# 5. CAPITAL STRUCTURE

## ASSIGNMENT SOLUTIONS

### PROBLEM NO: 1

| Particulars | Plan A | Plan B | Plan C | Plan D |
|---|---|---|---|---|
| EBIT | 15,00,000 | 18,00,000 | 15,00,000 | 15,00,000 |
| **Less:** Interest | 0 | (1,80,000) | (3,00,000) | 0 |
| EBT | 15,00,000 | 13,20,000 | 12,00,000 | 15,00,000 |
| **Less:** Tax @ 50% | (7,50,000) | (6,60,000) | (6,00,000) | (7,50,000) |
| EAT | 7,50,000 | 6,60,000 | 6,00,000 | 7,50,000 |
| **Less:** Preference Dividend | 0 | 0 | 0 | 1,50,000 |
| EAESH | 7,50,000 | 6,60,000 | 6,00,000 | 6,00,000 |
| No. of Equity shares | 80,000 | 60,000 | 50,000 | 60,000 |
| EPS | 9.375/- | 11/- | 12/- | 10/- |

**Conclusion:** From above computation we can decide that Plan 'C' i.e. Rs. 12 EPS is highest. So it is advised to company to Opt. 'Plan C'

### PROBLEM NO: 2

Given information,

Additional amount required = 50,000

Tax rate = 50%

**PART - A (EBIT remains same)**

**Evaluation of financial plans basing on EPS**

| Particulars | Present | 100% equity | 100% preference | 100% debt |
|---|---|---|---|---|
| **a)** EBIT | 40,000 | 40,000 | 40,000 | 40,000 |
| **b)** Interest | - | - | - | (5,000) |
| **c)** EBT | 40,000 | 40,000 | 40,000 | 35,000 |
| **d)** Tax @ 50% | (20,000) | (20,000) | (20,000) | 17,500 |
| **e)** EAT / EASH | 20,000 | 20,000 | 20,000 | 17,500 |
| **f)** Preference shares | - | - | (6,000) | - |
| **g)** EAESH | 20,000 | 20,000 | 14,000 | 17,500 |
| **h)** No of Equity shares | 10,000 | 15,000 | 10,000 | 10,000 |
| **i)** EPS (g/h) | 2 | 1.33 | 1.4 | 1.75 |
| **j)** Impact on EPS | - | - 0.67 | - 0.60 | - 0.25 |



If there is no change in EBIT, it is not advisable to go for expansion. This is because as a result of expansion the companies EPS is decreased in all options.

**PART - B (EBIT increases by 10,000)**

| Particulars | Present | 100% equity | 100% preference | 100% debt |
|---|---|---|---|---|
| **a)** EBIT | 40,000 | 50,000 | 50,000 | 50,000 |
| **b)** Interest | - | - | - | (5,000) |
| **c)** EBT | 40,000 | 50,000 | 50,000 | 45,000 |
| **d)** Tax @ 50% | (20,000) | (25,000) | (25,000) | (22,500) |
| **e)** EAT / EASH | 20,000 | 25,000 | 25,000 | 22,500 |
| **f)** Preference shares | - | - | (6,000) | - |
| **g)** EAESH | 20,000 | 25,000 | 19,000 | 22,500 |
| **h)** No of Equity shares | 10,000 | 15,000 | 10,000 | 10,000 |
| **i)** EPS | 2 | 1.67 | 1.9 | 2.25 |
| **j)** Impact on EPS | - | - 0.33 | - 0.1 | 0.25 |

**Conclusion:**

1. After expansion the company EBIT increase by Rs. 10,000 than it is better to choose option-I.
2. As it increase the EPS the company by 0.25. therefore it is better to choose additional capacity by issue of 10% debentures

## PROBLEM NO: 3

**Working Note: Calculation of Interest**

| Particulars | Option - I (50%) | Option - II (40%) | Option - III (60%) |
|---|---|---|---|
| **a)** Up to 40,00,000 | 6,00,000 (40 L x 15%) | 6,00,000 (40 L x 15%) | 6,00,000 (40 L x 15%) |
| **b)** 40,00,000 - 50,00,000 | 1,60,000 (10 L x 16%) | - | 1,60,000 (10 L x 16%) |
| **c)** Above 50,00,000 | - | - | 1,80,000 (10 L x 18%) |
| **Total** | **7,60,000** | **6,00,000** | **9,40,000** |

**Evaluation of Financial Plans:** **(Basing on EPS)**

| Particulars | Option - I | Option - II | Option - III |
|---|---|---|---|
| **a)** EBIT | 22,00,000 | 22,00,000 | 22,00,000 |
| **b)** Interest (Refer WN) | (7,60,000) | (6,00,000) | (9,40,000) |
| **c)** EBT (a - b) | 14,40,000 | 16,00,000 | 12,60,000 |
| **d)** Tax @ 50% | (7,20,000) | (8,00,000) | (6,30,000) |
| **e)** EAT / EAESH | 7,20,000 | 8,00,000 | 6,30,000 |
| **f)** No. of Equity Shares | $1,25,000\left(\frac{\text{Rs. } 50,00,000}{\text{Rs. } 40}\right)$ | $1,50,000\left(\frac{\text{Rs. } 60,00,000}{\text{Rs. } 40}\right)$ | $1,25,000\left(\frac{\text{Rs. } 40,00,000}{\text{Rs. } 32}\right)$ |
| **g)** EPS (e/f) | 5.76 | 5.333 | 5.04 |

**Note:** company issue shares only at market price, because issue less No. of shares and increases sale proceeds but dividend can be paid only on face value of a share.

**Conclusion:** option-I is better because EPS more than other two options. As EPS maximize under option - I it is advisable to raise required capital in the proportion of Rs.50 lacks equity and Rs.50 lacks debt.

