3. COST OF CAPITAL

ASSIGNMENT SOLUTIONS

PROBLEM NO: 1

Estimation of Cost of Debt in each of the cases:

Particulars	CASE-A	CASE-B	CASE-C	CASE-D
	Par	Par	10% premium	10% Discount
a) Interest (1- tax)	10.5	10.5	10.5	10.5
b) Net Proceeds	100	95	104.5	85.5
c) Cost of debt= interest (1-tax)/NP	10.5%	11.05%	10.05%	12.28%

* Net proceeds (NP) = (Face Value + Premium/ - Discount - Floatation Cost)

PROBLEM NO: 2

Cost of redeemable debentures:-

Particulars	CASE-A	CASE-B	CASE-C
	At Par	At Premium	At Discount
A. Interest (1 -Tax)	7.20	7.20	7.20
B. Net Proceeds	95	104.5	90.25
	(100 - (5% of 100))	(100 + (100 x 10%)) - 110 x 5%	(100 - (100 x 5%)) - 95 x 5%
Cost of debt (k_d) $K_d = \frac{Interest(1-t)+\frac{RV-NP}{n}}{\frac{RV+NP}{2}}$	$\frac{12(1-0.4)+\frac{100-95}{10}}{\frac{100+95}{2}}$x100 = 7.89%	$\frac{12(1-0.4)+\frac{100-104.5}{10}}{\frac{100+104.5}{2}}$ = 6.66%	$\frac{12(1-0.4)+\frac{100-90.25}{10}}{\frac{100-90.25}{2}}$ = 8.59%

PROBLEM NO: 3

a) Market Price = $\frac{100 \text{ x } 15\%}{12\%} = \frac{15}{0.12} = 125$

b) Market Price if debenture rises to 18% = $\frac{100 \text{ x } 18\%}{12\%} = 150$

Market Price if debenture drops to 12% = $\frac{100 \text{ x } 12\%}{12\%} = 100$

c) Estimation of market value of Debentures:

Years	Particulars	Cash Flows	PVF @ 10%	P.V. of Cash Flows
Y_1 - Y_5	Interest	12	3.79	45.48
Y_5	Net sale Proceeds	100	0.621	62.1
Market Value				104.58

d) Yes, it is advisable to purchase debentures at a price of Rs. 90 Since its market price is Rs.104.58

PROBLEM NO: 4

Calculation of Post tax cost of debentures

Step-1: Identification of cash flows in different years

Year	Repayment		Total	Tax Shield on interest @ 50%	Post Tax Net cash Outflows
	Principal	Interest			
1	200	150	350	75	275
2	200	120	320	60	260
3	200	90	290	45	245

4	200	60	260	30	230
5	200	30	230	15	215

Net sale proceeds on issue of each debenture = 1,000-100 = Rs.900

Step-2: Calculation of Post Tax cost of debenture

Year	Cash flow	NPV @ 10%		NPV @ 12%	
		PVF	Present Value	PVF	Present Value
0	900	1	900	1	900
1	275	0.909	(249.98)	0.893	(245.58)
2	260	0.826	(214.76)	0.797	(207.22)
3	245	0.751	(183.90)	0.712	(174.44)
4	230	0.683	(157.09)	0.636	(146.28)
5	215	0.621	(133.52)	0.567	(121.91)
			(39.34)		**4.58**

Using Interpolation,

$$IRR = I_1 + \frac{NPV@I_1}{NPV@I_2 - NPV@I_1} x (I_2 - I_1) = 10 + \frac{39.34}{4.58 + 39.34} \text{ x } (12 - 10)$$

IRR = 11.79%

PROBLEM NO: 5

a) Equated annual instalment = $\frac{\text{Rs. 100 lakhs}}{\text{PV of Annuity of Re. 1 for 5 years @ 12\%}} = \frac{100}{3.605}$ = Rs. 27.74 lakh

Statement showing the payment of principal and interest

Year A	Debentures at year beginning B	Interest C = B x Rate	Instalment D	Principal E = D-C	Debentures at year end F = B+C-D	Tax saving on interest G = C x 40%	Cash outflow H = D - G
1	100.00	12.00	27.74	15.74	84.26	4.80	22.94
2	84.26	10.11	27.74	17.63	66.63	4.04	23.70
3	66.63	8.00	27.74	19.74	46.89	3.20	24.54
4	46.89	5.63	27.74	22.11	24.78	2.25	25.49
5	24.78	2.96	27.74	24.78	-	1.18	26.56

Instead of interest of Rs. 2.9736, it has been taken at 2.96 so as bring the figure of Debentures at year end to nil. The need for this adjustment has arisen because of use of approximation in equated annual instalment.

