would have been repayable together with the interest at the rate of

10% in equal installment at the end of each year. The PVAF at the rate of 10% for 4 years is

3.169 (.909 + .826 + .751 + .683), the amount payable would have been-

Annual Installment = $\frac{Rs.5,00,000}{3.169}$ = Rs. 1,57,778 (approx.)

The interest expense schedule and tax shield on interest expense are given in table 2.

Table 2

Year	Total Installment (Rs.)	Interest (Rs.)	Principal (Rs.)	Principal amount outstanding (Rs.)	Tax shield (Rs.)
1	1,57,778	50,000	1,07,778	3,92,222	15,000
2	1,57,778	39,222	1,18,556	2,73,666	11,766.6
3	1,57,778	27,367	1,30,411	1,43,255	8,210.1
4	1,57,778	14,523 (bal. fig.)	1,43,255	------	4,356.9

(4) After 4 years the equipment is sold for Rs. 50,000 which is a cash outflow due to lease over buy

Loss on sale= Rs. (1,58,203.12 - 50,000)

= Rs. 1,08,203.12

Tax savings on loss = 30% of Rs. 1,08,203.12 = Rs. 32,460.94 This further tax shield has to be accounted for in the year 4.

(5) If the equipment is taken on lease, the cash outflow on a/c of lease rental, depreciation tax shield is given in table 3

Table 3

Year	Net of tax lease rental (Rs.)	Depreciation tax shield (Rs.) (from Table 1)	Interest tax shield (Rs.) (from Table 2)	Total (Rs.)
1	1,33,000	37,500	15,000	1,85,500
2	1,33,000	28,125	11,766.6	1,72,891.6
3	1,33,000	21,093.75	8,210.1	1,62,303.85
4	1,33,000	15,820.31	4,356.9	1,53,177.21

(6) Net of tax interest rate = 0.10X (1-.30) = 0.07

Calculation of NPV for lease over buy option   (Amount in Rs.)

Year	1	2	3	4
Loan Installment	1,57,778	1,57,778	1,57,778	1,57,778
License Fees (net of Taxes)	36,400	36,400	36,400	36,400
Amount from sale of Machine				(50,000)
Tax saving on loss on sale				(32,460.94)
Total Tax Shield on Lease Rent, Interest and Depreciation	(1,85,500)	(1,72,891.60)	(1,62,303.85)	(1,53,177.21)
Total Cash flow	8,678.00	21,286.40	31,874.15	(41,460.15)
Discounting Factor @7%	0.935	0.873	0.816	0.763
Discounted Cash Flow	8,113.93	18,583.03	26,009.31	(31,634.09)
NPV [8,113.93 + 18,583.03 + 26,009.31 + (31,634.09)]				21,072.17

Since, NPV or value of the lease is positive, the equipment should be taken on lease.

7. CK Ltd. is planning to buy a new machine. Details of which are as follows:

Cost of the Machine at the commencement	Rs. 2,50,000
Economic Life of the Machine	8 year
Residual Value	Nil
Annual Production Capacity of the Machine	1,00,000 units
Estimated Selling Price per unit	Rs. 6
Estimated Variable Cost per unit	Rs. 3
Estimated Annual Fixed Cost (Excluding depreciation)	Rs. 1,00,000
Advertisement Expenses in 1st year in addition of annual fixed cost	Rs. 20,000
Maintenance Expenses in 5th year in addition of annual fixed cost	Rs. 30,000
Cost of Capital	12%

Ignore Tax.

Analyse the above mentioned proposal using the Net Present Value Method and advice.

P.V. factor @ 12% are as under:

Year	1	2	3	4	5	6	7	8
PV Factor	0.893	0.797	0.712	0.636	0.567	0.507	0.452	0.404

(Nov 2020)

Solution
Calculation of Net Cash flows

Contribution = (Rs. 6 – Rs. 3) x 1,00,000 units = Rs. 3,00,000

Fixed costs (excluding depreciation) = Rs. 1,00,000

Year	Capital (Rs.)	Contribution (Rs.)	Fixed costs (Rs.)	Advertisement/ Maintenance expenses (Rs.)	Net cash flow (Rs.)
0	(2,50,000)				(2,50,000)
1		3,00,000	(1,00,000)	(20,000)	1,80,000
2		3,00,000	(1,00,000)		2,00,000
3		3,00,000	(1,00,000)		2,00,000
4		3,00,000	(1,00,000)		2,00,000
5		3,00,000	(1,00,000)	(30,000)	1,70,000
6		3,00,000	(1,00,000)		2,00,000
7		3,00,000	(1,00,000)		2,00,000
8		3,00,000	(1,00,000)		2,00,000

Calculation of Net Present Value

Year	Net cash flow (Rs.)	12% discount factor	Present value (Rs.)
0	(2,50,000)	1.000	(2,50,000)
1	1,80,000	0.893	1,60,740
2	2,00,000	0.797	1,59,400
3	2,00,000	0.712	1,42,400
4	2,00,000	0.636	1,27,200
5	1,70,000	0.567	96,390
6	2,00,000	0.507	1,01,400

7	2,00,000	0.452	90,400
8	2,00,000	0.404	80,800
			7,08,730

Advise: CK Ltd. should buy the new machine, as the net present value of the proposal is positive i.e Rs. 7,08,730.

8. Stand Ltd. is contemplating replacement of one of its machines which has become outdated and inefficient. Its financial manager has prepared a report outlining two possible replacement machines. The details of each machine are as follows:

	Machine 1	Machine 2
Initial investment	Rs. 12,00,000	Rs. 16,00,000
Estimated useful life	3 years	5 years
Residual value	Rs. 1,20,000	Rs. 1,00,000
Contribution per annum	Rs. 11,60,000	Rs. 12,00,000
Fixed maintenance costs per annum	Rs. 40,000	Rs. 80,000
Other fixed operating costs per annum	Rs. 7,20,000	Rs. 6,10,000

The maintenance costs are payable annually in advance. All other cash flows apart from the initial investment assumed to occur at the end of each year. Depreciation has been calculated by straight line method and has been included in other fixed operating costs. The expected cost of capital for this project is assumed as 12% p.a.

Required:
(i)   Which machine is more beneficial, using Annualized Equivalent Approach? Ignore tax.
(ii)   Calculate the sensitivity of your recommendation in part (i) to changes in the contribution generated by machine 1.

Year	1	2	3	4	5	6
PVIF0.12,t	0.893	0.797	0.712	0.636	0.567	0.507
PVIFA0.12,t	0.893	1.690	2.402	3.038	3.605	4.112

(Dec. 2021)

Solution
(i)   Calculation of Net Cash flows
Machine 1
Other fixed operating costs (excluding depreciation) = 7,20,000–[(12,00,000–1,20,000)/3]
= Rs. 3,60,000

Year	Initial Investment (Rs.)	Contribution (Rs.)	Fixed maintenance Costs (Rs.)	Other fixed operating costs (excluding depreciation) (Rs.)	Residual Value (Rs.)	Net cash flow (Rs.)
0	(12,00,000)		(40,000)		(12,40,000)	
1		11,60,000	(40,000)	(3,60,000)		7,60,000
2		11,60,000	(40,000)	(3,60,000)		7,60,000

3		11,60,000		(3,60,000)	1,20,000	9,20,000

Machine 2

Other fixed operating costs (excluding depreciation) = 6,10,000 –[(16,00,000–1,00,000)/5]
= Rs. 3,10,000

Year	Initial Investment (Rs.)	Contribution (Rs.)	Fixed maintenance Costs (Rs.)	Other fixed operating costs (excluding depreciation) (Rs.)	Residual Value (Rs.)	Net cash flow (Rs.)
0	(16,00,000)		(80,000)	(16,80,000)		
1		12,00,000	(80,000)	(3,10,000)		8,10,000
2		12,00,000	(80,000)	(3,10,000)		8,10,000
3		12,00,000	(80,000)	(3,10,000)		8,10,000
4		12,00,000	(80,000)	(3,10,000)		8,10,000
5		12,00,000		(3,10,000)	1,00,000	9,90,000

Calculation of Net Present Value

Year	12% discount factor	Machine 1 Net cash flow (Rs.)	Machine 1 Present value (Rs.)	Machine 2 Net cash flow (Rs.)	Machine 2 Present value (Rs.)
0	1.000	(12,40,000)	(12,40,000)	(16,80,000)	(16,80,000)
1	0.893	7,60,000	6,78,680	8,10,000	7,23,330
2	0.797	7,60,000	6,05,720	8,10,000	6,45,570
3	0.712	9,20,000	6,55,040	8,10,000	5,76,720
4	0.636			8,10,000	5,15,160
5	0.567			9,90,000	5,61,330
NPV @ 12%			6,99,440		13,42,110
PVAF @ 12%			2.402		3.605
Equivalent Annualized Criterion			2,91,190.674		3,72,291.262

Recommendation: Machine 2 is more beneficial using Equivalent Annualized Criterion.

(ii)   Calculation of sensitivity of recommendation in part (i) to changes in the contribution generated by machine 1

Difference in Equivalent Annualized Criterion of Machines required for changing the recommendation in part (i) = 3,72,291.262- 2,91,190.674 = Rs. **81,100.588**

∴ Sensitivity relating to contribution = $\frac{Rs.81,100.588}{Rs.11,60,000.00}$ ×100 = 6.991 **or 7% yearly**

Alternatively,

The annualized equivalent cash flow for machine 1 is lower by Rs. (3,72,291.262–

2,91,190.674) = **Rs.81,100.588** than for machine 2. Therefore, it would need to increase contribution for **complete 3 years** before the decision would be to invest in this machine.
Sensitivity w.r.t contribution = 81,100.588 / (11,60,000 × 2.402) x100 = **2.911%**

9. A company wants to buy a machine, and two different models namely A and B are available. Following further particulars are available:

Particulars	Machine-A	Machine-B
Original Cost (Rs.)	8,00,000	6,00,000
Estimated Life in years	4	4
Salvage Value (Rs.)	0	0

The company provides depreciation under Straight Line Method. Income tax rate applicable is 30%.
The present value of Rs. 1 at 12% discounting factor and net profit before depreciation and tax are as under:

Year	Net Profit Before Depreciation and tax		PV Factor
	Machine-A Rs.	Machine-B Rs.	
1.	2,30,000	1,75,000	0.893
2.	2,40,000	2,60,000	0.797
3.	2,20,000	3,20,000	0.712
4.	5,60,000	1,50,000	0.636

Calculate:
1. NPV (Net Present Value)
2. Discounted pay-back period
3. PI (Profitability Index)
Suggest: Purchase of which machine is more beneficial under Discounted pay-back period method, NPV method and PI method.

(Jan 2021)

Solution
Workings:
(i)   Calculation of Annual Depreciation

$$\text{Depreciation on Machine} - A = \frac{Rs.8,00,000}{4} = \text{Rs. } 2,00,000$$

$$\text{Depreciation on Machine} - B = \frac{Rs.6,00,000}{4} = \text{Rs. } 1,50,000$$

(ii)   Calculation of Annual Cash Inflows

Particulars	Machine-A (Rs.)			
	1	2	3	4
Net Profit before Depreciation and Tax	2,30,000	2,40,000	2,20,000	5,60,000
Less: Depreciation	2,00,000	2,00,000	2,00,000	2,00,000
Profit before Tax	30,000	40,000	20,000	3,60,000
Less: Tax @ 30%	9,000	12,000	6,000	1,08,000
Profit after Tax	21,000	28,000	14,000	2,52,000
Add: Depreciation	2,00,000	2,00,000	2,00,000	2,00,000
Annual Cash Inflows	**2,21,000**	**2,28,000**	**2,14,000**	**4,52,000**

Particulars	Machine-B (Rs.)			
	1	2	3	4
Net Profit before Depreciation and Tax	1,75,000	2,60,000	3,20,000	1,50,000
Less: Depreciation	1,50,000	1,50,000	1,50,000	1,50,000
Profit before Tax	25,000	1,10,000	1,70,000	0
Less: Tax @ 30%	7,500	33,000	51,000	0
Profit after Tax	17,500	77,000	1,19,000	0
Add: Depreciation	1,50,000	1,50,000	1,50,000	1,50,000
Annual Cash Inflows	1,67,500	2,27,000	2,69,000	1,50,000

(iii)   Calculation of PV of Cash Flows

Year	PV of Re 1 @ 12%	Machine – A			Machine - B		
		Cash flow (Rs.)	PV(Rs.)	Cumulative PV (Rs.)	Cash flow (Rs.)	PV(Rs.)	Cumulative PV (Rs.)
1	0.893	2,21,000	1,97,353	1,97,353	1,67,500	1,49,578	1,49,578
2	0.797	2,28,000	1,81,716	3,79,069	2,27,000	1,80,919	3,30,497
3	0.712	2,14,000	1,52,368	5,31,437	2,69,000	1,91,528	5,22,025
4	0.636	4,52,000	2,87,472	8,18,909	1,50,000	95,400	6,17,425

Machine – A

NPV = Rs. 8,18,909 - Rs. 8,00,000 = **Rs. 18,909**

Machine – B

NPV = Rs. 6,17,425 – Rs. 6,00,000 = **Rs. 17,425**

2.   Discounted Payback Period

Machine – A

Discounted Payback Period = $3 + \frac{Rs.8,00,000 - Rs.5,31,437}{Rs.2,87,472}$

= 3 + 0.934

= 3.934 years or 3 years 11.21 months

Machine – B

Discounted Payback Period = $3 + \frac{Rs.6,00,000 - Rs.55,22,025}{Rs.95,400}$

= 3 + 0.817

= 3.817 years or 3 years 9.80 months

3.   PI (Profitability Index)

Machine – A

Profitability Index $= \frac{Rs.8,18,909}{Rs.8,00,000} = 1.024$

Machine – B

Profitability Index $= \frac{Rs.6,17,425}{Rs.6,00,000} = 1.029$

Suggestion:

Method	Machine - A	Machine - B	Suggested Machine
Net Present Value	Rs. 18,909	Rs. 17,425	Machine A
Discounted Payback Period	3.934 years	3.817 years	Machine B
Profitability Index	1.024	1.029	Machine B

10. K.P. Ltd. is investing Rs. 50 lakhs in a project. The life of the project is 4 years. Risk free rate of return is 6% and risk premium is 6%, other information is as under:

Sales of 1st year	Rs. 50 lakhs
Sales of 2nd year	Rs. 60 lakhs
Sales of 3rd year	Rs. 70 lakhs
Sales of 4th year	Rs. 80 lakhs
P/V Ratio (same in all the years)	50%
Fixed Cost (Excluding Depreciation) of 1st year	Rs. 10 lakhs
Fixed Cost (Excluding Depreciation) of 2nd year	Rs. 12 lakhs
Fixed Cost (Excluding Depreciation) of 3rd year	Rs. 14 lakhs
Fixed Cost (Excluding Depreciation) of 4th year	Rs. 16 lakhs

Ignoring interest and taxes,
You are required to calculate NPV of given project on the basis of Risk Adjusted Discount Rate.

Discount factor @ 6% and 12% are as under:

Year	1	2	3	4
Discount Factor @ 6%	0.943	0.890	0.840	0.792
Discount Factor@ 12%	0.893	0.797	0.712	0.636

(Jul 2021)

Solution
Calculation of Cash Flow

Year	Sales (Rs. in Lakhs) (A)	P/V ratio (B)	Contribution (Rs. in Lakhs) (C) = (A x B)	Fixed Cost (Rs. in Lakhs) (D)	Cash Flows (Rs. in lakhs) (E) = (C – D)
1	50	50%	25	10	15
2	60	50%	30	12	18
3	70	50%	35	14	21
4	80	50%	40	16	24

When risk-free rate is 6% and the risk premium expected is 6%, then risk adjusted discount rate would be 6% + 6% =12%.