## PROBLEM NO: 4



| Particulars | Option - I | Option - II |
|---|---|---|
| EBIT (31,000 + 1,50,000 x 10%)<br>↓ Old EBIT ↓ Additional Shares | 46,000 | 46,000 |
| **Less:** Interest (W.N 1) | (4500) | (1000) |
| EBT | 41500 | 45000 |
| **Less:** Tax @ 35% | (14525) | (15750) |
| EAT/EAESH | 26975 | 29250 |
| No. of Equity shares (W.N 2) | 5000 | 7000 |
| EPS | 5.395 | 4.178 |
| P/E Ratio | 6 | 7 |
| Market price | 32.37 | 29.25 |

**WORKING NOTES 1:** Calculation of interest on Debt

**Option 1:**

5% Debentures of Rs.20,000 i.e. 5% x Rs.20,000 = Rs.1,000

7% Debt of Rs.50,000 i.e. 7% x Rs.50,000 = Rs.3,500

= Rs.4,500

**Option 2:** 5% Debentures of Rs.20,000 i.e. 5% x Rs.20,000 = Rs.1000

**WORKING NOTES 2:** Calculation of number of equity shares to be issued:

**Option 1:** Existing $= \frac{50,000}{10}$ = 5,000 shares

**Option 2:** Existing $= \frac{50,000}{10}$ = 5,000 shares

New issue $= \frac{50,000}{25(\text{M.P.S})}$ = 2,000 shares

= 7,000 shares



**Decision:** Since M.P under option - I is more than option - II, it is advisable to accept Option - I.

## PROBLEM NO: 5

**Calculation of EPS & Market price in each of the given options:** **(Rs. In Lakhs)**

| Particulars | Existing | Option I | Option II | Option III |
|---|---|---|---|---|
| EBIT (W.N-1) | 15.00 (100 x 15%) | 22.5 (150 x 15%) | 22.5 (150 x 15%) | 22.5 (150 x 15%) |
| **Less:** Interest | 1.75 (25 x 7%) | 1.75 | 1.75 | 6.75 (1.75 + 50 x 10%) |
| EBT | 16.75 | 20.75 | 20.75 | 15.75 |
| **Less:** Tax @ 40% | 6.7 | 8.3 | 8.3 | 6.3 |
| EAT | 10.05 | 12.45 | 12.45 | 9.45 |
| **Less:** Preference dividend | 2.25 (25 x 9%) | 2.25 | 8.25 (2.25 + 50 x 12%) | 2.25 |
| EAESH (A) | 7.8 | 10.2 | 4.2 | 7.2 |
| **No. of equity shares (Lakhs)** | | | | |
| Existing | 0.40 | 0.40 | 0.40 | 0.40 |
| New | - | 0.25 | - | - |
| Number of Equity shares (B) | 0.40 | 0.65 | 0.40 | 0.40 |
| EPS (Rs.) (A/B) | 19.5 | 15.69 | 10.5 | 18 |
| PE ratio | - | 25 | 20 | 15 |
| Market price (EPS x PE ratio) | - | 392.25 | 210 | 270 |

**W.N-1:** Calculation of EBIT

EBIT = 15% of capital employed

Capital employed (Before expansion):

| | |
|---|---|
| Equity share capital | Rs. 40,00,000 |
| Debt | Rs. 25,00,000 |
| Preference share capital | Rs. 25,00,000 |
| Reserves and surplus | Rs. 10,00,000 |
| | Rs.1,00,00,000 |



Capital employed (After expansion) = 1,00,00,000 + Additional Debt of Rs.50,00,000 = Rs. 1,50,00,000

EBIT, before expansion = 1,00,00,000 x 15% = Rs. 15,00,000

EBIT, after expansion = 1,50,00,000 x 15% = Rs. 22,50,000

**Conclusion:** The objective of Financial Management is to maximize the benefits of equity shareholders. Since market price is high in option I, it is beneficial to raise the funds of Rs.25,00,000 by way of fresh equity shares.

**Assumption:** The return on existing capital is given as 15%. It is assumed that the same rate of return will be maintained on additional investment also.

## PROBLEM NO: 6

**i) Computation of EPS under three-financial plans:**

**Plan 1: Equity Financing**

| | | | | | |
|---|---|---|---|---|---|
| EBIT | Rs. 62,500 | Rs. 1,25,000 | Rs. 2,50,000 | Rs. 3,75,000 | Rs. 6,25,000 |
| Interest | 0 | 0 | 0 | 0 | 0 |
| EBT | Rs. 62,500 | Rs. 1,25,000 | Rs. 2,50,000 | Rs. 3,75,000 | Rs. 6,25,000 |
| **Less:** Taxes 40% | 25,000 | 50,000 | 1,00,000 | 1,50,000 | 2,50,000 |
| PAT | Rs. 37,500 | Rs. 75,000 | Rs. 1,50,000 | Rs. 2,25,000 | Rs. 3,75,000 |
| No. of equity shares | 3,12,500 | 3,12,500 | 3,12,500 | 3,12,500 | 3,12,500 |
| EPS | Rs. 0.12 | 0.24 | 0.48 | 0.72 | 1.20 |

**Plan 2: Debt - Equity Mix**

| | | | | | |
|---|---|---|---|---|---|
| EBIT | Rs. 62,500 | Rs. 1,25,000 | Rs. 2,50,000 | Rs. 3,75,000 | Rs. 6,25,000 |
| Interest | 1,25,000 | 1,25,000 | 1,25,000 | 1,25,000 | 1,25,000 |
| EBT | (62,500) | 0 | 1,25,000 | 2,50,000 | 5,00,000 |
| **Less:** Taxes 40% | 25,000* | 0 | 50,000 | 1,00,000 | 2,00,000 |
| PAT | (37,500) | 0 | 75,000 | 1,50,000 | 3,00,000 |

| | | | | | |
|---|---|---|---|---|---|
| No. of equity shares | 1,56,250 | 1,56,250 | 1,56,250 | 1,56,250 | 1,56,250 |
| EPS | (Rs. 0.24) | 0 | 0.48 | 0.96 | 1.92 |

*The Company will be able to set off losses against other profits. If the Company has no profits from operations, loses will be carried forward.