Calculation of PV at 11% and 12%

Year A	Outflow B	PV Factor @ 11% C	PV Factor @ 12% D	PV @ 11% E = B x C	PV @ 12% F = B x D
1	22.94	0.901	0.893	20.669	20.485
2	23.70	0.812	0.797	19.244	18.889
3	24.54	0.731	0.712	17.939	17.472
4	25.49	0.659	0.636	16.798	16.212
5	26.56	0.593	0.567	15.750	15.060
			Total	**90.400**	**88.118**

$$K_d = R_L + \frac{NPV_L}{NPV_L - NPV_H} \text{ x } R_H - R_L$$

K_d = 11% + $\frac{0.400}{0.400-(-1.882)}$ x (12% - 11%)

K_d = 11.175%

PROBLEM NO: 6

In the given case, the convertible debentures are being traded at Rs. 140 per debenture. The company has to pay interest of Rs.11 per debenture for 5 years and thereafter it will be the converted into 5 equity shares. The market price of equity share is growing @ 5% p.a. So, the price of equity share after 5 years would be:

P_1 = Rs. 22 x $(1 + 0.05)^5$ = Rs. 28.08

So the redemption value of debenture shall be 28.08 x 5 = Rs.140.4

$$\text{Cost of debt} = \frac{\text{Interest}(1-t)+\frac{RV-NP}{n}}{\frac{RV+NP}{2}} = \frac{11(1-0.3)+\frac{140.4-140}{5}}{\frac{140.4+140}{2}} \text{x}100 = 5.54\%$$

PROBLEM NO: 7

Given information,

Face value = 100

Coupon rate = 14%

Floatation cost = 5%

Estimation of Cost of Debt in each of the cases:

Particulars	CASE-A	CASE-B	CASE-C
	Par	10% premium	5% Discount
a) Net Proceeds (Face Value + Premium /- Discount - Floatation Cost)	95	104.5	90.25
b) Cost of preference shares (%)	14.73% $\left(\frac{14}{95}\times 100\right)$	13.39% $\left(\frac{14}{104.5}\times 100\right)$	15.51% $\left(\frac{14}{90.25}\times 100\right)$

PROBLEM NO: 8

Given information,

Face Value = 100

Coupon rate = 15%

Floatation Cost = 4%

Net Proceeds (Redeemable Value)

= Face value - Floatation Cost = 100 - 4 = 96

Redeemable Period = 10 years

Assumption: Face Value = Redeemable Value

Using Shortcut Method;

$$K_p = \frac{\text{Preference dividend}+\left(\frac{\text{Redeemable Value}-\text{Net Proceeds}}{\text{Redeemable Period}}\right)}{\left(\frac{RV+NP}{2}\right)}\text{x}100 = \frac{15+\left(\frac{100-96}{10}\right)}{\left(\frac{100+96}{2}\right)} \text{x } 100$$

=15.71%

PROBLEM NO: 9

Calculation of Cash Outflows (Including Dividend Tax)

Rs in Lakhs

Year	Principal Repayment Amount (Rs.) (2)	Preference Dividend including DDT PD(1+DDT) Amount (Rs.) (3)	Cash Outflow (2+3) Amount (Rs.)
1	20	14.4	34.40
2	20	11.52	31.52
3	20	8.64	28.64
4	20	5.76	25.76
5	20	2.88	22.88

Since Principal amount is repaid in installments, we can't use shortcut method so use IRR

Calculation of present values at 19% and 20%

Year A	Outflow B	PV Factor @ 19% C	PV Factor @ 20% D	PV Factor @19% E = B x C	PV Factor @20% F = B x D
0	Inflow			90	90
1	34.40	0.840	0.833	(28.896)	(28.655)
2	31.52	0.706	0.694	(22.253)	(21.875)
3	28.64	0.593	0.579	(16.984)	(16.583)
4	25.76	0.499	0.482	(12.854)	(12.416)
5	22.88	0.419	0.402	(9.587)	(9.198)
	NPV_L			**(0.574)**	
	NPV_H				**1.273**

$$K_p = R_L + \frac{NPV_L}{NPV_L - NPV_H} x\left(R_H - R_L\right)$$

$$K_p = 19\% + \frac{0.574}{0.574-(-1.273)} x\left(20\% - 19\%\right)$$

K_p = 19.31%

PROBLEM NO: 10

a) Given, Dividend at the end of 1st year (DPS_1) = Rs.12

Cost of equity share capital (K_e) = 10%

Given that, the company is expected to pay the same dividend of Rs.12 forever.