Calculation of NPV using Risk Adjusted Discount Rate (@ 12%)

Year	Cash flows (Rs. in Lakhs)	Discounting Factor @ 12%	Present Value of Cash Flows (Rs. in lakhs)
1	15	0.893	13.395
2	18	0.797	14.346
3	21	0.71214.952	
4	24	0.636	15.264

Total of present value of Cash flow	57.957
Less: Initial Investment	50.000
Net Present value (NPV)	7.957

11. An existing company has a machine which has been in operation for two years, its estimated remaining useful life is 4 years with no residual value in the end. Its current market value is Rs. 3 lakhs. The management is considering a proposal to purchase an improved model of a machine gives increase output. The details are as under:

Particulars	Existing Machine	New Machine
Purchase Price	Rs. 6,00,000	Rs. 10,00,000
Estimated Life	6 years	4 years
Residual Value	0	0
Annual Operating days	300	300
Operating hours per day	6	6
Selling price per unit	Rs. 10	Rs. 10
Material cost per unit	Rs. 2	Rs. 2
Output per hour in units	20	40
Labour cost per hour	Rs. 20	Rs. 30
Fixed overhead per annum excluding depreciation	Rs. 1,00,000	Rs. 60,000
Working Capital	Rs. 1,00,000	Rs. 2,00,000
Income-tax rate	30%	30%

Assuming that - cost of capital is 10% and the company uses written down value of depreciation @ 20% and it has several machines in 20% block.
Advice the management on the Replacement of Machine as per the NPV method. The discounting factors table given below:

Discounting Factors	Year 1	Year 2	Year 3	Year 4
10%	0.909	0.826	0.751	0.683

(Jul 2021)

Solution
(i)   Calculation of Net Initial Cash Outflows:

Particulars	Rs.
Purchase Price of new machine	10,00,000
Add: Net Working Capital	1,00,000
Less: Sale proceeds of existing machine	3,00,000
Net initial cash outflows	8,00,000

(ii)   Calculation of annual Profit Before Tax and depreciation

Particulars	Existing machine	New Machine	Differential
(1)	(2)	(3)	(4) = (3) – (2)
Annual output	36,000 units	72,000 units	36,000 units
	Rs.	Rs.	Rs.
(A) Sales revenue @ Rs. 10 per unit	3,60,000	7,20,000	3,60,000

(B) Cost of Operation			
Material @ Rs. 2 per unit	72,000	1,44,000	72,000
Labour			
Old	= 1,800 x Rs. 20	36,000	
New	= 1,800 x Rs. 30		54,000
Fixed	overhead	excluding depreciation	1,00,000
Total Cost (B)	2,08,000	2,58,000	50,000
Profit Before Tax and depreciation (PBTD) (A – B)	**1,52,000**	**4,62,000**	**3,10,000**

(iii)   Calculation of Net Present value on replacement of machine

Year	PBTD	Depreciation @ 20% WDV	PBT	Tax @ 30%	PAT			
Net cash flow	PVF @ 10%	PV						
(1)	(2)	(3)	(4 = 2-3)	(5)	(6 = 4-5)	(7 = 6 + 3)	(8)	(9 = 7 x 8)
1	3,10,000	1,40,000	1,70,000	51,000	1,19,000	2,59,000	0.909	2,35,431.000
2	3,10,000	1,12,000	1,98,000	59,400	1,38,600	2,50,600	0.826	2,06,995.600
3	3,10,000	89,600	2,20,400	66,120	1,54,280	2,43,880	0.751	1,83,153.880
4	3,10,000	71,680	2,38,320	71,496	1,66,824	2,38,504	0.683	1,62,898.232
								7,88,478.712
Add: Release of net working capital at year end 4 (1,00,000 x 0.683)								68,300.000
Less: Initial Cash Outflow								8,00,000.000
NPV								56,778.712

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

Working Notes:

1. **Calculation of Annual Output**

   Annual output = (Annual operating days x Operating hours per day) x output per hour

   Existing machine = (300 x 6) x 20 = 1,800 x 20 = 36,000 units

   New machine = (300 x 6) x 40 = 1,800 x 40 = 72,000 units

2. **Base for incremental depreciation**

Particulars		Rs.
WDV of Existing Machine		
Purchase price of existing machine		6,00,000
Less: Depreciation for year 1		1,20,000
Depreciation for Year 2	96,000	2,16,000
WDV of Existing Machine (i)		3,84,000
Depreciation base of New Machine		
Purchase price of new machine		10,00,000
Add: WDV of existing machine		3,84,000
Less: Sales value of existing machine		3,00,000

Depreciation base of New Machine (ii)	10,84,000
Base for incremental depreciation [(ii) – (i)]	7,00,000

(Note: The above solution have been done based on incremental approach) Alternatively, solution can be done based on Total Approach as below:

(i)   Calculation of depreciation:

Existing Machine

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Opening balance	6,00,000	4,80,000	3,84,000	3,07,200	2,45,760	1,96,608.00
Less: Depreciation @ 20%	1,20,000	96,000	76,800	61,440	49,152	39,321.60
WDV	4,80,000	3,84,000	3,07,200	2,45,760	1,96,608	1,57,286.40

New Machine

	Year 1	Year 2	Year 3	Year 4
Opening balance	10,84,000*	8,67,200	6,93,760	5,55,008.00
Less: Depreciation @ 20%	2,16,800	1,73,440	1,38,752	1,11,001.60
WDV	8,67,200	6,93,760	5,55,008	4,44,006.40

* As the company has several machines in 20% block, the value of Existing Machine from the block calculated as below shall be added to the new machine of Rs. 10,00,000:

WDV of existing machine at the beginning of the year	Rs. 3,84,000
Less: Sale Value of Machine	Rs. 3,00,000
WDV of existing machine in the block	Rs. 84,000

Therefore, opening balance for depreciation of block = Rs. 10,00,000 + Rs. 84,000 = Rs. 10,84,000

(ii)   Calculation of annual cash inflows from operation:

Particulars	EXISTING MACHINE			
	Year 3	Year 4	Year 5	Year 6
Annual output (300 operating days x 6 operating hours x 20 output per hour)	36,000 units	36,000 units	36,000 units	36,000 units
	Rs.	Rs.	Rs.	Rs.
(A) Sales revenue @ Rs. 10 per unit	3,60,000.00	3,60,000.00	3,60,000.00	3,60,000.00
(B) Less: Cost of Operation				
Material @ Rs. 2	72,000.00	72,000.00	72,000.00	72,000.00

per unit				
Labour @ Rs. 20 per hour for (300 x 6) hours	36,000.00	36,000.00	36,000.00	36,000.00
Fixed overhead	1,00,000.00	1,00,000.00	1,00,000.00	1,00,000.00
Depreciation	76,800.00	61,440.00	49,152.00	39,321.60
Total Cost (B)	**2,84,800.00**	**2,69,440.00**	**2,57,152.00**	**2,47,321.60**
Profit Before Tax (A – B)	75,200.00	90,560.00	1,02,848.00	1,12,678.40
Less: Tax @ 30%	22,560.00	27,168.00	30,854.40	33,803.52
Profit After Tax	**52,640.00**	**63,392.00**	**71,993.60**	**78,874.88**
Add: Depreciation	76,800.00	61,440.00	49,152.00	39,321.60
Add: Release of Working Capital				1,00,000.00
Annual Cash Inflows	**1,29,440.00**	**1,24,832.00**	**1,21,145.60**	**2,18,196.48**

Particulars	NEW MACHINE			
	Year 1	**Year 2**	**Year 3**	**Year 4**
Annual output (300 operating days x 6 operating hours x 40 output per hour)	**72,000 units**	**72,000 units**	**72,000 units**	**72,000 Units**
	Rs.	Rs.	Rs.	Rs.
(A) Sales revenue @ Rs. 10 per unit	**7,20,000.00**	**7,20,000.00**	**7,20,000.00**	**7,20,000.00**
(B) Less: Cost of Operation				
Material @ Rs. 2 per unit	1,44,000.00	1,44,000.00	1,44,000.00	1,44,000.00
Labour @ Rs. 30 per hour for (300 x 6) hours	54,000.00	54,000.00	54,000.00	54,000.00
Fixed overhead	60,000.00	60,000.00	60,000.00	60,000.00
Depreciation	2,16,800.00	1,73,440.00	1,38,752.00	1,11,001.60
Total Cost (B)	4,74,800.00	4,31,440.00	3,96,752.00	3,69,001.60
Profit Before Tax (A – B)	2,45,200.00	2,88,560.00	3,23,248.00	3,50,998.40
Less: Tax @ 30%	73,560.00	86,568.00	96,974.40	1,05,299.52
Profit After Tax	1,71,640.00	2,01,992.00	2,26,273.60	2,45,698.88
Add: Depreciation	2,16,800.00	1,73,440.00	1,38,752.00	1,11,001.60
Add: Release of Working Capital				2,00,000.00
Annual Cash Inflows	3,88,440.00	3,75,432.00	3,65,025.60	5,56,700.48

(iii)   Calculation of Incremental Annual Cash Flow:

Particulars	Year 1 (Rs.)	Year 2 (Rs.)	Year 3 (Rs.)	Year 4 (Rs.)
Existing Machine (A)	1,29,440.00	1,24,832.00	1,21,145.60	2,18,196.48
New Machine (B)	3,88,440.00	3,75,432.00	3,65,025.60	5,56,700.48
Incremental Annual Cash Flow (B – A)	2,59,000.00	2,50,600.00	2,43,880.00	3,38,504.00

(iv)   Calculation of Net Present Value on replacement of machine:

Year	Incremental Annual Cash Flow (Rs.) (A)	Discounting factor @ 10% (B)	Present Value of Incremental Annual Cash Flow (Rs.) (A x B)
1	2,59,000.00	0.909	2,35,431.000
2	2,50,600.00	0.826	2,06,995.600
3	2,43,880.00	0.751	1,83,153.880
4	3,38,504.00	0.683	2,31,198.232
Total Incremental Inflows			**8,56,778.712**
Less: Net Initial Cash Outflows (Working note)			8,00,000.000
Incremental NPV			**56,778.712**

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

Working Note:
Calculation of Net Initial Cash Outflows:

Particulars	Rs.
Cost of new machine	10,00,000
Less: Sale proceeds of existing machine	3,00,000
Add: incremental working capital required (Rs. 2,00,000 – Rs. 1,00,000)	1,00,000
Net initial cash outflows	8,00,000

12. Alpha Limited is a manufacturer of computers. It wants to introduce artificial intelligence while making computers. The estimated annual saving from introduction of the artificial intelligence (AI) is as follows:
    • reduction of five employees with annual salaries of Rs. 3,00,000 each
    • reduction of Rs. 3,00,000 in production delays caused by inventory problem
    • reduction in lost sales Rs. 2,50,000 and
    • Gain due to timely billing Rs. 2,00,000

The purchase price of the system for installation of artificial intelligence is Rs. 20,00,000 and installation cost is Rs. 1,00,000. 80% of the purchase price will be paid in the year of purchase and remaining will be paid in next year.

The estimated life of the system is 5 years and it will be depreciated on a straight -line basis. However, the operation of the new system requires two computer specialists with annual salaries of Rs. 5,00,000 per person.

In addition to above, annual maintenance and operating cost for five years are as below:

(Amount in Rs.)

Year	1	2	3	4	5
Maintenance & Operating Cost	2,00,000	1,80,000	1,60,000	1,40,000	1,20,000

Maintenance and operating cost are payable in advance.
The company's tax rate is 30% and its required rate of return is 15%.

Year	1	2	3	4	5
PVIF 0.10, t	0.909	0.826	0.751	0.683	0.621
PVIF 0.12, t	0.893	0.797	0.712	0.636	0.567
PVIF 0.15, t	0.870	0.756	0.658	0.572	0.497

Evaluate the project by using Net Present Value and Profitability Index.

(May 2022)

Solution

Computation of Annual Cash Flow after Tax

Particulars	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Savings in Salaries		15,00,000	15,00,000	15,00,000	15,00,000	15,00,000
Reduction in Production Delays			3,00,000	3,00,000	3,00,000	3,00,000
Reduction in Lost Sales		2,50,000	2,50,000	2,50,000	2,50,000	2,50,000
Gain due to Timely Billing		2,00,000	2,00,000	2,00,000	2,00,000	2,00,000
Salary to Computer Specialist		(10,00,000)	(10,00,000)	(10,00,000)	(10,00,000)	(10,00,000)
Maintenance and Operating Cost (payable in advance)		(2,00,000)	(1,80,000)	(1,60,000)	(1,40,000)	(1,20,000)
Depreciation (21 lakhs/5)		(4,20,000)	(4,20,000)	(4,20,000)	(4,20,000)	(4,20,000)
Gain Before Tax		**6,30,000**	**6,50,000**	**6,70,000**	**6,90,000**	**7,10,000**
Less: Tax (30%)		1,89,000	1,95,000	2,01,000	2,07,000	2,13,000
Gain After Tax		4,41,000	4,55,000	4,69,000	4,83,000	4,97,000
Add: Depreciation		4,20,000	4,20,000	4,20,000	4,20,000	4,20,000
Add: Maintenance and Operating Cost (payable in advance)		2,00,000	1,80,000	1,60,000	1,40,000	1,20,000
Less: Maintenance and Operating Cost (payable in advance)	(2,00,000)	(1,80,000)	(1,60,000)	(1,40,000)	(1,20,000)	-
Net CFAT	**(2,00,000)**	**8,81,000**	**8,95,000**	**9,09,000**	**9,23,000**	**10,37,000**

Note: Annual cash flows can also be calculated Considering tax shield on depreciation & maintenance and operating cost. There will be no change in the final cash flows after tax.

Computation of NPV

Particulars	Year	Cash Flows (Rs.)	PVF	PV (Rs.)
Initial Investment (80% of 20 Lacs)	0	16,00,000	1	16,00,000
Installation Expenses	0	1,00,000	1	1,00,000
Instalment of Purchase Price	1	4,00,000	0.870	3,48,000
PV of Outflows (A)				20,48,000
CFAT	0	(2,00,000)	1	(2,00,000)
CFAT	1	8,81,000	0.870	7,66,470
CFAT	2	8,95,000	0.756	6,76,620
CFAT	3	9,09,000	0.658	5,98,122
CFAT	4	9,23,000	0.572	5,27,956
CFAT	5	10,37,000	0.497	5,15,389
PV of Inflows (B)				28,84,557
NPV (B-A)				8,36,557
Profitability Index (B/A)				1.408 or 1.41

Evaluation: Since the NPV is positive (i.e. Rs. 8,36,557) and Profitability Index is also greater than 1 (i.e. 1.41), Alpha Ltd. may introduce artificial intelligence (AI) while making computers.

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13. A firm is in need of a small vehicle to make deliveries. It is in tending to choose between two options. One option is to buy a new three wheeler that would cost Rs. 1,50,000 and will remain in service for 10 years.
The other alternative is to buy a second hand vehicle for Rs. 80,000 that could remain in service for 5 years. Thereafter the firm, can buy another second hand vehicle for Rs. 60,000 that will last for another 5 years.
The scrap value of the discarded vehicle will be equal to it written down value (WDV). The firm pays 30% tax and is allowed to claim depreciation on vehicles @ 25% on WDV basis. The cost of capital of the firm is 12%.

You are required to advise the best option. Given:

t	1	2	3	4	5	6	7	8	9	10
PVIF (t,12%)	0.892	0.797	0.711	0.635	0.567	0.506	0.452	0.403	0.360	0.322

(Nov. 2022)

Solution

Selection of Investment Decision

Tax shield on Purchase of New vehicle

Year	WDV	Dep. @ 25%	Tax shield @ 30%
1	1,50,000	37,500	11,250
2	1,12,500	28,125	8,437
3	84,375	21,094	6,328
4	63,281	15,820	4,746
5	47,461	11,865	3,560
6	35,596	8,899	2,670
7	26,697	6,674	2,002
8	20,023	5,006	1,502
9	15,017	3,754	1,126
10	11,263	2,816	845
11	8,447	Scrap value	

Tax shield on Purchase of Second hand vehicles

Year	WDV	Dep. @ 25%	Tax shield @ 30%	
1	80,000	20,000	6,000	
2	60,000	15,000	4,500	
3	45,000	11,250	3,375	
4	33,750	8,437	2,531	
5	25,313	6,328	1,898	Scrap value = Rs. 18,985
6	60,000	15,000	4,500	
7	45,000	11,250	3,375	
8	33,750	8,437	2,531	
9	25,313	6,328	1,898	
10	18,985	4,746	1,424	Scrap value = Rs. 14,239

Calculation of PV of Net outflow of New Vehicle

Year	Cash OF/IF	PV Factor	PV of OF/IF
0	1,50,000	1	1,50,000
1	(11,250)	0.892	(10,035)
2	(8,437)	0.797	(6,724)
3	(6,328)	0.711	(4,499)
4	(4,746)	0.635	(3,014)
5	(3,560)	0.567	(2,018)
6	(2,670)	0.506	(1,351)
7	(2,002)	0.452	(905)
8	(1,502)	0.403	(605)
9	(1,126)	0.360	(405)
10	(845 + 8447)	0.322	(2,992)
		PVNOF	**1,17,452**

Calculation of PV of Net outflow of Second hand Vehicles

Year	Cash OF/IF	PV Factor	PV of OF/IF
0	80,000	1	80,000
1	(6,000)	0.892	(5,352)
2	(4,500)	0.797	(3,587)
3	(3,375)	0.711	(2,400)
4	(2,531)	0.635	(1,607)
5	(60000 – 18985 – 1898) = 39,117	0.567	22,179
6	(4,500)	0.506	(2,277)
7	(3,375)	0.452	(1,525)
8	(2,531)	0.403	(1,020)
9	(1,898)	0.360	(683)
10	(1424 + 14239) = (15,663)	0.322	(5,043)
		PVNOF	**78,686**

Advise: The PV of net outflow is low in case of buying the second hand vehicles. Therefore, it is advisable to buy second hand vehicles.