**Plan 3: Preference Shares - Equity Mix**

| EBIT | Rs. 62,500 | Rs. 1,25,000 | Rs. 2,50,000 | Rs. 3,75,000 | Rs. 6,25,000 |
|---|---|---|---|---|---|
| Interest | 0 | 0 | 0 | 0 | 0 |
| EBT | Rs. 62,500 | Rs. 1,25,000 | Rs. 2,50,000 | Rs. 3,75,000 | Rs. 6,25,000 |
| **Less:** Taxes 40% | 25,000 | 50,000 | 1,00,000 | 1,50,000 | 2,50,000 |
| PAT | Rs. 37,500 | Rs. 75,000 | Rs. 1,50,000 | Rs. 2,25,000 | Rs. 3,75,000 |
| **Less:** Pref. dividend | 1,25,000* | 1,25,000* | 1,25,000 | 1,25,000 | 1,25,000 |
| PAT for ordinary Shareholders | (87,500) | (50,000) | 25,000 | 1,00,000 | 2,50,000 |
| No. of equity shares | 1,56,250 | 1,56,250 | 1,56,250 | 1,56,250 | 1,56,250 |
| EPS | (0.56) | (0.32) | 0.16 | 0.64 | 1.60 |

*In case of cumulative preference shares, the dividend gets accumulated if there is insufficient profit to pay dividend. If we assume it as non-cumulative preference shares, then in this case dividend amount will be lower of PAT and amount of preference dividend.

**ii)** The choice of the financing plan will depend on the state of economic conditions. If the company's sales are increasing, the EPS will be maximum under Plan II: Debt - Equity Mix. Under favorable economic conditions, debt financing gives more benefit due to tax shield availability than equity or preference financing.

**iii) EBIT - EPS Indifference Point : Plan I and Plan II:**

$$\frac{(EBIT^*)x(1-T_C)}{N_1} = \frac{(EBIT^* - Interest)x(1-T_C)}{N_2}$$

$$\frac{EBIT^*(1-0.40)}{3,12,500} = \frac{(EBIT^* - 1,25,000)x(1-0.40)}{1,56,250}$$

$$EBIT^* = \frac{3,12,500}{3,12,500-1,56,250} \times 1,25,00 = Rs.2,50,000$$



**EBIT - EPS Indifference Point: Plan I and Plan III**

$$\frac{EBIT^* x(1-T_C)}{N_1} = \frac{EBIT^*(1-T_C) - Pref.Div.}{N_2}$$

$$EBIT^* = \frac{N_1}{N_1 - N_2} x \frac{Pref.Div.}{1-T_C} = \frac{3,12,500}{3,12,500-1,56,250} x \frac{1,25,000}{1-0.4} = Rs.4,16,666.67$$

## PROBLEM NO: 7

**Computation of Interest Rate on Debentures:**

$$\frac{(EBIT - Interest)(1-t)}{No.\ of\ Equity\ Shares\ (N_1)} = \frac{EBIT(1-t) - Preference Dividend}{No.\ of\ Equity\ Shares\ (N_2)}$$

$$\frac{(2,72,000 - Interest)(1-0.5)}{8,000\ Shares} = \frac{2,72,000(1-0.5) - 40,000}{6,000\ Shares}$$

$$\frac{1,36,000 - 0.5\ Interest}{4} = \frac{1,36,000 - 40,000}{3}$$

$$1,36,000 - 0.5\ Interest = 1,28,000 \left(\frac{96,000}{3} x\ 4\right)$$

$$0.5\ Interest = 8,000$$

$$Interest = \frac{8,000}{0.5} = 16,000$$

$$Rate\ of\ Interest = \frac{Rs.16,000}{Rs.2,00,000} x\ 100 = 8\%$$

## PROBLEM NO: 8

| Particulars | Proposal P | Proposal Q | Proposal R |
|---|---|---|---|
| EBIT | 18,00,000 | 18,00,000 | 18,00,000 |
| **Less:** Interest @ 10% | 0 | 2,00,000 | 0 |
| EBT | 18,00,000 | 16,00,000 | 18,00,000 |
| **Less:** Tax @ 50% | 9,00,000 | 8,00,000 | 9,00,000 |
| EAT | 9,00,000 | 8,00,000 | 9,00,000 |
| **Less:** Preference Dividend | 0 | 0 | 2,00,000 |
| EAESH | 9,00,000 | 8,00,000 | 7,00,000 |
| No of Equity Shares | 2,00,000 | 1,00,000 | 1,00,000 |
| EPS | 4.5/- | 8/- | 7/- |
| EBIT for Financial Break Even Point $\left[\text{Int} + \frac{\text{P.D}}{1-\text{Tax}}\right]$ | 0 | 2,00,000 | 4,00,000 $\left(\frac{2,00,000}{0.5}\right)$ |