Therefore, growth rate = 0

We know that, $K_e = \frac{DPS_1}{MP_0}$, $MP_0 = \frac{DPS_1}{k_e} = \frac{12}{0.1}$ = Rs.120

PROBLEM NO: 11

Given information,

K_e= 15%

$D_1 = D_0(1+g)$

P_0 =?

D_0=10

(i) Growth rate = 10%	ii) Growth rate = 3%	iii) Growth rate = -10%	iii) Growth rate = 14%
Cost of Equity (K_e) = $\frac{D_1}{P_0}+g$	Cost of Equity (K_e) = $\frac{D_1}{P_0}+g$	Cost of Equity (K_e) = $\frac{D_1}{P_0}+g$	Cost of Equity (K_e) = $\frac{D_1}{P_0}+g$
$k_e = \frac{10(1+0.1)}{P}+10\%$	$k_e = \frac{10(1+0.03)}{P}+3\%$	$k_e = \frac{10(1-0.1)}{P}-10\%$	$k_e = \frac{10(1+0.14)}{P}+14\%$
15%= 11/P+10%	15%= 10.3/P+3%	15%= 9/P-10%	15%= 11.4/P+14%
$P = \frac{11}{5}*100 = 220$	$P = \frac{10.3}{12}*100 = 85.833$	$P = \frac{9}{25}*100 = 36$	$P = \frac{11.4}{1}*100 = 1140$

PROBLEM NO: 12

Calculation of dividend growth rate:

During the last 5 years (Years 2000 is ignored since the dividend of 2000 is compared with the dividend of 2005), the dividend has increased from Rs. 1.05 to 1.34

Compound Factor= $\frac{Rs.1.34}{Rs.1.05}$ = 1.2762

By looking into compound value of Rs.1 (compound table given at the end of the book) the sum of Rs. 1 would accumulate to Rs. 1.2762 in five years is 5%. Therefore, the dividend growth rate is 5%

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

D_1 = Expected dividend of current year (2005) i.e., Rs. 140

NP = Net proceeds i.e., Rs. 40- Rs. 0.50= Rs. 39.5

g = 5% or 0.05

$K_e = \frac{1.40}{39.50}$ +0.05= 8.54%

PROBLEM NO: 13

i) According to Dividend Discount Model Approach the firm's expected or required return on equity is computed as follows:

$K_e = \frac{D_1}{p_0} + g$

D_1 = 3.36

P_o = 146

G = 7.5%

Therefore, $K_e = \frac{3.36}{1.46} + 7.5\%$ = 0.0230 + 0.075= 0.098 Or, K_e=9.80%

ii) With rate of return on retained earnings (r) 10% and retention ratio (b) 60%, new growth rate will be as follows:

g = br i.e. = 0.10 x 0.60 = 0.06

Accordingly dividend will also get changed and to calculate this, first we shall calculate previous retention ration (b_1) and then EPS assuming that rate of return on retained earnings (r) is same.

With previous Growth Rate of 7.5% and r = 10% the retention ratio comes out to be:

0.075 = b_1 x 0.01

b_1 = 0.75 and payout ratio = 0.25

With 0.25 payout ratio the EPS will be as follows: $\frac{3.36}{0.25} = 13.44$

With new 0.40 (1 - 0.60) payout ratio the new dividend will be D_1 = 13.44 x 0.40 = 5.376

Accordingly new k_e will be

$K_e = \frac{5.376}{1.46} + 6.0\%$ = 9.68%

PROBLEM NO: 14

Important Issues:

i) Growth rate is staggering for the first 6 years

ii) Consistent growth rate is only from year 7.

iii) Therefore, constant growth model formula cannot be used at year 0. However it shall be the beginning of year 7 or end of year 6

iv) In order to evaluate value per share presently, future cash flows of the security shall be disclosed using opportunity cost of capital

v) P_0 formula shall be re-modified at P_6 as follow

$P_0 = \frac{d_1}{k_e - g}$ $\quad P_6 = \frac{d_7}{k_e - g}$

a) Estimation of Fair Market Value of Equity:

Year	Event	Cash flow		PVF 18%	Disc. CF
1	Dividend 1	$2(1+0.15)^1$	= 2.30	0.8475	1.95
2	Dividend 2	$2(1+0.15)^2$	= 2.645	0.7182	1.90
3	Dividend 3	$2(1+0.15)^3$	= 3.042	0.6086	1.85
4	Dividend 4	$3.042(1+0.1)^1$	= 3.346	0.5158	1.73
5	Dividend 5	$3.042(1+0.1)^2$	= 3.680	0.4371	1.61
6	Dividend 6	$3.042(1+0.1)^3$	= 4.049	0.3704	1.50
6	Market price at the end of the 6th year	W.N.1	= 32.69	0.3704	12.11
	Market Value				22.65

Working Note 1:

a) $D_7 = D_6(1+g)$ = 4.04856925 (1+0.05)=4.25

b) $P_6 = \frac{d_7}{k_e - g} = \frac{4.25}{0.18 - 0.05}$ = Rs. 32.69

Working Note 2:

$P_0 \times (1 + K_e)$	$= D_1 + P_1$
P_1	$= P_0(1 + K_e) - D_1 = 22.65(1 + 0.18) - 2.30 = 24.43$
P_2	$= P_1(1 + K_e) - D_2 = 24.43(1 + 0.18) - 2.645 = 26.18$
P_3	$= P_2(1 + K_e) - D_3 = 26.18(1 + 0.18) - 3.04 = 27.85$

Year	Event	Cash flow			PVF 18%	Disc. CF
1	Dividend 1	$2(1+0.15)^1$	=	2.30	0.8475	1.95
2	Dividend 2	$2(1+0.15)^2$	=	2.645	0.7182	1.90
3	Dividend 3	$2(1+0.15)^3$	=	3.04175	0.6086	1.85
3	Price 3	W.N.2	=	27.85	0.6086	16.95
						22.65

Holding and value of security has no nexus and the value would remain same at Rs. 22.65

PROBLEM NO: 15

Calculation of EPS = Rs. 9,60,000 / 50,000 Equity shares = Rs. 19.20

K_e = E / M = Rs. 19.20 / Rs. 45 = 0.4267 or 42.67%

PROBLEM NO: 16

$$K_e = \frac{E_1}{P_0} + g = \frac{Rs.10}{Rs.50} + 0.08 = 0.20 + 0.08 = 28\%$$

PROBLEM NO: 17

Given information,

IERR = Total yield = 18%

DPS_0 = 2

Growth rate = 10%

MP_0 = 40

1. Dividend yield $= \frac{DPS_0\,(1+g)}{MP} \times 100$

$= \frac{2 \times 110\%}{40} \times 100 = 5.5\%$

2. Capital gain yield = Total yield - Dividend yield

= 18% - 5.5% = 12.5%

PROBLEM NO: 18

From the given information it is not possible to calculate cost of equity capital directly. So let us calculate IRR from investors' point of view.

Year	Particulars	Cash flow	PVF@11%	P.V	PVF @ 12%	P.V
01-01-1990	Purchase of shares	(318)	1	(318)	1	(318)
31-12-1990	Dividend	20	0.900	18	0.892	17.84
31-12-1991	Dividend	20	0.812	16.24	0.797	15.94
31-12-1992	Dividend	22	0.731	16.082	0.711	15.642
31-12-1993	Dividend	22.25	0.658	14.6405	0.636	14.151
31-12-1993	Sale of shares	400	0.658	263.2	0.636	254.4
				10.1625		0.027

Using interpolation,

$$IRR = L_1 + \frac{NPV\,@L_1}{NPV\,@L_1 - NPV\,@L_2} X(L_2 - L_1) = 11 + \frac{10.1625}{10.1625 + 0.027} x\,(12 - 11) = 11 + \frac{10.1625}{10.1895}$$

= 11.99%

PROBLEM NO: 19

a) According to CPM, $(K_e) = R_f + ß\,(R_m - R_f)$

Given: R_f = 8%, ß = 1.5, R_m = 16%

Required rate of return of the shares of EPL = 8+1.5(16-8) = 20%

Current market price per share = Rs.15.75

Present expected rate of return $= \frac{D_1}{P_0} + g = \frac{D_0\,(1+g)}{P_0} + g = \frac{3.00 \times 1.05}{15.75} + 0.05 = 25\%$

Since the expected rate of return is more than the required rate of return as per the CAPM, We can say that the share is priced below its equilibrium price. Thus, the present market price of the share is not at equilibrium.

b) The market adjusts itself in such a way that the share is valued at its equilibrium price. Let the equilibrium price be P_0.

$$0.20 = \frac{3.00 \times 1.05}{P_0} + 0.05$$

P_0 = Rs. 21

∴ The Market Price will increase from Rs. 15.75 per share to Rs.21 per share.