14. A hospital is considering to purchase a diagnostic machine costing Rs. 80,000. The projected life of the machine is 8 years and has an expected salvage value of Rs. 6,000 at the end of 8 years. The annual operating cost of the machine is Rs. 7,500. It is expected to generate revenues of Rs. 40,000 per year for eight years. Presently, the hospital is outsourcing the diagnostic work and is earning commission income of Rs. 12,000 per annum.

Consider tax rate of 30% and Discounting Rate as 10%. Advise:

Whether it would be profitable for the hospital to purchase the machine?

Give your recommendation as per Net Present Value method and Present Value Index method under below mentioned two situations:

(i)   If Commission income of Rs. 12,000 p.a. is before taxes.

(ii)   If Commission income of Rs. 12,000 p.a. is net of taxes.

Given

t	1	2	3	4	5	6	7	8
PVIF (t, 10%)	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467

(Nov. 2022)

Solution

Analysis of Investment Decisions

Determination of Cash inflows	Situation-(i) Commission Income before taxes	Situation-(ii) Commission Income after taxes
Cash flow up-to 7th year:		
Sales Revenue	40,000	40,000
Less: Operating Cost	(7,500)	(7,500)
	32,500	32,500
Less: Depreciation (80,000 – 6,000) ÷ 8	(9,250)	(9,250)
Net Income	23,250	23,250
Tax @ 30%	(6,975)	(6,975)
Earnings after Tax (EAT)	16,275	16,275

Add: Depreciation	9,250	9,250
Cash inflow after tax per annum	25,525	25,525
Less: Loss of Commission Income	(8,400)	(12,000)
Net Cash inflow after tax per annum	17,125	13,525
In 8th Year:		
Net Cash inflow after tax	17,125	13,525
Add: Salvage Value of Machine	6,000	6,000
Net Cash inflow in year 8	**23,125**	**19,525**

Calculation of Net Present Value (NPV) and Profitability Index (PI)

	Particulars	PV factor @10%	Situation-(i) [Commission Income before taxes]	Situation-(ii) [Commission Income after taxes]
A	Present value of cash inflows (1st to 7th year)	4.867	83,347.38 (17,125 × 4.867)	65,826.18 (13,525 × 4.867)
B	Present value of cash inflow at 8th year	0.467	10,799.38 (23,125 × 0.467)	9,118.18 (19,525 × 0.467)
C	PV of cash inflows	1.00	94,146.76	74,944.36
D	Less: Cash Outflow		(80,000)	(80,000)
E	Net Present Value (NPV)		14,146.76	(5,055.64)
F	PI = (C÷D)		1.18	0.94

Recommendation: The hospital may consider purchasing of diagnostic machine in situation (i) where commission income is 12,000 before tax as NPV is positive and PI is also greater than 1. Contrary to situation (i), in situation (ii) where the commission income is net of tax, the recommendation is reversed to not purchase the machine as NPV is negative and PI is also less than 1.

15. Four years ago, Z Ltd. had purchased a machine of Rs. 4,80,000 having estimated useful life of 8 years with zero salvage value. Depreciation is charged using SLM method over the useful life. The company want to replace this machine with a new machine. Details of new machine are as below:
    • Cost of new machine is Rs. 12,00,000, Vendor of this machine is agreed to take old machine at a value of Rs. 2,40,000. Cost of dismantling and removal of old machine will be Rs. 40,000. 80% of net purchase price will be paid on spot and remaining will be paid at the end of one year.
    • Depreciation will be charged @ 20% p.a. under WDV method.
    • Estimated useful life of new machine is four years and it has salvage value of Rs. 1,00,000 at the end of year four.
    • Incremental annual sales revenue is Rs. 12,25,000.
    • Contribution margin is 50%.
    • Incremental indirect cost (excluding depreciation) is Rs. 1,18,750 per year.
    • Additional working capital of Rs. 2,50,000 is required at the beginning of year and Rs. 3,00,000 at the beginning of year three. Working capital at the end of year four

will be nil.
- Tax rate is 30%.
- Ignore tax on capital gain.

Z Ltd. will not make any additional investment, if it yields less than 12% Advice, whether existing machine should be replaced or not.

Year	1	2	3	4	5
PVIF0.12, t	0.893	0.797	0.712	0.636	0.567

(May 2023)

Solution
Working Notes:
(i)   Calculation of Net Initial Cash Outflow

Particulars	Rs.
Cost of New Machine	12,00,000
Less: Sale proceeds of existing machine	2,00,000
Net Purchase Price	10,00,000
Paid in year 0	8,00,000
Paid in year 1	2,00,000

(ii)   Calculation of Additional Depreciation

Year	1	2	3	4
	Rs.	Rs.	Rs.	Rs.
Opening WDV of machine	10,00,000	8,00,000	6,40,000	5,12,000
Depreciation on new machine @ 20%	2,00,000	1,60,000	1,28,000	1,02,400
Closing WDV	8,00,000	6,40,000	5,12,000	4,09,600
Depreciation on old machine (4,80,000/8)	60,000	60,000	60,000	60,000
Incremental depreciation	**1,40,000**	**1,00,000**	**68,000**	**42,400**

(iii)   Calculation of Annual Profit before Depreciation and Tax (PBDT)

Particulars	Incremental Values (Rs.)
Sales	12,25,000
Contribution	6,12,500
Less: Indirect Cost	1,18,750
Profit before Depreciation and Tax (PBDT)	4,93,750

Calculation of Incremental NPV

Year	PVF @ 12%	PBTD(Rs.)	Incremental Depreciation (Rs.)	PBT(Rs.)	Tax @ 30%(Rs.)	Cash Inflows (Rs.)	PV of Cash Inflows (Rs.)
	(1)	(2)	(3)	(4)	(5) = (4) x 0.30	(6) = (4) – (5)+ (3)	(7) = (6) x (1)
1	0.893	4,93,750	1,40,000	3,53,750	106,125	3,87,625	3,46,149.125
2	0.797	4,93,750	1,00,000	3,93,750	1,18,125	3,75,625	2,99,373.125
3	0.712	4,93,750	68,000	4,25,750	1,27,725	3,66,025	2,60,609.800
4	0.636	4,93,750	42,400	4,51,350	1,35,405	3,58,345	2,27,907.420
*	*						11,34,039.470
Add: PV of Salvage (Rs. 1,00,000 x 0.636)							63,600
Less: Initial Cash Outflow - Year 0							8,00,000

Year 1 (Rs. 2,00,000 × 0.893)	1,78,600
Less: Working Capital - Year 0	2,50,000
Year 2 (Rs. 3,00,000 × 0.797)	2,39,100
Add: Working Capital released - Year 4 (Rs. 5,50,000 × 0.636)	3,49,800
Incremental Net Present Value	**79,739.470**

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

Alternative Presentation Computation of Outflow for new Machine:

	Rs.
Cost of new machine	12,00,000
Replaced cost of old machine	2,40,000
Cost of removal	40,000
Net Purchase price	10,00,000
Outflow at year 0	8,00,000
Outflow at year 1	2,00,000

Computation of additional deprecation

Year	1	2	3	4
	Rs.	Rs.	Rs.	Rs.
Opening WDV of machine	10,00,000	8,00,000	6,40,000	5,12,000
Depreciation on new machine @ 20%	2,00,000	1,60,000	1,28,000	1,02,400
Closing WDV	8,00,000	6,40,000	5,12,000	4,09,600
Depreciation on old machine (4,80,000/8)	60,000	60,000	60,000	60,000
Incremental depreciation	**1,40,000**	**1,00,000**	**68,000**	**42,400**

Computation of NPV

	Year	0	1	2	3	4
		Rs.	Rs.	Rs.	Rs.	Rs.
1.	Increase in sales revenue		12,25,000	12,25,000	12,25,000	12,25,000
2.	Contribution		6,12,500	6,12,500	6,12,500	6,12,500
3.	Increase in fixed cost		1,18,750	1,18,750	1,18,750	1,18,750
4.	Incremental Depreciation		1,40,000	1,00,000	68,000	42,400
5.	Net profit before tax [1-(2+3+4)]		3,53,750	3,93,750	4,25,750	4,51,350
6.	Net Profit after tax (5 x 70%)		2,47,625	2,75,625	2,98,025	3,15,945
7.	Add: Incremental depreciation	1,40,000	1,00,000	68,000	42,400	
8.	Net Annual cash inflows (6 + 7)		3,87,625	3,75,625	3,66,025	3,58,345
9.	Release of salvage value					1,00,000
10.	(investment)/disinvestment in working capital	(2,50,000)		(3,00,000)		5,50,000
11.	Initial cost	(8,00,000)	(2,00,000)			
12.	Total net cash flows	(10,50,000)	1,87,625.0	75,625	3,66,025	10,08,345
13.	Discounting Factor	1	0.893	0.797	0.712	0.636
14.	Discounted cash flows (12 x 13)	(10,50,000)	1,67,549.125	60,273.125	2,60,609.800	641307.420

NPV = (1,67,549 + 60,273 + 2,60,610 + 6,41,307) - 10,50,000 = **Rs. 79,739**
Since the NPV is positive, existing machine should be replaced.

16. ABC Ltd. is considering to purchase a machine which is priced at Rs. 5,00,000. The estimated life of machine is 5 years and has an expected salvage value of Rs. 45,000 at the end of 5 years. It is expected to generate revenues of Rs. 1,50,000 per annum for five years. The annual operating cost of the machine is Rs. 28,125, Corporate Tax Rate is 20% and the cost of capital is 10%.

You are required to analyse whether it would be profitable for the company to purchase the machine by using;

(i)   Payback period Method
(ii)   Net Present value method
(iii) Profitability Index Method

(Nov 2023)

<u>Solution</u>

Computation of Annual Cash Flows

Particular	(Rs.)
Revenue	1,50,000
Less: Operating Cost	(28,125)
Less: Depreciation $\frac{(5,00,000-45,000)}{5}$	(91,000)
Profit before Tax	30,875
Less: Tax	(6,175)
Profit after Tax	24,700
Add: Depreciation	91,000
Annual Cash Inflows	1,15,700

(i)   Computation of Payback Period

Year	Cash Flows	Cumulative Present Value
1	1,15,700	1,15,700
2	1,15,700	2,31,400
3	1,15,700	3,47,100
4	1,15,700	4,62,800
5 (Including Salvage)	1,60,700	6,23,500

Amount to be recovered in 5th year cash flow = Rs. 5,00,000 – Rs. 4,62,800 = Rs. 37,200

Payback period = 4 years + $\frac{37,200}{1,60,700}$ = 4.23 years

Since the payback period is less than the life of machinery, the company may purchase the machine.

(ii)   Computation of Net Present Value

Year	Cash Flows	PVF @10%	Present Value
0	(5,00,000)	1.000	(5,00,000)
1 - 5	1,15,700	3.791	4,38,594
5	45,000	0.621	27,941
Net Present Value			(33,465)

Since the net present value (NPV) is negative, the company should not purchase the machine.

(iii)   Computation of Profitability Index (PI)

Profitability Index (PI) $= \dfrac{\text{Sum of present value of net cash inflow}}{\text{Initial cash outflow}}$

$$= \frac{Rs.\,4,38,594 + Rs.\,27,941}{Rs.\,5,00,000} = 0.93$$

Since the profitability index is less than 1, the company should not purchase the machine.

17. BSB Ltd. is considering its new project with the following details:

Sr. No.	Particulars	Amount
1	Initial capital cost	5,00,00,000
2	Annual unit sales	6,00,000
3	Selling price per unit (in Rs.)	120
4	Variable cost per unit (in Rs.)	80
5	Fixed cost per year	36,00,000
6	Discount Rate	10%

Required:

a.   To advise the company whether to invest in the new project or not based on the NPV concept.

b.   Compute the impact on the project's NPV considering a 1% adverse variance in each variable. Which variable is having minimum effect?

Consider Life of the project as 3 years.

Year	1	2	3
PVF @ 10%	0.909	0.826	0.751
PVF @ 11%	0.901	0.812	0.731

(Nov 2023)

Solution

Calculation of Net Cash Inflow per year

	Particulars	Amount (Rs.)
A	Selling price per unit	120
B	Variable cost per unit	80
C	Contribution per unit (A - B)	40
D	Number of units sold per year	6 lakhs
E	Total Contribution (C × D)	Rs. 240 lakhs
F	Fixed cost per year	Rs. 36 lakhs
G	Net cash inflow per year (E - F)	Rs. 204 lakhs

Calculation of Net Present Value (NPV) of the Project

Year	Year Cash Flow (Rs. in lakhs)	PV factor @ 10%	Present Value (PV) (Rs. in lakhs)
0	(500.00)	1.000	(500.00)
1	204	0.909	185.44
2	204	0.826	168.50

3	204	0.751	153.20
Net Present Value			7.14

Since the NPV of the project is positive, the company should invest in the new project.

2.   Sensitivity Analysis considering 1 % Adverse Variance in each variable

	Particulars	Base	Initial capital cost increased to Rs. 505 lakhs	Selling Price per Unit Reduced to Rs. 118.8	Variable Cost Per Unit increased to Rs. 80.80	Fixed Cost per year increased to Rs. 36.36 lakhs	Units sold per year reduced to 5.94 lakhs
		(Rs.)	(Rs.)	(Rs.)	(Rs.)	(Rs.)	(Rs.)
A	Selling price per unit	120	120	118.8	120	120	120
B	Variable cost per unit	80	80	80	80.8	80	80
C	Contribution	per unit (A - B)	40	40	38.8	39.2	40
		(Rs. in lakhs)	(Rs. in lakhs)	(Rs. in lakhs)	(Rs. in lakhs)	(Rs. in lakhs)	(Rs. in lakhs)
D	Number of units sold per year (units in lakhs)	6	6	6	6	6	5.94
E	Total Contribution (C × D)	240	240	232.8	235.2	240	237.6
F	Fixed cost per year	36	36	36	36	36.36	36
G	Net Cash Inflow per year (E - F)	204	204	196.8	199.2	203.64	201.6
H	PV of Net cash Inflow per year (G × 2.486)	507.14	507.14	489.24	495.21	506.25	501.18
I	Initial capital cost	500	505	500	500	500	500
J	NPV (H - I)	7.14	2.14	-10.76	-4.79	6.25	1.18
K	Percentage Change in NPV	-	-69.99%	-250.55%	-167.03%	-12.53%	-83.52%

The above table shows that by changing one variable at a time by 1% (adverse) while keeping the others constant, the impact in percentage terms on the NPV of the project can be calculated. Thus, it can be seen that the change in fixed cost has the minimum effect on the NPV by 12.53%.

18. HCP Ltd. is a leading manufacturer of railway parts for passenger coaches and freight wagons. Due to high wastage of material and quality issues in production, the General Manager of the company is considering the replacement of machine A with a new CNC machine B. Machine A has a book value of Rs. 4,80,000 and remaining economic life is 6 years. It could be sold now at Rs. 1,80,000 and zero salvage value at the end of sixth year. The purchase price of Machine B is Rs. 24,00,000 with economic life of 6 years. It will require Rs. 1,40,000 for installation and Rs. 60,000 for testing. Subsidy of 15% on the purchase price of the machine B will be received from Government at the end of 1st year. Salvage value at the end of sixth year will be Rs. 3,20,000.