**a)** Indifference Point between plan P & plan Q

$$\frac{(x-0)(1-0.5)-0}{2,00,000} = \frac{(x-2L)(1-0.5)-0}{1,00,000}$$

2 [(x-2L) 0.5] = 0.5 x

2 [0.5x - 1L] = 0.5 x

1.0 x - 2L = 0.5 x

0.5 x = 2L

X = 4,00,000

**b)** Indifference Point between plan Q & plan R

$$\frac{(x-2L)(1-0.5)-0}{1,00,000} = \frac{(x-0L)(1-0.5)-2L}{1,00,000}$$

(x - 2,00,000) 0.5 = 0.5x - 2,00,000

0.5x - 1,00,000 = 0.5x - 2,00,000

There is no indifference point between plan Q & R



**c)** I.D.P between plan P & plan R

$$\frac{(x-0)(1-0.5)-0}{2,00,000} = \frac{(x-0)(1-0.5)-2L}{1,00,000}$$

$$\frac{0.5x}{2,00,000} = \frac{0.5x-2,00,000}{100000}$$

$$X = \frac{2,00,000}{0.25} = \text{Rs.}8,00,000$$

**Analysis:** It can be seen that financial plan Q dominates Plan R, since the financial BEP of former is only Rs.2,00,000 but in case of latter it is Rs.4,00,000

## PROBLEM NO: 9

**a)** Calculation of indifference level

Let that level of EBIT be X

| Particulars | Plan I | Plan II |
|---|---|---|
| **A.** EBIT | X | X |
| **B. Less:** Interest | 4.00 | 5.20 |
| **C.** EBT [A - B] | X - 4.00 | X - 5.20 |
| **D. Less:** Tax @ 50% | 0.5 (X - 4.00) | 0.5 ( X - 5.20) |
| **E.** EAT [C - D] | 0.5 X - 2.00 | 0.5 X - 2.60 |
| **F.** No. of equity shares | 6.40 | 6.00 |

Equating EPS under both the plans to find indifference point.

$$\frac{0.5X - 2.00}{6.40} = \frac{0.5X - 2.60}{6.00}$$

6.00 (0.5 x - 2.00) = 6.40 (0.5 X - 2.60)

3.00 x - 12.00 = 3.20 x - 16.64

3.00 x - 3.20 x = - 16.64 + 12.00

- 0.20 x = - 4.64

X = 4.64/0.20 = 23.20

Thus, indifference level of EBIT = Rs. 23,20,000

**b)** Calculation of financial BEP

Equality EPS under each plan equal to zero.

Financial BEP under plan I = $\frac{0.5X - 2.00}{6.40} = 0$

0.5 X - 2.00 = 0

X = 2.00/0.5 = 4.00

Thus Financial BEP under Plan I = Rs.4,00,000

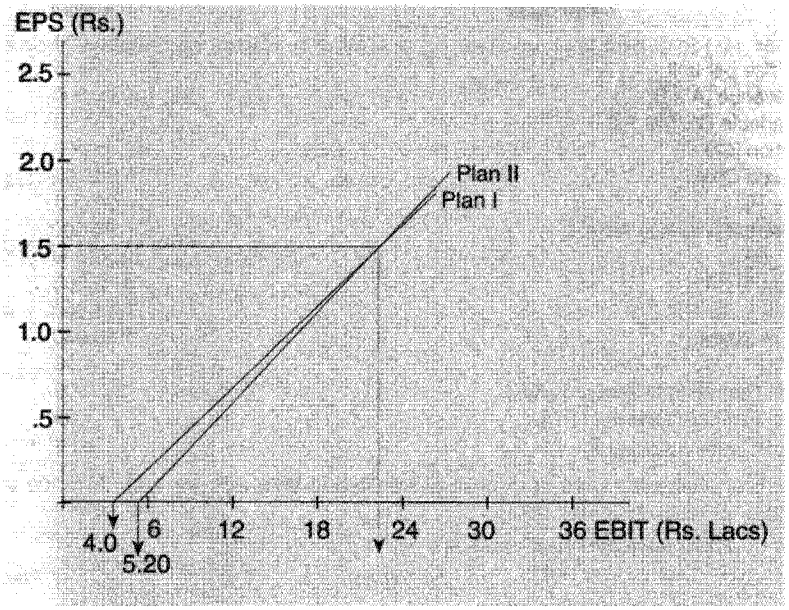
Financial BEP under plan II = $\frac{0.5X - 2.60}{6.00} = 0$

= 0.5X - 2.60 = 0

X = 2.60/0.5 = 5.20

Thus Financial BEP under Plan II = Rs.5,20,000

**c)** Graphical representation of EBIT - EPS, indifference point and financial Break-even levels




To the right of the indifference point Plan II is better, while Plan I is better for all values of EBIT below the indifference point. The horizontal intercepts identify the financial break-even levels of EBIT for each plan.

**d)** Choice of financial plan

$$\text{EPS (Plan I)} = \left(\frac{\text{Rs. } 34,00,000 - \text{Rs. } 4,00,000(1 - 0.5)}{6,40,000 \text{ Shares}}\right) = \text{Rs. } 2.34 \text{ per share}$$

$$\text{EPS (Plan II)} = \left(\frac{\text{Rs. } 3,40,000 - 4,00,000 - 1,20,000\,(1 - 0.5)}{6,00,000 \text{ Shares}}\right) = \text{Rs. } 2.40 \text{ per share}$$

In the absence of P/E ratio, choice of financial plan is to be made on the basis of EPS. Hence, plan II is better since EPS under plan II is greater than that under Plan I.