For an investment in 1,000 shares of the company the change in market value = 1,000 (21 - 15.75) = Rs.5,250 (increase).

PROBLEM NO: 20

Given information,

Cost of Retained Earnings (Ks) =?

cost of equity(Ke) = 12%

(tp) = 25%

Brokerage = 2%

Ks = Ke(1– brokerage)(1 - tp)

Ks = 0.12(1 – 0.02)(1 - 0.25)

Ks = 0.882

Ks = 8.82%

PROBLEM NO: 21

Workings:

P_0 = EPS × P/E = 20 × 6.25 = 125

r = Rate of Return on Retained Earnings = 100/6.25 = 16%

Retention ratio = b = 1 - Dividend Payout Ratio = 1 - 0.60 = 0.40

Growth rate = g = br = 0.40 ×0.16 = 0.064

D_0 = EPS × Dividend Payout = 20 × 60% = 12

$D_1 = D_0$ (1 + g) = 12 (1 + 0.064) = 12.768

Cost of Equity before issue:

$$k_e = \frac{D_1}{P_0} + g = \frac{12.768}{125} + 0.064 = 0.1021 + 0.064 = 0.1661 \text{ or } 16.61\%$$

Cost of Equity after issue:

$$k_e = \frac{D_1}{P_0} + g = \frac{12.768}{120} + 0.064 = 0.1064 + 0.064 = 0.1704 \text{ or } 17.04\%$$

PROBLEM NO: 22

Part A - Calculation of weighted average cost of capital

Step 1: Estimation of specific cost of capital

a) Cost of debt = I (1 - t) = 12 (1 - 0.5) = 6%

b) Cost of preference (K_p) $= \frac{PD}{MP_0} = \frac{10}{100} = 10\%$

c) Cost of equity (K_e) $= \frac{DPS_1}{MP_0} + g = \frac{10}{110} + 0.06 = 15.09\%$

Step 2: Calculation of weighted average cost of capital

Source of Capital	Market Value of capital structure	Weights	After Tax Cost of Capital	WACC
Equity Share Capital	10,00,000	0.5	15.09	7.545
Preference Share Capital	4,00,000	0.20	10	2
Debentures	6,00,000	0.30	6	1.8
	20,00,000			11.345

Part B - Calculation of revised weighted average cost of capital when company makes additional borrowings amounting to 10,00,000.

Step I: Calculation of specific cost of capital

a) $k_e = \frac{DPS_1}{MP_0} + g$ = $\frac{12}{105} + 0.06$ = 17.42%

b) Cost of old debt = 6%

c) Cost of preference = 10%

d) Cost of new debt = Where rate of interest = 14%

$K_d = I\ (1 - t)$ = 14 (1 - 0.5) = 7%

Step II: Calculation of weighted average cost of capital

Source of Capital	Market Value of capital structure	Weights	After Tax Cost of Capital	WACC
Equity Share Capital	10,00,000	0.33	17.42	5.75
Preference Share Capital	4,00,000	0.14	10	1.4
Debentures	6,00,000	0.20	6	1.2
New Debt	10,00,000	0.33	7	2.31
	20,00,000			10.66

Note: Total capital after raising new debt

Equity	10,00,000
10% preference shares	4,00,000
12% debentures	6,00,000
14% new debentures	10,00,000
	30,00,000

PROBLEM NO.23

Working Notes:

(1) Computation of cost of debentures (Kd) :

$$Kd = \frac{Interest(1-t) + \frac{RV - NP}{3years}}{\frac{RV + NP}{2}} = \frac{Rs.12(1-0.40) + \frac{Rs.100 - Rs.102.50}{3years}}{\frac{100+102.50}{2}}$$

$$= \frac{Rs.7.2 - \frac{Rs.2.50}{3years}}{\frac{202.50}{2}} = \frac{Rs.8.64 - 0.834}{101.25}$$

= 6.29%

(2). Computation of cost of equity (Ke):

= Rf + ß (Rm - Rf)

= Risk free rate + (Beta × Risk premium)

= 0.1+(1.06 x 0.06)

= 0.1636 or 16.36%

(3). Cost of Preference share Capital (KP) = 11%

(4). Cost of Term Loan (KT) = 14%(1-0.40)