The General manager estimates that the annual savings due to installation of machine B include a reduction of three skilled workers with annual salaries of Rs. 1,68,000 each, Rs. 4,80,000 from reduced wastage of materials and defectives and Rs. 3,50,000 from loss in sales due to delay in execution of purchase orders. Operation of Machine B will require the services of a trained technician with annual salary of t 3,90,000 and annual operation and maintenance cost will increase by Rs. 1,54,000. The company's tax rate is 30% and it's required rate of return is 14%. The company follows straight line method of depreciation. Ignore tax savings on loss due to sale of existing machine.

The present value factors at 14% are:

Years	0	1	2	3	4	5	6
PV Factor	1	0.877	0.769	0.675	0.592	0.519	0.456

Required:

a. Calculate the Net Present Value and Profitability Index and advise the company for replacement decision.

b. Also calculate the discounted pay-back period.

(May 2024)

Solution

(a) Calculation of Net Initial Cash Outflows:

Particulars	₹
Cost of new machine	24,00,000
Less: Sale proceeds of existing machine	(1,80,000)
Add: Installation	1,40,000
Add: Testing	60,000
Less: Subsidy from government (15% of 24,00,000) x 0.877	**(3,15,720)**
Net initial cash outflows	**21,04,280**

Calculation of Incremental Depreciation

Particulars	₹
Depreciation on existing machine (4,80,000/6) **(i)**	80,000
Depreciation base of New Machine	
Cost of new machine	24,00,000
Add: Installation	1,40,000
Add: Testing	60,000
Less: Subsidy from government	(3,60,000)
Less: Salvage value at the end of 6th year	(3,20,000)
Depreciation base of New Machine	**19,20,000**
Depreciation on New Machine (19,20,000/6) **(ii)**	3,20,000
Incremental depreciation [(ii) – (i)]	2,40,000

Computation of Annual Operating Cash flow after tax (CFAT)

Particulars	Amount (₹)	Amount (₹)
Savings in cost		
Cost of 3 skilled workers (₹1,68,000 x 3)	5,04,000	
Reduced wastage of material	4,80,000	
Saving in loss of sales	3,50,000	
Total		13,34,000
Less: Increase in cost		
Salary to trained technician	3,90,000	
Increase in annual operation and maintenance cost	1,54,000	
Total		(5,44,000)
Incremental Saving before tax and depreciation		7,90,000
Less: Incremental Depreciation		(2,40,000)
Incremental PBT		5,50,000
Less: Tax @30%		(1,65,000)
PAT		3,85,000
Add: Depreciation		2,40,000
Incremental CFAT		6,25,000

Calculation of NPV

Particulars	Year	Net Cashflow (₹)	PVF @ 14%	PV (₹)
Net initial cash outflows	0	(24,20,000)	1	(21,04,280)
Incremental CFAT	1 to 6	6,25,000	3.888	24,30,000
Salvage Value of New Machine	6	3,20,000	0.456	1,45,920

PV of inflows			25,75,920
Net Present Value			**4,71,640**

Profitability Index = $\dfrac{\text{Sum of discounted cash inflows}}{\text{Initial cash outlay or Total discounted cash outflow (as the case may)}}$

= 25,75,920/21,04,280= **1.224**

Advise: Since the NPV is positive and PI is greater than 1, the company should replace the machine

Computation of Discounted Payback Period

Year	Cashflow	PVF @ 14%	PV of CFs (₹)	Cumulative PV (₹)
1	6,25,000	0.877	5,48,125	5,48,125
2	6,25,000	0.769	4,80,625	10,28,750
3	6,25,000	0.675	4,21,875	14,50,625
4	6,25,000	0.592	3,70,000	18,20,625
5	6,25,000	0.519	3,24,375	21,45,000
6	9,45,000	0.456	4,30,920	25,75,920

Discounted Payback Period

$$= 4 + \frac{21,04,280 - 18,20,625}{3,24,375}$$

= 4.87 years

If we take subsidy in cash inflow of 1st year, then solution can also be done in the following way:

Calculation of Net Initial Cash Outflows:

Particulars	₹
Cost of new machine	24,00,000
Less: Sale proceeds of existing machine	(1,80,000)
Add: Installation	1,40,000
Add: Testing	60,000
Net initial cash outflows	**24,20,000**

Note: However, Incremental Depreciation and CFAT will remain same.

Calculation of NPV

Particulars	Year	Net Cashflow (₹)	PVF @ 14%	PV (₹)
Net initial cash outflows	0	(24,20,000)	1	(24,20,000)
Subsidy	1	3,60,000	0.877	3,15,720
Incremental CFAT	1 to 6	6,25,000	3.888	24,30,000
Salvage Value of New Machine	6	3,20,000	0.456	1,45,920
PV of inflows				28,91,640
Net Present Value				**4,71,640**

$$\text{Profitability Index} = \frac{\text{Sum of discounted cash in flows}}{\text{Initial cash outlay or Total discounted cash outflow (as the case may)}}$$

$$= 28,91,640 / 24,20,000 = \textbf{1.195}$$

Advise: Since the NPV is positive and PI is greater than 1, the company should replace the machine

Computation of Discounted Payback Period

Year	Cashflow	PVF @ 14%	PV of CFs (₹)	Cumulative PV (₹)
1	9,85,000	0.877	8,63,845	8,63,845
2	6,25,000	0.769	4,80,625	13,44,470
3	6,25,000	0.675	4,21,875	17,66,345
4	6,25,000	0.592	3,70,000	21,36,345
5	6,25,000	0.519	3,24,375	24,60,720
6	9,45,000	0.456	4,30,920	28,91,640

Discounted Payback Period

$$= 4 + \frac{24,20,000 - 21,36,345}{3,24,375}$$

= 4.87 years

1. The accountant of Moon Ltd. has reported the following data:

Gross profit	Rs. 60,000
Gross Profit Margin	20 per cent
Total Assets Turnover	0.30:1
Net Worth to Total Assets	0.90:1
Current Ratio	1.5:1
Liquid Assets to Current Liability	1:1
Credit Sales to Total Sales	0.80:1
Average Collection Period	60 days

Assume 360 days in a year
You are required to complete the following:

Balance Sheet of Moon Ltd.

Liabilities	Rs.	Assets	Rs.
Net Worth		Fixed Assets	
Current Liabilities		Stock	
		Debtors	
		Cash	
Total Liabilities		Total Assets	

(May 2018)

Solution

Preparation of Balance Sheet Working Notes:

Sales   = Gross Profit / Gross Profit Margin

                            = 60,000 / 0.2 = ₹ 3,00,000

Total Assets   = Sales / Total Asset Turnover

                            = 3,00,000 / 0.3 = ₹ 10,00,000

Net Worth   = 0.9 X Total Assets

                            = 0.9 X ₹ 10,00,000 = ₹ 9,00,000

Current Liability   = Total Assets – Net Worth

                            = ₹ 10,00,000 – ₹ 9,00,000

                            = ₹ 1,00,000

Current Assets   = 1.5 x Current Liability

                            = 1.5 x ₹ 1,00,000 = ₹ 1,50,000

Stock   = Current Assets – Liquid Assets

                            = Current Assets – (Liquid Assets / Current Liabilities =1)

$$= 1,50,000 - (LA / 1,00,000 = 1) = ₹\ 50,000$$

Debtors   = Average Collection Period X Credit Sales / 360

$$= 60 \times 0.8 \times 3,00,000 / 360 = ₹\ 40,000$$

Cash   = Current Assets – Debtors – Stock

$$= ₹\ 1,50,000 - ₹\ 40,000 - ₹\ 50,000$$

$$= ₹\ 60,000$$

Fixed Assets   = Total Assets – Current Assets

$$= ₹\ 10,00,000 - ₹\ 1,50,000$$

$$= ₹\ 8,50,000$$

Balance Sheet

Liabilities	₹	Assets	₹
Net Worth Current Liabilities	9,00,000 1,00,000	Fixed Assets Stock Debtors Cash	8,50,000 50,000 40,000 60,000
Total liabilities	10,00,000	Total Assets	10,00,000

2. The following is the information of XML Ltd. relate to the year ended 31-03-2018 :

Gross Profit	20% of Sales
Net Profit	10% of Sales
Inventory Holding period	3 months
Receivable collection period	3 months
Non-Current Assets to Sales	1 : 4
Non-Current Assets to Current Assets	1 : 2
Current Ratio	2 : 1
Non-Current Liabilities to Current Liabilities	1 : 1
Share Capital to Reserve and Surplus	4 : 1
Non-current Assets as on 31st March, 2017	Rs. 50,00,000

Assume that:

(i) No change in Non-Current Assets during the year 2017-18

(ii) No depreciation charged on Non-Current Assets during the year 2017-18.

(iii) Ignoring Tax

You are required to Calculate cost of goods sold, Net profit, Inventory, Receivables and Cash for the year ended on 31st March, 2018

(Nov 2018)

Solution

Workings

$$\frac{Non\ Current\ Assets}{Curent\ Assets} = \frac{1}{2}$$

Or $\frac{50,00,000}{Curent\ Assets} = \frac{1}{2}$

So, Current Assets = ₹ 1,00,00,000

Now further,

$$\frac{Non\ Current\ Assets}{Sales} = \frac{1}{4}$$

Or $\frac{50,00,000}{Sales} = \frac{1}{4}$

So, Sales = ₹ 2,00,00,000

Calculation of Cost of Goods sold, Net profit, Inventory, Receivables and Cash:

(i)   Cost of Goods Sold (COGS):

Cost of Goods Sold = Sales- Gross Profit

= ₹ 2,00,00,000 – 20% of ₹ 2,00,00,000

= ₹ 1,60,00,000

(ii)   Net Profit = 10% of Sales = 10% of ₹ 2,00,00,000

= ₹ 20,00,000

(iii)   Inventory:

Inventory   Holding Period = $\frac{12\ Month}{Inventory\ Turnover\ Ratio}$

Inventory Turnover Ratio = 12/ 3 = 4

$4 = \frac{COGS}{Anverage\ Inventory}$

$4 = \frac{₹\,1,60,00,000}{Average\ Inventory}$

Average or Closing Inventory =₹ 40,00,000

(i)Receivables :

Receivable   Collection Period = $\frac{12\ Months}{Receivables\ Turnover\ Ratio}$

Or Receivables Turnover Ratio = 12/ 3 = 4 = $\frac{Credit\ Sales}{Average\ Accounts\ Receivable}$

Or 4 = $\frac{₹\,2,00,00,000}{Average\ Accounts\ Receivable}$

So, Average Accounts Receivable/Receivables = ₹ 50,00,000/-

(v)   Cash:

Cash* = Current Assets* – Inventory- Receivables

Cash = ₹ 1,00,00,000 - ₹ 40,00,000 - ₹ 50,00,000

= ₹ 10,00,000

(it is assumed that no other current assets are included in the Current Asset)

3. Following figures and ratios are related to a company Q Ltd. :

(i) Sales for the year (all credit)	Rs. 30,00,000
(ii) Gross Profit ratio	25 per cent
(iii) Fixed assets turnover (based on cost of goods sold)	1.5
(iv) Stock turnover (based on cost of goods sold)	6
(v) Liquid ratio	1 : 1
(vi) Current ratio	1.5 : 1
(vii) Receivables (Debtors) collection period	2 months
(viii) Reserves and surplus to share capital	0.6 : 1
(ix) Capital gearing ratio	0.5

(x) Fixed assets to net worth   1.20 : 1
You are required to calculate
Closing stock, Fixed Assets, Current Assets, Debtors and Net worth.

(May 2019)

Solution

Calculation of Closing Stock:

Cost of Goods Sold	= Sales – Gross Profit (25% of Sales)
	= ₹ 30,00,000 – ₹ 7,50,000
	= ₹ 22,50,000
Closing Stock	= Cost of Goods Sold / Stock Turnover
	= ₹ 22,50,000/6 = ₹ 3,75,000

(ii) Calculation of Fixed Assets:

Fixed Assets	= Cost of Goods Sold / Fixed Assets Turnover
	= ₹ 22,50,000/1.5
	= ₹ 15,00,000

(iii) Calculation of Current Assets:

Current Ratio	= 1.5 and Liquid Ratio = 1
Stock	= 1.5 – 1 = 0.5
Current Assets	= Amount of Stock × 1.5/0.5
	= ₹ 3,75,000 × 1.5/0.5 = ₹ 11,25,000

(iv) Calculation of Debtors:

Debtors	= Sales × Debtors Collection period /12
	= ₹ 30,00,000 × 2 /12
	= ₹ 5,00,000

(v) Calculation of Net Worth:

Net worth	= Fixed Assets /1.2
	= ₹ 15,00,000/1.2 = ₹ 12,50,000

4. Following information has been gathered from the books of Tram Ltd. the equity shares of which is trading in the stock market at Rs. 14.

Particulars	Amount (Rs.)
Equity Share Capital (face value Rs. 10)	10,00,000
10% Preference Shares	2,00,000
Reserves	8,00,000
10% Debentures	6,00,000
Profit before Interest and Tax for the year	4,00,000
Interest	60,000
Profit after Tax for the year	2,40,000

Calculate the following:
(i)   Return on Capital Employed
(ii)   Earnings per share
(iii)   PE ratio

(Nov 2019)

Solution

(i) Calculation of Return on capital employed (ROCE)

Capital employed = Equity Shareholders' funds + Debenture + Preference shares
= ₹ (10,00,000 + 8,00,000 + 6,00,000 + 2,00,000)
= ₹ 26,00,000

Return on capital employed [ROCE-(Pre-tax)] $= \dfrac{PBIT}{Capital\ Employed} \times 100$

$= \dfrac{₹\ 4,00,000}{₹\ 26,00,000} \times 100$

= 15.38% (approx.)

Return on capital employed [ROCE-(Post-tax)] $= \dfrac{Profit\ after\ Tax}{Capital\ Employed} \times 100$

$= \dfrac{₹\ 2,40,000}{₹\ 26,00,000} \times 100$

= 9.23% (approx.)

(ii) Calculation of Earnings per share

Earnings per share $= \dfrac{Earnings\ available\ to\ equity\ shareholders}{No\ of\ equity\ shares}$

$= \dfrac{Profit\ after\ tax - preference\ Dividend}{No\ of\ equity\ shares}$

$= \dfrac{₹\ (2,40,000 - 20,000)}{₹1,00,000}$

= ₹ 2.20

(ii)   Calculation of PE ratio

$PE = \dfrac{Market\ Price\ per\ Share\ (MPS)}{Earnings\ per\ Shares\ (EPS)}$

$= \dfrac{₹\ 14}{₹\ 2.20} = 6.364\ (approx.)$

5. Following information relates to RM Co. Ltd.

	(Rs.)
Total Assets employed	10,00,000
Direct Cost	5,50,000
Other Operating Cost	90,000

Goods are sold to the customers at 150% of direct costs.
50% of the assets being financed by borrowed capital at an interest cost of 8% per annum.
Tax rate is 30%.

You are required to calculate :
(i)   Net profit margin
(ii)   Return on Assets
(iii)   Asset turnover
(iv)   Return on owners' equity

(Nov 2020)

Solution

Computation of net profit:

Particulars	(Rs.)
Sales (150% of Rs. 5,50,000)	8,25,000
Direct Costs	5,50,000

Gross profit	2,75,000
Other Operating Costs	90,000
Operating profit (EBIT)	1,85,000
Interest changes (8% of Rs. 5,00,000)	40,000
Profit before taxes (EBT)	1,45,000
Taxes (@ 30%)	43,500
Net profit after taxes (EAT)	1,01,500

(i)   Net profit margin (After tax) = $\frac{Profit\ after\ taxes}{sales}$ = $\frac{Rs.1,01,500}{Rs.8,25,000}$ = 0.12303 or 12.303%

Net profit margin (Before tax)= = $\frac{Profit\ before\ taxes}{Sales}$ = $\frac{Rs.1,45,000}{Rs.8,25,000}$ = 0.17576 or 17.576%

(ii)   Return on assets = $\frac{EBIT\ (1-T)}{Total\ Assets}$ = $\frac{Rs.1,85,000\ (1-0.3)}{Rs.10,00,000}$ = 0.1295 or 12.95%

(iii)   Asset turnover = $\frac{Sales}{Assets}$ = $\frac{Rs.8,25,000}{Rs.10,00,000}$ = 0.825 times

(iv)   Return on owner's equity = $\frac{Profit\ after\ taxes}{Owners\ equity}$ = $\frac{Rs.1,01,500}{50\%\ x\ Rs.10,00,000}$ = 0.203 or 20.3%

6. Following are the data in respect of ABC Industries for the year ended 31 st March, 2021:

Debt to Total assets ratio	:	0.40
Long-term debts to equity ratio	:	30%
Gross profit margin on sales	:	20%
Accounts receivables period	:	36 days
Quick ratio	:	0.9
Inventory holding period	:	55 days
Cost of goods sold	:	Rs. 64,00,000

Liabilities	Rs.	Assets	Rs.
Equity Share Capital	20,00,000	Fixed assets	
Reserves & surplus		Inventories	
Long-term debts		Accounts receivable	
Accounts payable		Cash	
Total	50,00,000	Total	

Required:
Complete the Balance Sheet of ABC Industries as on 31st March, 2021. All calculations should be in nearest Rupee. Assume 360 days in a year.