## PROBLEM NO: 10

**Working Note I: Estimation of EAESH**

| Particulars | Amount (Rs.) |
|---|---|
| **a)** EBIT | 5,00,000 |
| **b)** Interest | (2,00,000) |
| **c)** EBT | 3,00,000 |

**PART - A**

**a) Estimation of Market Value of Equity:**

$$\text{Market Value of Equity} = \frac{EAESH}{k_e} = \frac{3,00,000}{16\%} = \text{Rs. } 18,75,000$$

**b)** Market value of Firm = Market Value of Equity + Market Value of Debt

= Rs. 18,75,000 + Rs. 20,00,000 = Rs. 38,75,000

**PART - B**

**Estimation of $k_o$:**

$$K_o = \frac{EBIT}{\text{Market Value of Firm}} = \frac{\text{Rs. } 5,00,000}{\text{Rs. } 38,75,000} \times 100 = 12.9\% \text{ or } 13\%$$

## PROBLEM NO: 11

**i)** Market value of Debt (25,000 x 150) = 37,50,000

**ii)** Market value of equity $= \frac{EAESH}{ke} = \frac{20,00,000 - 5,25,000}{16\%} = 92,18,750$

**iii)** Market value of Firm [M.V of debt + M.V of equity] = 1,29,68,750 (92,18,750 + 37,50,000)

**iv)** Overall COC $(K_o) = \frac{EBIT}{\text{Market Value of Firm}} = \frac{20,00,000}{1,29,68,750} = 15.42\%$



## PROBLEM NO: 12

| WN 1: Estimation of EAESH | | WN 2: Calculation of Market Value of Firm | |
|---|---|---|---|
| **Particulars** | **Amount (Rs.)** | **Particulars** | **Amount (Rs.)** |
| **a)** EBIT | 5,00,000 | Market value of Firm $= \frac{EBIT}{k_o}$ | $= \frac{\text{Rs. } 5,00,000}{0.15}$ |
| **b) Less:** Interest | (1,50,000) | | = Rs. 33,33,333 |
| **EAESH** | 3,50,000 | | |

**WN 3: Estimation of Market Value of Equity:**

Market value of Equity = Market Value of Firm - Market Value of Debt

= Rs. 33,33,333 - Rs. 15,00,000 = Rs. 18,33,333

Calculation of $k_e$: $\frac{EAESH}{\text{Market Value of Equity}} = \frac{\text{Rs. } 3,50,000}{\text{Rs. } 18,33,333} \times 100 = 19.09\%$

## PROBLEM NO: 13

Given Information, EBIT = Rs. 12,00,000; $k_d$ = 15%

**Alternative 1:** Since Capital Structure has 100% Equity

$K_e = k_o = 24\%$

Market Value of Firm = Market Value of Equity

EBIT = EAESH = 12,00,000

$$\text{Estimation of } k_o, k_e = \frac{EAESH}{\text{Market Value of Firm}} = \frac{\text{Rs. } 12,00,000}{\text{Rs. } 50,00,000} = 24\%$$

**Alternative 2:** Market Value of Equity = Rs. 25,00,000

Market Value of debt = Rs. 25,00,000

Market Value of Firm = Market Value of Equity + Market Value of Debt

= Rs. 25,00,000 + Rs. 25,00,000 = Rs. 50,00,000

$$K_o = \frac{EBIT}{Market\ Value\ of\ Firm} = 24\%$$

$$k_e = \frac{EAESH}{Market\ Value\ of\ Equity} = \frac{Rs.12,00,000 - Rs.3,75,000}{Rs.25,00,000} \times 100 = 33\%$$

**Verification:** $k_o = 33\% \left(\frac{25,00,000}{50,00,000}\right) + 15\% \left(\frac{25,00,000}{50,00,000}\right) = 24\%$

**Alternative 3:** Market Value of Debt = Rs. 37,50,000 ⟶ (1)

Market Value of Equity = Rs. 12,50,000 ⟶ (2)

Market Value of Firm = (1) + (2) = Rs. 50,00,000

$$K_o = \frac{EBIT}{Market\ Value\ of\ Firm} = \frac{Rs.12,00,000}{Rs.50,00,000} = 24\%$$

$$K_e = \frac{EAESH}{Market\ Value\ of\ Equity} = \frac{Rs.12,00,000 - Rs.5,62,500}{Rs.12,50,000} = 51\%$$

**Verification:** $k_o = 51\% \left(\frac{12,50,000}{50,00,000}\right) + 15\% \left(\frac{37,50,000}{50,00,000}\right) = 24\%$

**Note:** under NOI approach every capital structure is an optimum capital structure.



## PROBLEM NO: 14

| Company X | (Rs.) |
|---|---|
| Equity share capital | 6,00,000 |
| 10% Debentures | 9,00,000 |
| Total assets | 15,00,000 |
| EBIT (20% on total assets) | 3,00,000 |
| Tax Rate | 50% |

| Company Y | (Rs.) |
|---|---|
| Equity share capital | 15,00,000 |
| Total assets | 15,00,000 |
| EBIT | 3,00,000 |
| Tax Rate (20% on total assets) | 50% |
| Capitalization rate | 15% |

**i)** Value of Both companies under Net Income Approach (NI)

| Company X (geared company) | (Rs.) |
|---|---|
| EBIT (20% of total assets) | 3,00,000 |
| **Less:** Interest on debentures | 90,000 |
| EBT | 2,10,000 |
| **Less:** Tax @ 50% | 1,05,000 |
| Earnings available to equity shareholders | 1,05,000 |
| Equity capitalization rate (1,05,000/0.15) | 15% |
| Market value of equity (S) | 7,00,000 |
| Market value of debt (B) | 9,00,000 |
| Market value of firm V = (S+B) | 16,00,000 |

| Company Y (Ungeared company) | (Rs.) |
|---|---|
| EBIT (20% of total assets) | 3,00,000 |
| **Less:** Tax @ 50% | 1,50,000 |
| Earnings available to equity shareholders | 1,50,000 |
| Equity capitalization rate | 15% |
| Market value of equity (S) (1,50,000/0.15) | 10,00,000 |
| Market value of firm (V = S) | 10,00,000 |