(Dec. 2021)

Solution

Working Notes:
(1) Total liability = Total Assets = Rs. 50,00,000 Debt to Total
     Asset Ratio   = 0.40
     $$\frac{Dect}{Total\ Assets} = 0.40$$

$$Or, \frac{Debt}{50,00,000} = 0.40$$

So, **Debt** **= 20,00,000**

(2) Total Liabilities = Rs. 50,00,000

Equity share Capital + Reserves + Debt = Rs. 50,00,000

So, Reserves =Rs. 50,00,000 - Rs. 20,00,000 - Rs. 20,00,000

So, Reserves & Surplus = Rs. 10,00,000

(3) $\frac{Long\ Term\ Debt}{Equity\ Shareholder's\ Fund} = 30\% *$

$$\frac{Long\ Term\ Debt}{(20,00,000 + 10,00,000)} = 30\%$$

Long Term Debt = Rs. 9,00,000

(4) So, Accounts Payable = Rs. 20,00,000 – Rs. 9,00,000

Accounts Payable = Rs. 11,00,000

(5) Gross Profit to sales = 20%

Cost of Goods Sold = 80% of Sales = Rs. 64,00,000

$$Sales = \frac{100}{80}\ x\ 64,00,000 = 80,00,000$$

(6) Inventory Turnover $= \frac{360}{55}$

$$\frac{COGS}{Closing\ inventory} = \frac{360}{55}$$

$$\frac{64,00,000}{Closing\ inventory} = \frac{360}{55}$$

Closing inventory = 9,77,778

(7) Accounts Receivable period = 36 days

$$\frac{Accounts\ Receivable}{Credit\ sales}\ x\ 360 = 36$$

Accounts Receivable $= \frac{36}{360}\ x\ credit\ sales$

$= \frac{36}{360}\ x\ 80,00,000$ (assumed all sales are on credit)

Accounts Receivable = Rs. 8,00,000

(8) Quick Ratio = 0.9

$$\frac{Quick\ Assets}{Current\ liabilities} = 0.9$$

$$\frac{Cash\ +\ Debtors}{11,00,000} = 0.9$$

Cash + 8,00,000 = Rs. 9,90,000

Cash   = Rs. 1,90,000

(9) Fixed Assets = Total Assets- Current Assets = 50,00,000 – (9,77,778+8,00,000+1,90,000)
    = **30,32,222**

Balance Sheet of ABC Industries as on 31st March 2021

Liabilities	(Rs.)	Assets	(Rs.)
Share Capital	20,00,000	Fixed Assets	30,32,222
Reserved surplus	10,00,000	Current Assets:	
Long Term Debt	9,00,000	Inventory	9,77,778
Accounts Payable	11,00,000	Accounts Receivables	8,00,000
		Cash	1,90,000
Total	50,00,000	Total	50,00,000

(***Note:** Equity shareholders' fund represent equity in 'Long term debts to equity ratio'. The question can be solved assuming only share capital as 'equity')

7. From the following information, complete the Balance Sheet given below:

(i)	Equity Share Capital	:	Rs. 2,00,000
(ii)	Total debt to owner's equity	:	0.75
(iii)	Total Assets turnover	:	2 times
(iv)	Inventory turnover	:	8 times
(v)	Fixed Assets to owner's equity	:	0.60
(vi)	Current debt to total debt	:	0.40

Balance Sheet of XYZ Co. as on March 31, 2020

Liabilities	Amount (Rs.)	Assets	Amount (Rs.)
Equity Shares Capital	2,00,000	Fixed Assets	?
Long term Debt	?	Current Assets:	
Current Debt	?	Inventory	?
		Cash	?

(Jan 2021)

Solution

Balance Sheet of XYZ Co. as on March 31, 2020

Liabilities	Amount (Rs.)	Assets	Amount (Rs.)
Equity Share Capital	2,00,000	Fixed Assets	1,20,000
Long-term Debt	90,000	Current Assets:	
Current Debt	60,000	Inventory	87,500
		Cash (balancing figure)	1,42,500
	3,50,000		3,50,000

Working Notes
1. Total Debt = 0.75 x Equity Share Capital = 0.75 x Rs. 2,00,000 = Rs. 1,50,000
    Further, Current Debt to Total Debt = 0.40.

So, Current Debt = 0.40 x Rs. 1,50,000   = Rs. 60,000
Long term Debt = Rs. 1,50,000 - Rs. 60,000 = Rs. 90,000

2.   Fixed Assets = 0.60 x Equity Share Capital = 0.60 x Rs. 2,00,000 = Rs. 1,20,000

3.   Total Assets to Turnover = 2 times; Inventory Turnover = 8 times
      Hence, Inventory /Total Assets = 2/8 =1/4
      Further, Total Assets = Rs. 2,00,000 + Rs. 1,50,000 = Rs. 3,50,000
      Therefore, Inventory = Rs. 3,50,000/4   = Rs. 87,500
      Cash in Hand = Total Assets – Fixed Assets – Inventory
              = Rs. 3,50,000 - Rs. 1,20,000 - Rs. 87,500 = Rs. 1,42,500

8. Masco Limited has furnished the following ratios and information relating to the year ended 31st March 2021:

Sales	Rs. 75,00,000
Return on net worth	25%
Rate of income tax	50%
Share capital to reserves	6:4
Current ratio	2.5
Net profit to sales (After Income Tax)	6.50%
Inventory turnover (based on cost of goods sold)	12
Cost of goods sold	Rs. 22,50,000
Interest on debentures	Rs. 75,000
Receivables (includes debtors Rs. 1,25,000)	Rs. 2,00,000
Payables	Rs. 2,50,000
Bank Overdraft	Rs. 1,50,000

You are required to:

(a)   Calculate the operating expenses for the year ended 31st March, 2021.

(b)   Prepare a balance sheet as on 31st March in the following format:

Liabilities	Rs.	Assets	Rs.
Share Capital		Fixed Assets	
Reserves and Surplus		Current Assets	
15% Debentures		Stock	
Payables		Receivables	
Bank Term Loan		Cash	

(Jul 2021)

Solution

(a) Calculation of Operating Expenses for the year ended 31st March, 2021

Particulars		(Rs.)
Net Profit [@ 6.5% of Sales]		4,87,500
Add: Income Tax (@ 50%)		4,87,500
Profit Before Tax (PBT)		9,75,000
Add: Debenture Interest		75,000
Profit before interest and tax (PBIT)		10,50,000
Sales		75,00,000
Less: Cost of goods sold	22,50,000	

	Rs.	Rs.
PBIT	10,50,000	33,00,000
Operating Expenses		42,00,000

(b) **Balance Sheet as on 31st March, 2021**

Liabilities	Rs.	Assets	Rs.
Share Capital	11,70,000	Fixed Assets	18,50,000
Reserve and Surplus	7,80,000	Current Assets	
15% Debentures	5,00,000	Stock	1,87,500
Payables	2,50,000	Receivables	2,00,000
Bank Overdraft (or Bank Term Loan)	1,50,000	Cash	6,12,500
	28,50,000		28,50,000

Working Notes:

(i)   Calculation of Share Capital and Reserves

The return on net worth is 25%. Therefore, the profit after tax of Rs. 4,87,500 should be equivalent to 25% of the net worth.

Net worth x $\frac{25}{100}$ = ₹ 4,87,500

∴ *Net worth* = $\frac{₹ 4,87,500 \ x \ 100}{25}$ = ₹ 19,50,000

The ratio of share capital to reserves is 6:4

Share Capital = 19,50,000 x 6/10 = Rs. 11,70,000

Reserves = 19,50,000 x 4/10 = Rs. 7,80,000

(ii)   Calculation of Debentures

Interest on Debentures @ 15% (as given in the balance sheet format) = Rs. 75,000

∴ *Debentures* = $\frac{75,000 \ x 100}{15}$ = ₹ 5,00,000

(iii)   Calculation of Current Assets

Current Ratio = 2.5

Payables = Rs. 2,50,000

Bank overdraft = Rs. 1,50,000

Total Current Liabilities = Rs. 2,50,000 + Rs. 1,50,000 = Rs. 4,00,000

∴ Current Assets = 2.5 x Current Liabilities = 2.5 + 4,00,000 = Rs. 10,00,000

(iv)   Calculation of Fixed Assets

Particulars	Rs.
Share capital	11,70,000
Reserves	7,80,000
Debentures	5,00,000
Payables	2,50,000
Bank Overdraft	1,50,000

Total Liabilities	28,50,000
Less: Current Assets	10,00,000
Fixed Assets	18,50,000

(v) Calculation of Composition of Current Assets

Inventory Turnover = 12

$$\frac{Cost\ of\ goods\ sold}{closing\ stock} = 12$$

Closing stock $= \frac{₹\ 22,50,000}{12} = Closing\ stock\ = ₹\ 1,87,500$

Particulars	Rs.
Stock	1,87,500
Receivables	2,00,000
Cash (balancing figure)	6,12,500
Total Current Assets	10,00,000

9. Following information and ratios are given for W Limited for the year ended 31st March, 2022:

Equity Share Capital of Rs. 10 each	Rs. 10 lakhs
Reserves & Surplus to Shareholders' Fund	0.50
Sales / Shareholders' Fund	1.50
Current Ratio	2.50
Debtors Turnover Ratio	6.00
Stock Velocity	2 Months
Gross Profit Ratio	20%
Net Working Capital Turnover Ratio	2.50

You are required to calculate:
(i)   Shareholders' Fund
(ii)   Stock
(iii) Debtors
(iv)   Current liabilities
(v)   Cash Balance.

(May 2022)

Solution

(i) Calculation of Shareholders' Fund:

$$\frac{Reserve\ \&\ Surplus}{Shareholders'\ Funds} = 0.5$$

$$\frac{Reserve\ \&\ Surplus}{Equity\ Share\ Capital\ +\ Reserve\ \&\ Surplus} = 0.5$$

$$\frac{Reserve\ \&\ Surplus}{10,00,000\ +\ Reserve\ \&\ Surplus} = 0.5$$

Reserve & Surplus = 5,00,000 + 0.5 Reserve & Surplus

0.5 Reserve & Surplus = 5,00,000

Reserve & Surplus = 10,00,000

Shareholders' funds = 10,00,000 +10,00,000
Shareholders' funds = Rs. 20,00,000

(ii) Calculation of Value of Stock:
$$\frac{Sales}{Shareholders'\ Funds} = 1.5$$
Sales = 1.5 × 20,00,000
Sales = 30,00,000
Gross Profit = 30,00,000 × 20% = 6,00,000
Cost of Goods Sold   = 30,00,000 – 6,00,000
                           = Rs. 24,00,000
Stock velocity = 2 months
$$\frac{Average\ Stock}{Cost\ of\ Goods\ Sold}\ x\ 12\ =\ 2$$
$$\frac{Average\ Stock}{24,00,000}\ x\ 12\ =\ 2$$
$$Average\ Stock\ =\ 24,00,000\ x\ \frac{2}{12}$$
Average stock = Rs. 4,00,000

(iii) Calculation of Debtors:
Debtors Turnover Ratio = 6
$$\therefore \frac{Sales}{Average\ Debtor} = 6$$
$$\therefore \frac{30,00,000}{Average\ Debtor} = 6$$
Average Debtors = Rs. 5,00,000

(iv) Calculation of Current Liabilities:
Net Working Capital Turnover ratio = 2.5
$$\frac{Sales}{Current\ Assets\ -\ Current\ Liabilities} = 2.5$$
$$\frac{30,00,000}{Current\ Assets\ -\ Current\ Liabilities} = 2.5$$
Current Assets – Current Liabilities = 12,00,000 ....(1)
Current Ratio = 2.5
$$\frac{Current\ Asset}{Current\ Liabilities} = 2.5$$
Current Assets = 2.5 Current Liabilities ....(2)
From (1) & (2),
2.5 Current Liabilities – Current Liabilities = 12,00,000
1.5 Current Liabilities = 12,00,000
Current Liabilities = Rs. 8,00,000

(v) Calculation of Cash Balance:
Current Assets = 2.5 Current Liabilities

Current Assets = 2.5 (8,00,000)	= 20,00,000
(-) Debtors	(5,00,000)
(-) Stock	(4,00,000)
Cash Balance	**Rs. 11,00,000**

10. The following figures are related to the trading activities of M Ltd.

Total assets	Rs. 10,00,000
Debt to total assets	50%
Interest cost	10% per year
Direct Cost	10 times of the interest cost
Operating Exp.	Rs. 1,00,000

The goods are sold to customers at a margin of 50% on the direct cost Tax Rate is 30%
You are required to calculate
(i)   Net profit margin
(ii)   Net operating profit margin
(iii) Return on assets
(iv)   Return on owner's equity

(Nov. 2022)

Solution

(i) Computation of Net Profit Margin

Debt = (10,00,000 x 50%) = Rs. 5,00,000

Interest cost = 5,00,000 x $\left(\frac{10}{100}\right)$ = ₹ 50,000

Direct cost = 50,000 x 10 = Rs. 5,00,000

Sales = 5,00,000 x 150% = Rs. 7,50,000

	(Rs.)
Gross profit = 7,50,000 – 5,00,000	= 2,50,000
Less: Operating expenses	= 1,00,000
∴ EBIT	= 1,50,000
Less: Interest	= 50,000
∴ EBT	= 1,00,000
Less: Tax @ 30%	= 30,000
∴ PAT	= 70,000

Net profit margin = $\left(\frac{70,000}{7,50,000}\right)$ x 100 = 9.33%

(ii) Net Operating Profit margin

$$Net\ Operating\ profit\ margin\ =\ \left(\frac{EBIT}{Sales}\right) x\ 100$$

$$= \left(\frac{1,50,000}{7,50,000}\right) x100 = 20\%$$

(iii) Return on Assets

$$Return\,on\,Assets = \left[\left(\frac{PAT + Interest}{Total\,Assets}\right)\right] x100$$

$$= [(\frac{1,20,000}{10,00,000})] \, x \, 100 \,] \, = \, 12\%$$

$$(OR)$$

$$Return\,on\,Assets \, = \, \frac{EBIT}{Assets} \, x \, 100$$

$$= \, \frac{1,50,000}{10,00,000} \, x \, 100 \, = \, 15\%$$

(Or)

$$= \, \frac{70,000}{10,00,000} \, x \, 100 \, = \, 7\%$$

(Or)

$$= \, [\frac{1,50,000 \, (1 \, - \, 0.3)}{10,00,000}] \, x \, 100 \, = \, 10.5\%$$

(iv) Return on owner's equity

$$Return \, = \, (\frac{PAT}{Owner's\,Equity}) \, x \, 100$$

$$= \, (\frac{70,000}{5,00,000}) \, x \, 100 \, = \, 14\%$$

11. Following information and ratios are given in respect of AQUA Ltd. for the year ended 31st March, 2023:

Current ratio	4.0
Acid test ratio	2.5
Inventory turnover ratio (based on sales)	6
Average collection period (days)	70
Earnings per share	Rs. 3.5
Current liabilities	Rs. 3,10,000
Total assets turnover ratio (based on sales)	0.96
Cash ratio	0.43
Proprietary ratio	0.48
Total equity dividend	Rs. 1,75,000
Equity dividend coverage ratio	1.60

Assume 360 days in a year.

You are required to complete Balance Sheet as on 31stMarch, 2023.

Balance Sheet as on 31stMarch, 2023.

Liabilities	Rs.	Assets	Rs.
Equity share capital (Rs.10 per share)	XXX	Fixed assets	XXX
Reserves & surplus	XXX	Inventory	XXX
Long-term debt	XXX	Debtors	XXX
Current liabilities	3,10,000	Loans & advances	XXX

		Cash & bank	XXX
Total	XXX	Total	XXX

(May 2023)

Solution

(i)   Current Ratio = 4

$\dfrac{Current\ Assets}{Current\ Liabilities} = 4$

∴ $\dfrac{Current\ Assets}{3,10,000} = 4$

∴ Current Assets = Rs. 12,40,000

(ii)   Acid Test Ratio = 2.5

$\dfrac{Current\ Assets - Inventory}{Current\ Liabilities} = 2.5$

∴ $\dfrac{12,40,000 - Inventory}{3,10,000} = 2.5$

∴ 12,40,000 – Inventory = Rs. 7,75,000

Inventory = Rs. 4,65,000

(iii)   Inventory Turnover Ratio (on Sales) = 6

$\dfrac{Sales}{Inventory} = 6$

$\dfrac{Sales}{4,65,000} = 6$

∴ Sales = Rs. 27,90,000

(iv)   Debtors Collection Period = 70 days

∴ (Debtors / sales) x 360 = 70

∴ (Debtors / 27,90,000) x 360 = 70

Debtors = Rs. 5,42,500

(v)   Total Assets Turnover Ratio (on Sales) = 0.96

∴ $\dfrac{Sales}{Total\ Assets} = 0.96$

∴ $\dfrac{27,90,000}{Total\ Assets} = 0.96$

Total Assets = Rs. 29,06,250

(vi)   Fixed Assets (FA) = Total Assets – Current Assets

= 29,06,250 – 12,40,000

Fixed Assets = Rs. 16,66,250

(vii)   Cash Ratio = $\dfrac{Cash}{Current\ Liabilities} = 0.43$

∴ $\dfrac{Cash}{3,10,000} = 0.43$

∴ Cash = Rs. 1,33,300

(viii)   Proprietary Ratio = $\frac{Proprietary\ Fund}{Total\ Assets}$ = 0.48

∴ $\frac{Proprietary\ Fund}{29,06,250}$ = 0.48

∴ Proprietary Fund = Rs. 13,95,000

(ix)   Equity Dividend Coverage Ratio = 1.6
or $\frac{EPS}{DPS} = \frac{3.5}{DPS}$

∴ DPS = Rs. 2.1875

DPS = $\frac{Total\ Dividend}{Numbe\ of\ Equity\ Shares}$

∴ 2.1875 = $\frac{1,75,000}{Numbe\ of\ Equity\ Shares}$

∴ Number of Equity Shares = 80,000
∴ Equity Share Capital = 80,000 x 10 = Rs. 8,00,000
∴ Reserves &Surplus = 13,95,000 - 8,00,000 = Rs. 5,95,000

(x)   Loans and Advances = Current Assets - (Inventory + Receivables + Cash & Bank)
       = Rs. 12,40,000 - (Rs. 4,65,000 + 5,42,500 + 1,33,300) = Rs. 99,200

Balance Sheet as on 31st March 2023

Liabilities	Rs.	Assets	Rs.
Equity Share Capital (Rs. 10 per share)	8,00,000	Fixed Assets	16,66,250
Reserves & Surplus	5,95,000	Inventory	4,65,000
Long-term debt *(B/F)	12,01,250	Receivables	5,42,500
Current Liabilities	3,10,000	Loans & Advances	99,200
		Cash & Bank	1,33,300
Total	29,06,250	Total	29,06,250

12.   You are available with following information of Brave Ltd:

Debtor's velocity	3 months
Stock velocity	6 months
Creditor's velocity	2 months
Gross profit ratio	20%

The gross profit for the year ended 31st March,2023 was Rs. 10,00,000. Stock for the same period was Rs. 40,000 more than what it was at the beginning of the year. Bills receivable were Rs. 1,20,000.

Form the above information you are required to calculate:
(i)   Sales
(ii)   Sundry debtors

(iii)   Closing stock

(Nov 2023)

Solution

(i)   Determination of Sales:

Gross Profit Ratio = $\frac{Gross\ profit}{sales} \times 100$

Or, $\frac{20}{100} = \frac{Rs.10,00,000}{Sales}$

Or, Sales $= \frac{10,00,00,000}{20}$ = Rs. 50,00,000

Cost of Goods Sold = Sales – Gross Profit
= Rs. 50,00,000 - Rs. 10,00,000 = Rs. 40,00,000

(ii)   Determination of Sundry Debtors:

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

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

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

$= \frac{Rs.50,00,000}{Bills\ Receivable + Sundry\ Debtors} = 4$

Or, Sundry Debtors + Bills receivable   = Rs. 12,50,000
Sundry Debtors = Rs. 12,50,000 – Rs. 1,20,000 = Rs. 11,30,000

(iii)   Determination of Closing Stock

Stock velocity is 6 months so Stock Turnover Ratio=2

Stock Turnover Ratio = $\frac{Cost\ of\ Goods\ Sold}{Average\ Stock} = \frac{Rs.40,00,000}{Average\ Stock} = 2$

So, Average Stock = Rs. 20,00,000

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

Or $\frac{Opening\ Stock + (Opening\ Stock + Rs.40,000)}{2}$ = Rs. 20,00,000

Or, Opening Stock + Rs. 20,000 = Rs. 20,00,000
Or, Opening Stock = Rs. 19,80,000
So, Closing Stock = Rs. 19,80,000 + Rs. 40,000 = Rs. 20,20,000

13.   Theme Ltd provides you the following information:

12.5 % Debt   Rs. 45,00,000

Debt to Equity ratio	1.5 : 1
Return on Shareholder's fund	54%
Operating Ratio	85%
Ratio of operating expenses to Cost of Goods sold	2 : 6
Tax rate	25%
Fixed Assets	` 39,00,000
Current Ratio	1.8 : 1

You are required to calculate:
a) Interest Coverage Ratio
b) Gross Profit Ratio
c) Current Assets

(May 2024)

Solution

(a) Working Notes:

Debt = ₹ 45,00,000

Interest = ₹ 45,00,000 x 12.5% = 5,62,500

Debt to Equity = 1.5:1 = $\dfrac{\text{Total Debt}}{\text{Shareholders'Equity}}$

Equity = ₹ 30,00,000

Return of Shareholder's funds = 54% = $\dfrac{\text{NetProfitafter taxes}}{\text{Equityshareholders'fund}} \times 100$

Profit after tax (PAT) = 54% x Equity = ₹16,20,000

Profit before tax (PBT)(1-25%) = Profit after tax

= ₹16,20,000/75% = ₹21,60,000

Earning before interest and tax (EBIT) = PBT + Interest

= ₹21,60,000 + ₹ 5,62,500
= ₹27,22,500

(i) Interest Coverage Ratio = EBIT/Interest

= ₹27,22,500/₹5,62,500

= 4.84 Times

(ii) Operating Profit Ratio = 1 - Operating Ratio

= 1 − 0.85 = 0.15 or 15%

0.15 = $\dfrac{\text{Operating Profit}}{\text{Sales}} \times 100$

Sales = EBIT or Operating Profit /0.15

= ₹ 27,22,500 / 0.15

= ₹ 1,81,50,000

Operating ratio	$= \dfrac{\text{Operating expenses}}{\text{Cost of goods sold (COGS)}} = 2:6 = 1:3$
Operating expenses	= 1/3 COGS
Operating cost	= Sales – Operating profit
	= ₹ 1,81,50,000 - ₹ 27,22,500
	= ₹ 1,54,27,500

₹ 1,54,27,500	= COGS + Operating expenses
₹ 1,54,27,500	= COGS + 1/3 COGS
COGS	= ₹ 1,15,70,625
Gross profit	= Sales – COGS
	= 1,81,50,000 – 1,15,70,625
	= ₹ 65,79,375
Gross Profit ratio	$= \dfrac{\text{Gross Profit}}{\text{Sales}} \times 100$
	= 65,79,375/1,81,50,000
	= **0.3625 or 36.25%**

Gross profit and sales can be calculated in alternative way also. However, there will be no change in GP ratio i.e 36.25%

(iii) Current Ratio $= \dfrac{\text{Current Assets}}{\text{Current Liabilities}}$

= 1.8

Current Assets	= 1.8 Current Liabilities

Total of Balance sheet liability = Equity + Debt + Current Liabilities

=30,00,000+45,00,000+CL ....(2)

Total Balance sheet asset	= Fixed Assets + Current Assets
	= 39 lakhs + CA= 39 + 1.8CL.......(3)

Equating 2 and 3,

75,00,000 + CL	= 39,00,000 + 1.8CL
0.8CL	= 36,00,000
CL	=₹ 45,00,000
Current Assets	= 1.8 CL = 1.8 x 45 lakhs= ₹ **81,00,000**

Chapter -7
MANAGEMENT OF WORKING CAPITAL

1. Day Ltd., a newly formed company has applied to the Private Bank for the first time for financing it's Working Capital Requirements. The following informations are available about the projections for the current year:

Estimated Level of Activity	Completed Units of Production 31200 plus unit of work in progress 12000
Raw Material Cost	Rs. 40 per unit
Direct Wages Cost	Rs. 15 per unit
Overhead	Rs. 40 per unit (inclusive of Depreciation Rs.10 per unit)
Selling Price	Rs. 130 per unit
Raw Material in Stock	Average 30 days consumption
Work in Progress Stock	Material 100% and Conversion Cost 50%
Finished Goods Stock	24000 Units
Credit Allowed by the supplier	30 days
Credit Allowed to Purchasers	60 days
Direct Wages (Lag in payment)	15 days
Expected Cash Balance	Rs. 2,00,000

Assume that production is carried on evenly throughout the year (360 days) and wages and overheads accrue similarly. All sales are on the credit basis. You are required to calculate the Net Working Capital Requirement on Cash Cost Basis.

(May 2018)

Solution

Calculation of Net Working Capital requirement:

	(Rs.)	(Rs.)
A. Current Assets:		
Inventories:		
Stock of Raw material (Refer to Working note (iii)	1,44,000	
Stock of Work in progress (Refer to Working note (ii)	7,50,000	
Stock of Finished goods (Refer to Working note (iv)	20,40,000	
Debtors for Sales		
(Refer to Working note (v)	1,02,000	
Cash	2,00,000	
Gross Working Capital	32,36,000	32,36,000
B. Current Liabilities:		
Creditors for Purchases	1,56,000	
(Refer to Working note (vi)		
Creditors for wages		
(Refer to Working note (vii)	23,250	
	1,79,250	1,79,250
Net Working Capital (A - B)		**30,56,750**

Working Notes:
(i)   Annual cost of production

	(Rs.)
Raw material requirements	
{(31,200 × Rs. 40) + (12,000 x Rs. 40)}	17,28,000
Direct wages {(31,200 ×Rs. 15) +(12,000 X Rs. 15 x 0.5)}	5,58,000
Overheads (exclusive of depreciation)	
{(31,200 × Rs. 30) + (12,000 x Rs. 30 x 0.5)}	11,16,000
Gross Factory Cost	34,02,000
Less: Closing W.I.P [12,000 (Rs. 40 + Rs. 7.5 + Rs.15)]	(7,50,000)
Cost of Goods Produced	26,52,000
Less: Closing Stock of Finished Goods (Rs. 26,52,000 × 24,000/31,200)	(20,40,000)
Total Cash Cost of Sales	6,12,000

(ii)   Work in progress stock

	(Rs.)
Raw material requirements (12,000 units × Rs.40)	4,80,000
Direct wages (50% × 12,000 units × Rs. 15)	90,000
Overheads (50% × 12,000 units × Rs. 30)	1,80,000
	7,50,000

(iii)   Raw material stock

It is given that raw material in stock is average 30 days 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 (360 days) is as follows:

	(Rs.)
For Finished goods (31,200 × Rs. 40)	12,48,000
For Work in progress (12,000 × Rs. 40)	4,80,000
	17,28,000

Raw material stock = $\frac{Rs.17,28,000}{360\ days}$ × 30 days = Rs.1,44,000

(iv)   Finished goods stock:
24,000 units @ Rs. (40+15+30) per unit = Rs.20,40,000

(v)   Debtors for sale: Rs. 6,12,000 x $\frac{60\ days}{360\ days}$ = Rs. 1,02,000

(vi)   Creditors for raw material Purchases [Working Note (iii)]:
Annual Material Consumed (Rs.12,48,000 + Rs.4,80,000)   Rs.17,28,000
Add: Closing stock of raw material   Rs. 1,44,000
                                                               Rs.18,72,000
Credit allowed by suppliers = $\frac{Rs.18,72,000}{360\ days}$× 30days= Rs. 1,56,000

(vii)   Creditors for wages:
Outstanding wage payment = $\frac{Rs.5,58,000}{360\ days}$×15days = Rs. 23,250

2. PK Ltd., a manufacturing company, provides the following information:

	(Rs.)
Sales	1,08,00,000
Raw Material Consumed	27,00,000
Labour Paid	21,60,000
Manufacturing Overhead (Including Depreciation for the year Rs. 3,60,000)	32,40,000
Administrative & Selling Overhead	10,80,000

Additional Information:

(a)   Receivables are allowed 3 months' credit.
(b)   Raw Material Supplier extends 3 months' credit.
(c)   Lag in payment of Labour is 1 month.
(d)   Manufacturing Overhead are paid one month in arrear.
(e)   Administrative & Selling Overhead is paid 1 month advance.
(f)   Inventory holding period of Raw Material & Finished Goods are of 3 months.
(g)   Work-in-Progress is Nil.
(h)   PK Ltd. sells goods at Cost plus 33⅓%.
(i)   Cash Balance Rs. 3,00,000.
(j)   Safety Margin 10%.

You are required to compute the Working Capital Requirements of PK Ltd. on Cash Cost basis.

(Nov 2020)

Solution

Statement showing the requirements of Working Capital (Cash Cost basis)

Particulars	(Rs.)	(Rs.)
A. Current Assets:		
Inventory:		
Stock of Raw material (Rs. 27,00,000 × 3/12)	6,75,000	
Stock of Finished goods (Rs. 77,40,000 × 3/12)	19,35,000	
Receivables (Rs. 88,20,000 × 3/12)	22,05,000	
Administrative and Selling Overhead (Rs. 10,80,000 × 1/12)	90,000	
Cash in Hand	3,00,000	
Gross Working Capital	52,05,000	52,05,000
B. Current Liabilities:		
Payables for Raw materials* (Rs. 27,00,000 × 3/12)	6,75,000	
Outstanding Expenses:		
Wages Expenses (Rs. 21,60,000 × 1/12)	1,80,000	
Manufacturing Overhead (Rs. 28,80,000 × 1/12)	2,40,000	
Total Current Liabilities	10,95,000	10,95,000
Net Working Capital (A-B)		41,10,000
Add: Safety margin @ 10%		4,11,000
Total Working Capital requirements		**45,21,000**

Working Notes:
(i)

(A) Computation of Annual Cash Cost of Production **(Rs.)**

Raw Material consumed	27,00,000
Wages (Labour paid)	21,60,000
Manufacturing overhead (Rs. 32,40,000 - Rs. 3,60,000)	28,80,000
Total cash cost of production	77,40,000

(B) Computation of Annual Cash Cost of Sales **(Rs.)**

Cash cost of production as in (A) above	77,40,000
Administrative & Selling overhead	10,80,000
Total cash cost of sales	88,20,000

*Purchase of Raw material can also be calculated by adjusting Closing Stock and Opening Stock (assumed nil). In that case Purchase will be Raw material consumed +Closing Stock-Opening Stock i.e Rs.27,00,000 + Rs.6,75,000 - Nil = Rs.33,75,000. Accordingly, Total Working Capital requirements (Rs. 43,35,375) can be calculated.

3. Bita Limited manufactures used in the steel industry. The following information regarding the company is given for your consideration:
   (i) Expected level of production 9000 units per annum.
   (ii) Raw materials are expected to remain in store for an average of two months before issue to production.
   (iii) Work-in-progress (50 percent complete as to conversion cost) will approximate to 1/2 month's production.
   (iv) Finished goods remain in warehouse on an average for one month.
   (v) Credit allowed by suppliers is one month.·
   (vi) Two month's credit is normally allowed to debtors.
   (vii) A minimum cash balance of Rs. 67,500 is expected to be maintained.
   (viii) Cash sales are 75 percent less than the credit sales.
   (ix) Safety margin of 20 percent to cover unforeseen contingencies.
   (x) The production pattern is assumed to be even during the year.
   (xi) The cost structure for Bita Limited's product is as follows:

Raw Materials	80 per unit
Direct Labour	20 per unit
Overheads (including depreciation Rs. 20)	80 per unit
Total Cost	180 per unit
Profit	20 per unit
Selling Price	200 per unit

You are required to estimate the working capital requirement of Bita limited.