**ii)** Value of both companies under Net operating income approach (NOI)

**Company X:**

Value of equity $= \frac{EBIT\ (1-T)}{K_e} = \frac{3,00,000\ (1-0.50)}{0.15}$ = Rs. 10,00,000

Value of debt = 9,00,000 x 0.50 = Rs. 4,50,000

Value of firm = 10,00,000 + 4,50,000 = Rs. 14,50,000

**Company Y:**

Value of equity $= \frac{EBIT\ (1-T)}{K_e} = \frac{3,00,000\ (1-0.50)}{0.15}$ = Rs. 10,00,000

Value of firm = value of equity = Rs. 10,00,000

**iii)** Calculation of overall cost of capital of both companies under Net operating income approach (NOI)

**Company X:**

$K_e = \frac{\text{Earnings available to equity shareholders}}{\text{Market value of equity}}$

Market value of equity = Market value of firm = Market value debentures

= 14,50,000 - 9,00,000 = Rs. 5,50,000

$K_e = \frac{1,05,000}{5,50,000} \times 100$ = 19.09%

$K_d$ = 10% (1 - 0.5)

Overall cost of capital $(K_o)$

$K_o = 5\%\left(\frac{9,00,000}{14,50,000}\right) + 19.09\%\left(\frac{5,50,000}{14,50,000}\right)$

= (0.05 x 0.60) + (0.1909 x 0.38) = 10.3%

**Company Y:**

Overall cost of capital $(K_o)$ = 15%



## PROBLEM NO: 15

Evaluation of different capital structures given in the problem:

| % of debt | % of equity | Cost of debt($K_i$) | Cost of equity($K_e$) | WACC ($K_o$) |
|---|---|---|---|---|
| 0% | 100% | 6% | 11.5% | 11.5% |
| 10% | 90% | 6% | 12% | 6*10%+12*90%=11.4% |
| 20% | 80% | 6% | 12% | 6*20%+12*80%=10.8% |
| 30% | 70% | 6.5% | 13% | 6.5*30%+13*70%=11.05% |
| 40% | 60% | 7% | 15% | 7*40%+15*60%=11.8% |
| 50% | 50% | 7.5% | 17% | 12.25% |
| 60% | 40% | 8% | 20% | 12.8% |

**Decision:** since the WACC is minimum 20% of debt and 80% equity represents optimum capital structure

## PROBLEM NO: 16

**Calculation of M.V of Firm & $K_o$**

| Particulars | Existing | Prop I | Prop II |
|---|---|---|---|
| **i)** M.V of Debt | 0 | 6,00,000 | 10,00,000 |
| **ii)** M.V of Equity | 18,75,000 $\left[\frac{3L}{16\%}\right]$ | 14,11,764 $\left[\frac{3L-0.6L}{17\%}\right]$ | 9,00,000 $\left[\frac{3L-1.2L}{20\%}\right]$ |
| **iii)** M.V of Firm (i + ii) | 18,75,000 | 20,11,764 | 19,00,000 |
| **iv)** Over all COC ($K_0$) | 16% $\left[\frac{18.75L}{18.75L}x16\%+0\right]$ | 14.91% $\left[\frac{6L}{2011764}(10\%)+\frac{1411764}{2011764}(17\%)\right]$ | 15.78% $\left[\frac{10L}{19L}(12\%)+\frac{9L}{19L}(20\%)\right]$ |

## PROBLEM NO: 17

Value of unlevered firm $V_n$ = EBIT (1-t) / $K_e$ = Rs. 2,00,000 (1-0.35) / 0.2 = Rs. 6,50,000

Value of levered firm $V_L = V_u + B_t$ = Rs. 6,50,000 + [Rs. 6,00,000 (0.35)] = Rs.8,60,000

$K_o$ of un levered firm = 0.20 ($K_e = K_o$)

$K_o$ of levered firm

| | |
|---|---|
| EBIT | Rs. 2,00,000 |
| **Less:** Interest | 90,000 |
| | 1,10,000 |
| Net Income after interest | 38,500 |
| | 71,500 |
| NI for equity holders | 8,60,000 |
| Total Market value (V) | 6,00,000 |
| Market value of debt (V-B) | 2,60,000 |
| $K_e$ = (NI ÷ S) = Rs. 71,500/Rs.2,60,000 | 0.275 |

$K_o = K_i (B/V) + K_e (B/V)$ = 0.0975 (Rs. 6,00,000/Rs.8,60,000) + 0.275 (Rs. 2,60,000/Rs.8,60,000) = 15.11%



## PROBLEM NO: 18

**a) Return to investor and Implied required rate of return:**

| | |
|---|---|
| EBIT | 6,00,000 |
| **Less:** Interest | - |
| EBT / EAESH | 6,00,000 |

If investor owns 3% of stock of Gamma Ltd., he would get Rs. 18,000 (Rs. 6,00,000 x 3%)

**Implied Rate of Return:**

Since, there is no debt, overall cost of capital ($K_O$) = Cost of equity ($K_e$) = 20%

**b) i) Implied required equity return of Delta Ltd.:**

Since these firms are in No tax world, Market Value of Gamma = Market Value of Delta

Market value of Gamma = Market value of Equity (since there is no debt)

$$= \frac{\text{Earnings available to Equity Shareholders}}{K_O} = \frac{\text{Rs. 6,00,000}}{20\%} = 30,00,000$$

**Market value of Delta = 30,00,000**

| | |
|---|---|
| EBIT | 6,00,000 |
| **Less:** Interest on Debt (12,00,000 x 10%) | (1,20,000) |
| EAESH | 4,80,000 |
| Market Value of Equity (30,00,000 x 60%) | 18,00,000 |

$$K_e = \frac{\text{Earnings available to Equity Shareholders}}{K_O} = 26.67\%$$

**ii)** Cost of Equity increases linearly as a function of its Debt - Equity Ratio. Therefore, Cost of Equity of Levered Firm (Delta) is always greater than Cost of Unlevered firm (Gamma Ltd.) Since, the shareholders of Delta Ltd. expects more return from Gamma Ltd.