(May 2019)

Solution

Statement showing Estimate of Working Capital Requirement

	(Amount in Rs.)	(Amount in Rs.)
A. Current Assets		
(i) Inventories		
- **Raw Material inventory** $\left(\frac{9,000\ units \times 80}{12\ months} \times 2\ months\right)$		**1,20,000**
- **Work in Progress :**		

Raw Material $\left(\frac{9,000\ units \times 60}{12\ months} \times 0.5\ months\right)$		**30,000**	
Wages $\left(\frac{9,000\ units \times 60}{12\ months} \times 0.5\ months\right) \times 50\%$		**3,750**	
Overheads $\left(\frac{9,000\ units \times 160}{12\ months} \times 0.5\ months\right) \times 50\%$ (Other than Depreciation)		**11,250**	**45,000**
Finished goods (inventory held for 1 months) $\left(\frac{9,000\ units \times 160}{12\ months} \times 1\ months\right)$			**1,20,000**
(ii) Debtors (for 2 months) $\left(\frac{9,000\ units \times ₹160}{12\ months} \times 2months\right) \times 80\%\ or$ $\left(\frac{11,52,000}{12\ Months}\right) \times 2\ month$			**1,92,000**
(iii) Cash balance expected			**67,500**
Total Current Assets			**5,44,500**
B. Current Liabilities			
(i) Creditors for Raw material (1 month) $\left(\frac{9,000\ units \times ₹80}{12\ months} \times 1\ months\right)$			**60,000**
Total Current Liabilities			**60,000**
Net Working Capital (A - B)			**4,84,500**
Add : Safely margin of 20 Percent			**96,900**
Working Capital Requirement			**5,81,400**

Working Notes:
1. If Credit sales is x then cash sales is x-75% of x i.e. x/4.
   Or x+0.25x = Rs. 18,00,000
   Or x=Rs. 14,40,000
   So, credit Sales is Rs. 14,40,000
   Hence, Cash cost of credit sales $\left(\frac{₹\ 14,40,000}{5} \times 4\right)$ = Rs. 11,52,000
2. It is assumed that safety margin of 20% is on net working capital.
3. No information is given regarding lag in payment of wages, hence ignored assuming it is paid regularly.
4. Debtors/Receivables is calculated based on total cost.
[If Debtors/Receivables is calculated based on sales, then debtors will be
$\left(\frac{9,000\ units \times ₹\ 200}{12\ Months} \times 2\ month\right) \times 80\%\ or\ \left(\frac{14,40,000}{12\ months} \times 2\ month\right)$ = ₹ 2,40,000

Then Total Current assets will be Rs. 5,92,500 and accordingly Net working capital and Working capital requirement will be Rs. 5,32,500 and Rs. 6,39,000 respectively].

4. The following information is provided by MNP Ltd. for the year ending 31st March, 2020:

Raw Material Storage period	45 days
Work-in-Progress conversion period	20 days
Finished Goods storage period	25 days
Debt Collection period	30 days
Creditors payment period	60 days
Annual Operating Cost	Rs. 25,00,000

(Including Depreciation of Rs. 2,50,000)
Assume 360 days in a year.

You are required to calculate:
(i)   Operating Cycle period
(ii)   Number of Operating Cycle in a year.
(iii) Amount of working capital required for the company on a cost basis.
(iv)   The company is a market leader in its product and it has no competitor in the market. Based on a market survey it is planning to discontinue sales on credit and deliver products based on pre-payments in order to reduce its working capital requirement substantially. You are required to compute the reduction in working capital requirement in such a scenario.

(Jan 2021)

Solution

(i)   Calculation of Operating Cycle Period:

Operating Cycle Period	$= R + W + F + D - C$
	$= 45 + 20 + 25 + 30 - 60 = 60$ days

(ii)   Number of Operating Cycle in a Year

$$= \frac{360}{\text{Operating cycle period}} = \frac{360}{60} = 6$$

(iii) Amount of Working Capital Required

$$= \frac{\text{Annual operating cost}}{\text{Number of operating cycl}} = \frac{Rs.25,00,000 - Rs.2,50,000}{6}$$

$$= \frac{Rs.22,50,000}{6} = \text{Rs. } 3,75,000$$

(iv)   Reduction in Working Capital

Operating Cycle Period = R + W + F − C

= 45 + 20 + 25 − 60 = 30 days

Amount of Working Capital Required = $\frac{Rs.22,50,000}{360}$ x 30 = Rs. 1,87,500

Reduction in Working Capital = Rs. 3,75,000 − Rs. 1,87,500 = Rs. 1,87,500

Note: If we use Total Cost basis, then amount of Working Capital required will be Rs. 4,16,666.67 (approx.) and Reduction in Working Capital will be Rs. 2,08,333.33 (approx.)

5.   Balance sheet of X Ltd for the year ended 31st March,2022 is given below:

(Rs. in lakhs)

Liabilities	Amount	Assets	Amount
Equity Shares Rs. 10 each	200	Fixed Assets	500
Retained earnings	200	Raw materials	150
11% Debentures	300	W.I.P	100
Public deposits (Short-Term)	100	Finished goods	50
Trade Creditors	80	Debtors	125
Bills Payable	100	Cash/Bank	55
	980		**980**

Calculate the amount of maximum permissible bank finance under three methods as per Tandon Committee lending norms.

The total core current assets are assumed to be Rs. 30 lakhs.

(May 2022)

Solution

Current Assets = 150 + 100 + 50 + 125 + 55   = Rs. 480 Lakhs

Current Liabilities = 100 + 80 + 100   = Rs. 280 Lakhs

Maximum Permissible Banks Finance under Tandon Committee Norms:

Method I

Maximum Permissible Bank Finance   = 75% of (Current Assets – Current Liabilities)

= 75% of (480 - 280)

= Rs. 150 Lakhs

Method II

Maximum Permissible Bank Finance   = 75% of Current Assets – Current Liabilities

= 75 % of 480 – 280

= Rs. 80 Lakhs

Method III

Maximum Permissible Bank Finance   = 75% of (Current Assets – Core Current Assets) – Current Liabilities

= 75 % of (480 - 30) – 280

= Rs. 57.5 Lakhs

6.   X Ltd. has furnished following cost sheet of per unit cost;

Raw material cost	Rs. 150
Direct labour cost	Rs. 40
Overhead cost	Rs. 60
Total Cost	Rs. 250
Profit	Rs. 50
Selling Price	Rs. 300

The company keeps raw material in stock on an average for 2 months; work in progress on an average for 3 months and finished goods in stock on an average 1 month. The credit allowed by suppliers is 1.5 months and company allows 2 months credit to its debtors. The lag in payment of wages is 1 month and lag in payment of overhead expenses is 1.5 months. The company sells 25% of the output against cash and maintain cash in hand at bank put together at Rs. 1,50,000. Production is carried on evenly throughout the year and wages and overheads also similarly. Work in progress stock is 75% complete in all respects. Prepare statement showing estimate of working capital requirements to finance an activity level of 15,000 units of production.

(Nov. 2023)

Solution
Statement showing Estimate of Working Capital Needs
(Receivables (Debtors) are calculated based on Cost of goods sold)

			(Rs.)	(Rs.)
A.	**Current Assets**			
(i)	Inventories:			
	Raw material (2 months) $\left(\dfrac{15{,}000 \ units \ x \ Rs.\,150}{12 \ months} \ x \ 2 \ month\right)$		3,75,000	
	WIP Inventory (3 months) $\left(\dfrac{15{,}000 \ units \ x \ Rs.\,250}{12 \ months} \ x \ 3 \ month\right) x \ 0.75$		7,03,125	
	Finished goods inventory (1 months) $\left(\dfrac{15{,}000 \ units \ x \ Rs.\,250}{12 \ months} \ x \ 1 \ month\right)$		3,12,500	13,90,625
(ii)	Receivables (Debtors) (2 months) $\left(\dfrac{15{,}000 \ units \ x \ Rs.\,250}{12 \ months} \ x \ 2 \ month\right) x \ 0.75$			4,68,750
(iii)	Cash and bank balance			1,50,000
	Total Current Assets			20,09,375
B.	**Current Liabilities:**			
(i)	Payables (Creditors) for materials (1.5 months) $\left(\dfrac{15{,}000 \ units \ x \ Rs.\,150}{12 \ months} \ x \ 1.5 \ month\right)$			2,81,250
(ii)	Outstanding wages (1 months) $\left(\dfrac{15{,}000 \ units \ x \ Rs.\,40}{12 \ months} \ x \ 1 \ month\right)$			50,000
(iii)	Outstanding overheads (1.5 months) $\left(\dfrac{15{,}000 \ units \ x \ Rs.\,60}{12 \ months} \ x \ 1.5 \ month\right)$			1,12,500
	Total Current Liabilities			4,43,750
	Net Working Capital Needs (A – B)			15,65,625

Alternative Solution
Statement showing Estimate of Working Capital Needs
(Receivables (Debtors) are calculated based on Selling price)

		(Rs.)	(Rs.)
A.	**Current Assets**		

(i)	Inventories:		
	Raw material (2 months) $\left(\dfrac{15,000\ units\ x\ Rs.\ 150}{12\ months}\ x\ 2\ month\right)$	3,75,000	
	WIP Inventory (3 months) $\left(\dfrac{15,000\ units\ x\ Rs.\ 250}{12\ months}\ x\ 3\ month\right) x\ 0.75$	7,03,125	
	Finished goods inventory (1 months) $\left(\dfrac{15,000\ units\ x\ Rs.\ 250}{12\ months}\ x\ 1\ month\right)$		3,12,500
(ii)	Receivables (Debtors) (2 months) $\left(\dfrac{15,000\ units\ x\ Rs.\ 300}{12\ months}\ x\ 2\ month\right) x\ 0.75$		5,62,500
(iii)	Cash and bank balance		1,50,000
	Total Current Assets		21,03,125
B.	**Current Liabilities:**		
(i)	Payables (Creditors) for materials (1.5 months) $\left(\dfrac{15,000\ units\ x\ Rs.\ 150}{12\ months}\ x\ 1.5\ month\right)$		2,81,250
(ii)	Outstanding wages (1 months) $\left(\dfrac{15,000\ units\ x\ Rs.\ 40}{12\ months}\ x\ 1\ month\right)$		50,000
(iii)	Outstanding overheads (1.5 months) $\left(\dfrac{15,000\ units\ x\ Rs.\ 60}{12\ months}\ x\ 1.5\ month\right)$		1,12,500
	Total Current Liabilities		4,43,750
	Net Working Capital Needs (A – B)		16,59,375

Chapter -8
MANAGEMENT OF RECEIVABLES & PAYABLES

1. MN Ltd. has a current turnover of Rs. 30,00,000 p.a. Cost of Sale is 80% of turnover and Bad Debts are 2% of turnover, Cost of Sales includes 70% variable cost and 30% Fixed Cost, while company's required rate of return is 15%. MN Ltd. currently allows 15 days credit to its customer, but it is considering increase this to 45 days credit in order to increase turnover.

   It has been estimated that this change in policy will increase turnover by 20%, while Bad Debts will increase by 1%. It is not expected that the policy change will result in an increase in fixed cost and creditors and stock will be unchanged.

   Should MN Ltd. introduce the proposed policy? (Assume 360 days year)

   (Nov 2018)

   Solution

   Statement Showing Evaluation of Credit Policies

	Particulars	Present Policy	Proposed Policy
A.	Expected Contribution		
	(a) Credit Sales	30,00,000	36,00,000
	(b) Less: Variable Cost	16,80,000	13,20,000
	(c) Contribution	20,16,000	15,84,000
	(d) Less: Bad Debts	60,000	1,08,000
	(e) Contribution after Bad debt [(c)-(d)]	12,60,000	14,76,000
B.	Opportunity Cost of investment in Receivables	15,000	54,000
C.	Net Benefits [A-B]	12,45,000	
D.	Increase in Benefit		1,77,000

   Recommendation: Proposed Policy i.e credit from 15 days to 45 days should be implemented by NM Ltd since the net benefit under this policy are higher than those under present policy

   Working Note: (1)

	Present Policy (Rs.)	Propose Policy (Rs.)
Sales	30,00,000	36,00,000
Cost of Sales (80% of sales)	24,00,000	28,80,000
Variable cost (70% of cost of sales)	16,80,000	20,16,000

2. **Opportunity Costs of Average Investments**

   $$= \text{Variable Cost} \times \frac{Collection\ Period}{360} \times \text{Rate of Return}$$

   Present Policy $= \text{Rs. } 24,00,000 \times \times \frac{45}{360} \times 15\% = \text{Rs. } 54,000$

   Proposed Policy $= \text{Rs. } 28,80,000 \times \times \frac{15}{360} \times 15\% = \text{Rs. } 18,000$

2. A factoring firm has offered a company to buy its accounts receivables. The relevant information is given below:
   (i)   The current average collection period for the company's debt is 80 days and ½% of debtors default. The factor has agreed to pay over money due to the company after 60 days and it will suffer all the losses of bad debts also.
   (ii)   Factor will charge commission @2%.
   (iii) The company spends Rs. 1,00,000 p.a. on administration of debtor. These are avoidable cost.
   (iv)   Annual credit sales are Rs. 90 lakhs. Total variable costs is 80% of sales. The company's cost of borrowing is 15% per annum. Assume 365 days in a year.

Should the company enter into agreement with factoring firm?

Discounting Factor @ 18%	0.847	0.718	0.608	0.515	0.436

(Dec. 2021)

Solution

	Particulars	(Rs.)
A.	**Annual Savings (Benefit) on taking Factoring Service**	
	Cost of credit administration saved	1,00,000
	Bad debts avoided (Rs. 90 lakh x ½%)	45,000
	Interest saved due to reduction in average collection period [Rs. 90 lakh x 0.80 × 0.15 × (80 days – 60 days)/365 days]	59,178
	Total	**2,04,178**
B.	**Annual Cost of Factoring to the Firm:**	
	Factoring Commission [Rs. 90 lakh × 2%]	1,80,000
	Total	**1,80,000**
C.	**Net Annual Benefit of Factoring to the Firm (A – B)**	**24,178**

Advice: Since savings to the firm exceeds the cost to the firm on account of factoring, therefore, the company should enter into agreement with the factoring firm.

3. Current annual sale of SKD Ltd. is Rs. 360 lakhs. It's directors are of the opinion that company's current expenditure on receivables management is too high and with a view to reduce the expenditure they are considering following two new alternate credit policies:

	Policy X	Policy Y
Average collection period	1.5 months	1 month
% of default	2%	1%
Annual collection expenditure	Rs. 12 lakh	Rs. 20 lakh
Selling price per unit of product is	Rs. 150.	
Total cost per unit is	Rs. 120.	

Current credit terms are 2 months and percentage of default is 3%.
Current annual collection expenditure is Rs. 8 lakh. Required rate of return on investment of SKD Ltd. is 20%. Determine which credit policy SKD Ltd. should follow.

(Jul 2021)

Solution

Statement showing the Evaluation of Credit policies (Total Approach)

Particulars	Present Policy (2 Months)	Proposed Policy X (1.5 Months)	Proposed Policy Y (1 Month)

		Rs. in lakhs	Rs. in lakhs	Rs. in lakhs
A.	**Expected Profit:**			
	(a) Credit Sales*	360	360	360
	(b) Total Cost other than Bad Debts and collection expenditure (360/150 x 120)	288	288	288
	(c) Bad Debts	10.8 (360 x 0.03)	7.2 (360 x 0.02)	3.6 (360 x 0.01)
	(d) Collection expenditure	8	12	20
	(e) Expected Profit [(a) – (b) – (c) - (d)]	53.2	52.8	48.4
B.	**Opportunity Cost of Investments in Receivables (Working Note)**	9.6	7.2	4.8
C.	**Net Benefits (A – B)**	**43.6**	**45.6**	**43.6**

Recommendation: The Proposed Policy X should be followed since the net benefits under this policy are higher as compared to other policies.

*Note: It is assumed that all sales are on credit.

Working Note:
Calculation of Investment in Receivables

$$= \text{Total Cost} \times \frac{Collection\ period}{12} \text{ x } \frac{Rate\ of\ Return}{100}$$

Present Policy $= \text{Rs. 288 lakhs} \times \frac{2}{12} \text{ x } \frac{20}{100} = \text{Rs. 9.6 lakhs}$

Policy X $= \text{Rs. 288 lakhs} \times \frac{1.5}{12} \text{ x } \frac{20}{100} = \text{Rs. 7.2 lakhs}$

Policy Y $= \text{Rs. 288 lakhs} \times \frac{1}{12} \text{ x } \frac{20}{100} = \text{Rs. 4.8 lakhs}$

Alternatively
Statement showing the Evaluation of Credit policies (Incremental Approach)

Particulars		Present Policy (2 Months)	Proposed Policy X (1.5 Months)	Proposed Policy Y (1 Month)
		Rs. in lakhs	Rs. in lakhs	Rs. in lakhs
	(a) Credit Sales*	360	360	360
	(b) Cost of sales (360/150 x 120)	288	288	288
	(c) Receivables (Refer Working Note)	48	36	24
	(d) Reduction in receivables from present policy	-	12	24
(A)	**Savings in Opportunity Cost of Investment in Receivables (@ 20%)**	-	**2.4**	**4.8**
	(e) Bad Debts	10.8 (360 x 0.03)	7.2 (360 x 0.02)	3.6 (360 x 0.01)
(B)	**Reduction**	in bad debts from present policy	-	3.6
	(f) Collection expenditure	8	12	20
(C)	**Increase in Collection expenditure from Present**	-	**4**	**12**

	policy			
(D)	Net Benefits (A +B-C)		2	0

Recommendation: The Proposed Policy X should be followed since the net benefits under this policy are higher as compared to other policies.

*Note: It is assumed that all sales are on credit.

Working Note:
Calculation of Investment in Receivables

$$= \text{Total Cost} \times \frac{Collection\ period}{12}$$

Present Policy $= \text{Rs. 288 lakhs} \times \frac{2}{12} = \text{Rs. 48 lakhs}$

Policy X $= \text{Rs. 288 lakhs} \times \frac{1.5}{12} = \text{Rs. 36 lakhs}$

Policy Y $= \text{Rs. 288 lakhs} \times \frac{1}{12} = \text{Rs. 24 lakhs}$

4. A company has current sale of Rs. 12 lakhs per year. The profit-volume ratio is 20% and post-tax cost of investment in receivables is 15%. The current credit terms are 1/10, net 50 days and average collection period is 40 days. 50% of customers in terms of sales revenue are availing cash discount and bad debt is 2% of sales.

   In order to increase sales, the company want to liberalize its existing credit terms to 2/10, net 35 days. Due to which, expected sales will increase to Rs. 15 lakhs. Percentage of default in sales will remain same. Average collection period will decrease by 10 days. 80% of customers in terms of sales revenue are expected to avail cash discount under this proposed policy.

   Tax rate is 30%.

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

   (May 2023)

   Solution

(i) **Calculation of Cash Discount**

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

$$\text{Present Policy} = \frac{12,00,000 \times 50 \times 0.01}{100} = ₹ 6,000$$

Proposed Policy = 15,00,000 × 0.80 × 0.02 = ₹ 24,000

(ii) **Opportunity Cost of Investment in Receivables**

$$\text{Present Policy: Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

$$= 9,60,000 \times \frac{40}{360} \times \frac{15}{100} = ₹ 16,000$$

$$\text{Proposed Policy:} = \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

$$= 12,00,000 \times \frac{30}{360} \times \frac{15}{100} = ₹ 15,000$$

Statement showing Evaluation of Credit Policies

Particulars	Present Policy	Proposed Policy
Credit Sales	12,00,000	15,00,000
Variable Cost @ 80%* of sales	9,60,000	12,00,000
Bad Debts @ 2%	24,000	30,000
Cash Discount	6,000	24,000
Profit before tax	**2,10,000**	**2,46,000**
Tax @ 30%	63,000	73,800
Profit after Tax	**1,47,000**	**1,72,200**
Opportunity Cost of Investment in Receivables	16,000	15,000
Net Profit	**1,31,000**	**1,57,200**

*Only relevant or variable costs are considered for calculating the opportunity costs on the funds blocked in receivables. Since 20% is profit-volume ratio, hence the relevant costs are taken to be 80% of the respective sales.

Advise: Proposed policy should be adopted since the net benefit is increased by (₹ 1,57,200 - ₹ 1,31,000) = ₹ 26,200.

Alternative presentation using incremental approach

	₹
Incremental sales (15,00,000 – 12,00,000)	3,00,000
Less: Incremental variable cost (12,00,000 – 9,60,000)	2,40,000
Less: Incremental Bad debts (30,000 – 24,000)	6,000
Less: Incremental Cash discount (24,000 – 6,000)	18,000
Increase in Profit Before Tax	**36,000**
Less: Tax @ 30%	10,800
Increase in Profit After Tax	**25,200**
Add: **Savings in opportunity cost** (16,000 - 15,000)	**1,000**
Increase in Net Profit	**26,200**

Advise: Proposed policy should be adopted since the net benefit is increased by (₹ 1,57,200 - ₹ 1,31,000)

= ₹ 26,200.

5. Following is the sales information in respect of Bright Ltd:

Annual Sales (90 % on credit)	Rs. 7,50,00,000
Credit period	45 days
Average Collection period	70 days
Bad debts	0.75%
Credit administration cost (out of which 2/5th is avoidable)	Rs. 18,60,000

A factor firm has offered to manage the company's debtors on a non-recourse basis at a service charge of 2%. Factor agrees to grant advance against debtors at in interest rate of 14% after withholding 20% as reserve. Payment period guaranteed by factor is 45 days. The cost of capital of the company is 12.5%. One time redundancy payment of Rs. 50,000 is required to be made to factor.

Calculate the effective cost of factoring to the company. (Assume 360 days in a year)

(May 2024)

Solution

Evaluation of Factoring Proposal

	Particulars	₹	₹
A.	**Savings due to factoring**		
	Bad Debts saved	0.75% x 7.5 crores x 90%	₹ 5,06,250
	Administration cost saved	18.6 lakhs x 2/5	₹ 7,44,000
	Interest saved due to reduction in average collection period	7.5 crores x 90% x (70-45)/ 360 x 12.5%	₹ 5,85,937.5
	Total		**₹ 18,36,187.5**
B.	**Costs of factoring:**		
	Service charge	7.5 crores x 90% x 2%	₹ 13,50,000
	Interest cost	₹ 1,15,171.875 x 360/45	₹ 9,21,375
	Redundancy Payment		₹ 50,000
	Total		**₹ 23.21,375**
C.	**Net Annual cost to the Firm: (A-B)**		**₹ 4,85,187.5**
	Rate of effective cost of factoring	₹ 4,85,187.5/ ₹ 64,66,078.125 x 100	**7.504%**

Advice: Since the rate of effective cost of factoring is less than the existing cost of capital, therefore, the proposal is acceptable.

Credit Sales = ₹ 7.5 crores x 90%	= ₹ 6,75,00,000
Average level of receivables = ₹ 6.75 crores x 45/360	= ₹ 84,37,500
Service charge = 2% of ₹ 84,37,500	₹ 1,68,750
Reserve = 20% of ₹ 84,37,500	₹ 16,87,500
Total (i)	₹ 18,56,250

Thus, the amount available for advance is

Average level of receivables	₹ 84,37,500
Less: Total (i) from above	₹ 18,56,250
(ii)	₹ 65,81,250
Less: Interest @ 14% p.a. for 45 days	₹ 1,15,171.875
Net Amount of Advance available.	₹ 64,66,078.125

Note: Alternatively, if redundancy cost is taken as irrelevant for decision making, then Net Annual cost to the Firm will be ₹ 4,35,187.5 and Rate of effective cost of factoring will be ₹ 4,35,187.5/₹ 64,66,078.125 x 100 = 6.730%

If average level of receivables is considered for 70 days then the calculation can be done in following way:

Evaluation of Factoring Proposal

Credit Sales = ₹ 7.5 crores X 90%	= ₹ 6,75,00,000	
Average level of receivables = ₹ 6.75 crores x 70/360	= ₹ 1,31,25,000	
Service charge = 2% of ₹ 1,31,25,000	₹ 2,62,500	
Reserve = 20% of ₹ 1,31,25,000	₹ 26,25,000	
Total (i)	₹ 28,87,500	

Thus, the amount available for advance is

Average level of receivables	₹ 1,31,25,000
Less: Total (i) from above	₹ 28,87,500
(ii)	₹ 1,02,37,500
Less: Interest @ 14% p.a. for 45 days	₹ 1,79,156.25
Net Amount of Advance available.	₹ 1,00,58,343.75

Note 1: Accordingly, interest cost will be ₹ 14,33,250 cost of factoring will be ₹ 28,33,250. Therefore, Rate of effective cost of factoring is 9.913%

Note 2: Alternatively, if redundancy cost is taken as irrelevant for decision making, then Net Annual cost to the Firm will be ₹ 9,47,062.5 and Rate of effective cost of factoring will be ₹ 9,47,062.5/ ₹ 1,00,58,343.75 x 100 = 9.416%.

Advice: Since the rate of effective cost of factoring is less than the existing cost of capital, therefore, the proposal is acceptable.

1. Slide Ltd. is preparing a cash flow forecast for the three months period from January to the end of March. The following sales volumes have been forecasted:

Months	December	January	February	March	April
Sales (units)	1,800	1,875	1,950	2,100	2,250

Selling price per unit is Rs. 600. Sales are all on one month credit. Production of goods for sale takes place one month before sales. Each unit produced requires two units of raw materials costing Rs. 150 per unit. No raw material inventory is held. Raw materials purchases are on one month credit. Variable overheads and wages equal to Rs. 100 per unit are incurred during production and paid in the month of production. The opening cash balance on 1st January is expected to be Rs. 35,000. A long term loan of Rs. 2,00,000 is expected to be received in the month of March. A machine costing Rs. 3,00,000 will be purchased in March.

(a) Prepare a cash budget for the months of January, February and March and calculate the cash balance at the end of each month in the three months period.

(b) Calculate the forecast current ratio at the end of the three months period.

(Nov 2019)

Solution

Working Notes:

(1) Calculation of Collection from Trade Receivables:

Particulars	December	January	February	March
Sales	1,800	1,875	1,950	2,100
Sales@Rs. 600 per unit/Trade Receivable (Debtors)(Rs.)	10,80,000	11,25,000	11,70,000	12,60,000
Collection from Trade Receivables (Debtors) (Rs.)		10,80,000	11,25,000	11,70,000

(2) Calculation of Payment to Trade Payables:

Particulars	December	January	February	March
Output (units)	1,875	1,950	2,100	2,250
Raw Material (2 units per output) (units)	3,750	3,900	4,200	4,500
Raw Material (@ Rs. 150 per unit) / Trade Payables (Creditors) (Rs.)	5,62,500	5,85,000	6,30,000	6,75,000
Payment to Trade Payables (Creditors) (Rs.)		5,62,000	5,85,000	6,30,000

(3) Calculation of Variable Overheads and Wages:

Particulars	January	February	March
Output (units)	1,950	2,100	2,250

Payment in the same month @ Rs. 100 per unit (Rs.)	1,95,000	2,10,000	2,25,000

(a) **Preparation of Cash Budget**

Particulars	January (Rs.)	February (Rs.)	March(Rs.)
Opening Balance	35,000	3,75,500	6,87,500
Receipts:			
Collection from Trade Receivables (Debtors)	10,80,000	11,25,000	11,70,000
Receipt of Long-Term Loan			2,00,000
Total (A)	11,15,000	14,82,500	20,57,500
Payments:			
Trade Payables (Creditors) for Materials	5,62,500	5,85,000	6,30,000
Variable Overheads and Wages	1,95,000	2,10,000	2,25,000
Purchase of Machinery			3,00,000
Total (B)	7,57,500	7,95,000	11,55,000
Closing Balance (A – B)	**3,57,500**	**6,87,500**	**9,02,500**

(b) **Calculation of Current Ratio**

Particulars	March (Rs.)
Output Inventory (i.e. units produced in March) [(2,250 units x 2 units of raw material per unit of output x Rs. 150 per unit of raw material) + 2,250 units x Rs. 100 for variable overheads and wages] or, [6,75,000 + 2,25,000] from Working Notes 2 and 3	9,00,000
Trade Receivables (Debtors)	12,60,000
Cash Balance	9,02,500
Current Assets	30,62,500
Trade Payables (Creditors)	6,75,000
Current Liabilities	6,75,000
Current Ratio (Current Assets / Current Liabilities)	4.537 Approx

2. A garment trader is preparing cash forecast for first three months of calendar year 2021. His estimated sales for the forecasted periods are as below:

	January (Rs. '000)	February (Rs. '000)	March (Rs. '000)
Total sales	600	600	800

(i) The trader sells directly to public against cash payments and to other entities on credit. Credit sales are expected to be four times the value of direct sales to public. He expects 15% customers to pay in the month in which credit sales are made, 25% to pay in the next month and 58% to pay in the next to next month. The outstanding balance is expected to be written off.

(ii) Purchases of goods are made in the month prior to sales and it amounts to 90% of sales and are made on credit. Payments of these occur in the month after the purchase. No inventories of goods are held.

(iii) Cash balance as on 1st January, 2021 is Rs. 50,000.

(iv)   Actual sales for the last two months of calendar year 2020 are as below:

	November (Rs. '000)	December (Rs. '000)
Total sales	640	880

You are required to prepare a monthly cash, budget for the three months from January to March, 2021.

(Dec. 2021)

Solution
Working Notes:
(1)   **Calculation of cash and credit sales**   (Rs. in thousands)

	Nov.	Dec.	Jan.	Feb.	Mar.
Total Sales	640	880	600	600	800
Cash Sales (1/5th of total sales)	128	176	120	120	160
Credit Sales (4/5th of total sales)	512	704	480	480	640

(2)   **Calculation of Credit Sales Receipts**   (Rs. in thousands)

Month	Nov.	Dec.	Jan.	Feb.	Mar.
Forecast Credit sales (Working note 1)	512.00	704.00	480.00	480.00	640.00
Receipts:					
15% in the month of sales			72.00	72.00	96.00
25% in next month			176.00	120.00	120.00
58% in next to next month			296.96	408.32	278.40
Total			**544.96**	**600.32**	**494.40**

<div align="center">Cash Budget</div>   (Rs.in thousands)

	Nov.	Dec.	Jan.	Feb.	Mar.
Opening Balance **(A)**			50.00	174.96	355.28
Sales	640.00	880.00	600.00	600.00	800.00
Receipts:					
Cash Collection (Working note 1)			120.00	120.00	160.00
Credit Collections (Working note 2)			544.96	600.32	494.40
Total **(B)**			664.96	720.32	654.40
Purchases (90% of sales in the month prior to sales)		540	540	720	
Payments:					
Payment for purchases (next month)			**540**	**540**	**720**
Total **(C)**			540	540	720
Closing balance(D) = (A + B – C)			174.96	355.28	**289.68**

3.   K Ltd. has a Quarterly cash outflow of Rs. 9,00,000 arising uniformly during the Quarter. The company has an Investment portfolio of Marketable Securities. It plans to meet the demands for cash by periodically selling marketable securities. The marketable securities are generating a return of 12% p.a. Transaction cost of converting investments to cash is Rs. 60. The company uses Baumol model to find out the optimal transaction size for converting marketable securities into cash.
Consider 360 days in a year.

You are required to calculate
(i)   Company's average cash balance,
(ii)   Number of conversions each year and
(iii)   Time interval between two conversions.

(Nov. 2022)

Solution

(i)   Computation of Average Cash balance:
Annual cash outflow (U) = 9,00,000 x 4 = Rs. 36,00,000
Fixed cost per transaction (P) = Rs. 60

Opportunity cost of one rupee p.a. (S) = $\frac{12}{100}$ = 0.12

Optimum cash balance (C) = $\sqrt{\frac{2UP}{S}}$ = $\sqrt{\frac{2 \ x \ 36,00,000 \ x \ 60}{0.12}}$ = Rs. 60,000

$\therefore$ Average Cash balance = $\frac{(0+6,000)}{2}$ = Rs. 30,000

(ii)   Number of conversions p.a.
Annual cash outflow = Rs. 36,00,000
Optimum cash balance = Rs. 60,000
$\therefore$ No. of conversions p.a. = $\frac{36,00,000}{60,000}$ = 60

(iii) Time interval between two conversions
No. of days in a year = 360
No. of conversions p.a. = 60
$\therefore$ Time interval = $\frac{360}{60}$ = 6 days