**Working Note:**

Gamma Ltd.: $K_e = K_o + (K_o - K_d)$ (Debt/Equity) = 20% + 0 = 20%

Delta Ltd.: $K_e = K_o + (K_o - K_d)$ (Debt/Equity) = 20% + (20% - 10%) (40/60) = 20% + 6.67% = 26.67%

## PROBLEM NO: 19

Here we are assuming that MM Approach 1958: without tax. Where capital structure has no relevance with the value of company and accordingly overall cost of capital of both levered as well as unlevered company is same. Therefore, the two companies should have similar WACC's. Because Samsui Limited is all equity financed, its WACC is the same as its cost of equity finance, i.e. 16 percent. It follows that Sanghmani Limited should have WACC equal to 16 percent also.

Therefore, Cost of equity in Sanghmani Ltd. (levered company) will be calculated as follows:

$K_o = \frac{2}{3} \times k_e + \frac{1}{3} \times k_d$ = 16% (i.e. equal to WACC of Samsui Ltd.0

Or, $16\% = \frac{2}{3} \times k_e + \frac{1}{3} \times 10\%$ Or, $k_e$ = 19%

## PROBLEM NO: 20

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

Market Value of 'A Ltd' (Unlevered) $V_u = \frac{EBIT(1-t)}{K_e} = \frac{Rs.2,50,000(1-0.30)}{20\%} = \frac{Rs.1,75,000}{20\%} = Rs.8,75,000$

Market Value of 'B Ltd.' (Levered)

$V_g = V_u + TB$

= Rs. 8,75,000 + (Rs. 10,00,000 × 0.30)

= Rs. 8,75,000 + Rs. 3,00,000 = Rs.11,75,000



**ii) Computation of Weighted Average Cost of Capital (WACC)**

WACC of 'A Ltd.' = 20% (i.e. $K_e = K_o$)

**WACC of 'B Ltd.'**

| | B Ltd. (Rs.) |
|---|---|
| EBIT | 2,50,000 |
| Interest to Debt holders | (1,20,000) |
| EBT | 1,30,000 |
| Taxes @ 30% | (39,000) |
| Income available to Equity Shareholders | 91,000 |
| Total Value of Firm | 11,75,000 |
| **Less:** Market Value of Debt | (10,00,000) |
| Market Value of Equity | 1,75,000 |
| Return on equity ($K_e$) = 91,000 / 1,75,000 | 0.52 |

**Computation of WACC B. Ltd**

| Component of Capital | Amount | Weight | Cost of Capital | WACC |
|---|---|---|---|---|
| Equity | 1,75,000 | 0.149 | 0.52 | 0.0775 |
| Debt | 10,00,000 | 0.851 | 0.084* | 0.0715 |
| Total | 11,75,000 | | | 0.1490 |

*$K_d$ = 12% (1- 0.3) = 12% × 0.7 = 8.4%

WACC = 14.90%

## PROBLEM NO: 21

**Statement of calculation of earnings available to equity holders and debt holders**

| Particulars | Company | |
|---|---|---|
| | A | B |
| Net operating income | 15,00,000 | 15,00,000 |
| **Less:** Interest on Debt (11% of Rs.7,00,000) (i) | - | 77,000 |
| Profit before taxes | 15,00,000 | 14,23,000 |
| **Less:** Tax @ 25% | 3,75,000 | 3,55,750 |
| Profit after tax/Earnings available in equity holders (ii) | 11,25,000 | 10,67,250 |
| Total earnings available to equity holders + Debt holders [(i) + (ii)] | 11,25,000 | 11,44,250 |

As we can see that the earnings in case of Company B is more than the earnings of Company A because of tax shield available to shareholders of Company B due to the presence of debt structure in Company B. The interest is deducted from EBIT without tax deduction at the corporate level; equity holders also get their income after tax deduction due to which income of both the investors increase to the extent of tax saving on the interest paid i.e. tax shield i.e. 25% × 77,000 = 19,250 i.e. difference in the income of two companies' earnings i.e. 11,44,250 - 11,25,000 = Rs. 19,250.

## PROBLEM NO: 22

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

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

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 lakhs) | Cost of Capital (%) | Weight | WACC (%) |
|---|---|---|---|---|
| Equity | 1,000 | 20.7 | 83.33 | 17.25 |
| Debt | 200 | (15% x 0.7) =10.5 | 16.67 | 1.75 |
| | 1,200 | | | 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

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

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

So, Cost of capital = 0.19 or 19%

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

Where,

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

$K_d$ = Cost of debt

t = Tax rate

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

$K_e$ = 0.20 + 0.007 = 0.207 or 20.7%

So, Cost of Equity = 20.70%

## PROBLEM NO: 23

### SHIFTING FROM LEVERED COMPANY Y TO UNLEVERED COMPANY X

**Step-1:** Calculation of Earnings of the investors in company Y.

**Profit Statement**

| Particulars | Amount (Rs.) |
|---|---|
| EBIT | 1,50,000 |
| **Less:** Interest | 60,000 |
| **EAESH** | 90,000 |

Investors percentage of holding of shares in Company Y = 5%

Earnings in company Y = 90,000 x 5% = Rs.4,500

**Step- 2:** Arbitrage

| Particulars | Amount |
|---|---|
| Net Sale Proceeds on sale of shares in Company Y (4,50,000 x 5%) | 22,500 |
| **Add:** Personal Loan to be taken @ 10% (6,00,000 x 5%) | 30,000 |
| | **52,500** |
| **Less:** Amount required to purchase 5% shares in Company X | 50,000 |
| **Surplus Funds** | **2,500** |

Through the process of arbitrage the investor can reduce his investment to the extent of Rs.2,500

**Step-3:** Earnings in Company X

| Particulars | Amount |
|---|---|
| Total amount of earnings in Company 'X' (EAESH) | 1,50,000 |
| Earnings of the investor holding 5% shares (1,50,000 x 5%) | 7,500 |
| **Less:** Interest on Personal Loan (30,000 x 10%) | 3,000 |
| | **4,500** |

The market values of two firms with similar risk class must be equal. In the given case market value of the Company Y is more than that of Company X. So there is scope for Arbitrage.

Some investors of Company Y will sell their holding and will shift to Company X. Eventually the market value of Company Y will decrease and market value of Company X will increase. After reaching equilibrium stage then there will not be any scope for arbitrage.

## PROBLEM NO: 24

| Particulars | Firms | |
|---|---|---|
| | N | M |
| NOI/EBIT | Rs.20,000 | Rs.20,000 |
| Debt | - | Rs.1,00,000 |
| Ke | 10% | 11.50% |
| Kd | - | 7% |

Value of equity (S) $= \frac{NOI - interest}{cost\ of\ equity}$

$s_n = \frac{20,000}{10\%}$ =Rs.2,00,000, $s_m = \frac{20,000 - 7,000}{11.50\%}$ = Rs.1,13,043

$V_n$ = Rs.2,00,000

$V_m$ = 1,13,043 + 1,00,000 {V = S + D} = Rs.2,13,043

Assume you have 10% share of levered company. i.e. M. Therefore, investment in 10% of equity of levered company = 10% × 1,13,043 = Rs.11,304.3

Return will be 10% of (20,000 - 7,000) = Rs.1,300.

**Alternate Strategy will be:**

Sell your 10% share of levered firm for Rs. 11,304.3 and borrow 10% of levered firms debt i.e.10% of Rs.1,00,000 and invest the money i.e. 10% in unlevered firms stock:

Total resources /Money we have = 11,304.3 + 10,000 = 21,304.3 and you invest 10% of 2,00,000 = Rs. 20,000

Surplus cash available with you is = 21,304.3 - 20,000 = Rs. 1,304.3

Your return = 10% EBIT of unlevered firm - Interest to be paid on borrowed funds

i.e. = 10% of Rs. 20,000 - 7% of Rs. 10,000 = 2,000 - 700 = Rs. 1,300

i.e. your return is same i.e. Rs. 1,300 which you are getting from 'N' company before investing in 'M' company. But still you have Rs. 1,304.3 excess money available with you. Hence, you are better off by doing arbitrage.



## PROBLEM NO: 25

Given Market Value of Firm A = Rs. 400 lakhs and Market Value of Firm B =Rs. 320 lakhs

Since, there is a variation in the Market Value, Both firms are not in equilibrium. But it may become equilibrium in the process called Arbitrage.

**Arbitrage Process:**

Let us assume that investor in "A" holds 10% holdings.

**Step I:** Estimation of EAESH

EBIT = EAESH = Rs.100 lakhs

% of Holdings = 10%

Net Earnings = Rs.100 lakhs x 10% = Rs.10 lakhs

**Step II:** Arbitrage Process

1. NSP of company A (Rs. 400 lakhs x 10%) = Rs. 40 lakhs
2. Investment Pattern & Percentage of holding in company B:

   As per debt equity Mix = 5:3

| Investment | Amount (Rs.) | % of Holdings |
|---|---|---|
| **a)** Equity | Rs. 40 lakhs x 3/8 = Rs. 15 lakhs | 12.5% |
| **b)** Debt | Rs. 40 lakhs x 5/8 = Rs. 25 lakhs | 12.5% |

**Step III:** Net Equity in Company B

**Income Statement**

| Per Share | A (Rs.) |
|---|---|
| **a)** EBIT | 100 lakhs |
| **b)** Interest | 30 lakhs |
| **c)** EAESH (a - b) | 70 lakhs |

**Net Earnings**

| | | |
|---|---|---|
| **a)** Equity | 70 lakhs x 12.5% | 8.75 lakhs |
| **b)** Debt | 30 lakhs x 12.5% | 3.75 lakhs |
| | | 12.5 lakhs |

An investor can increase his earnings by Rs. 12.5 lakhs in the process of arbitrage. So, arbitrage practically takes place with all effect. MV of firm B increases where as MV of firm A decreases. So that at a particular stage both the firms will become equilibrium.

Estimation of $K_e$ in company B:

It is given that in company A, if $K_e$ is 27.78%, both firms are equilibrium (MV are same).

**a)** Market Value of Company A (100% Equity): $\frac{EAESH}{K_e} = \frac{100}{27.78\%}$ = Rs.360 lakhs

**b)** Then, Market Value of Company B is Rs.360 lakhs

**i)** Market Value of Equity = Market Value of Firm - Market Value of Debt

= Rs.360 lakhs - Rs. 200 lakhs = Rs. 160 lakhs

**ii)** Cost of Equity = $\frac{EAESH}{\text{Market Value of Equity}} = \frac{\text{Rs. 100 lakhs} - (\text{Rs.200 lakhs x 15\%})}{\text{Rs.160 lakhs}}$ = 43.75%



**THE END**