= 8.4%

Calculation of Weighted Average Cost of Capital Using market value weights

Source of Capital	Market value of capital structure (Rs. in millions)	Weights	After tax cost of Capital (%)	WACC (%)
Equity share capital (24 million shares x Rs. 15)	360	0.36	16.36	5.89
11% Preference share capital (12million shares x Rs.12)	144	0.15	11	1.65
12% Debentures (1.2 million x Rs.102.50)	123	0.12	6.29	0.93
14% Term loans	360	0.37	8.4	3.11
	987	1.000		11.58

PROBLEM NO.24

i) Calculation of Cost of Capital for each source of Capital

a) Cost of equity (K_e) $= \frac{D_0\ (1+g)}{\text{Market Price per share}} + g = \frac{25\% \text{ x Rs. } 100\,(1+0.05)}{\text{Rs. } 200} + 0.05$

$= \frac{\text{Rs. } 26.25}{\text{Rs. } 200} + 0.05$ = 0.18125 (or) 18.125%

b) Cost of Preference share Capital (K_P) = 9%

c) Cost of debentures (K_d) = r (1 - t)

= 11% (1 - 0.3)

= 7.7%

d) Cost of Retained Earnings (K_s) = K_e (1 - t_p)

= 18.125 (1 - 0.2)

= 14.5%

ii) Calculation of weighted average cost of capital by using Book Value Weights:

Source	Amount (Rs.)	Weights (a)	After tax Cost of Capital (%) (b)	WACC (%) (c) = (a) x (b)
Equity shares	80,00,000	0.40	18.125	7.25
9% Preference shares	20,00,000	0.10	9.000	0.90
11% Debentures	60,00,000	0.30	7.700	2.31
Retained earnings	40,00,000	0.20	14.500	2.90
	2,00,00,000	**1.00**		**13.36**

iii) Calculation of weighted marginal cost of capital of company by using Market Value Weights:

Source	Amount (Rs.)	Weights (a)	After tax Cost of Capital (%) (b)	WACC (%) (c) = (a) x (b)
Equity share	1,60,00,000	0.640	18.125	11.60
9% Preference share	24,00,000	0.096	9.000	0.864
11% Debentures	66,00,000	0.264	7.700	2.033
	2,50,00,000	**1.000**		**14.497**

PROBLEM NO: 25

i)

Pattern of additional finance	(Rs.)
Equity	15,00,000
Debt	5,00,000
Total additional finance	**20,00,000**

	(Rs.)
Retained earnings	4,00,000
additional equity to be raised	11,00,000
Total equity	**15,00,000**

	(Rs.)
10% Debt	2,00,000
13% Debt	3,00,000
Total Debt	**5,00,000**

ii) Calculation of post-tax average cost of additional debt

Interest = (Rs. 2,00,000 x 10/100) + (Rs. 3,00,000 x 13/100)

= Rs. 20,000 + Rs. 39,000

= 59,000

$K_d = \frac{\text{Rs. } 59,000\,(1-03)}{\text{Rs. } 5,00,000} \times 100 = \frac{\text{Rs. } 41,300}{\text{Rs. } 5,00,000} \times 100 = 8.26\%$

iii) Calculation of cost of retained earnings and cost of equity

$K_e = \frac{\text{EPS x Payout}}{\text{Market price}} + g = \frac{\text{Rs. } 12 \times 50/100}{\text{Rs. } 60} + 10\% = 20\%$

iv) Calculation of overall weighted average (after tax) cost of additional finance

Particulars	Amount (Rs.)	After Tax	Cost (Rs.)
Equity capital	11,00,000	20%	2,20,000
Retained earnings	4,00,000	16%	64,000
Debt	5,00,000	8.26%	41,300
	20,00,000		**3,25,300**

Overall cost of capital $(K_o) = \frac{\text{Rs. } 3,25,300}{\text{Rs. } 20,00,000} \times 100 = 16.27\%$

PROBLEM NO: 26

i) Calculation of after tax coat

After tax cost of new Debt (K_d)

$K_d = \frac{14}{98}(1 - 0.5) = 0.07$

After tax cost of new preference capital (K_p)

$K_p = \frac{1.20}{9.80} = 0.12$

After tax cost of retained earnings (K_g)

$K_g = \frac{1.3865}{27.75} + 0.12 = 0.17$

ii) Calculation of Marginal cost of capital

Capital Structure	Amount (Rs.)	Proportion	Cost of Capital	Product
Equity capital	19,20,000	0.80	0.17	0.136
11% preference capital	1,20,000	0.05	0.12	0.006
13% debentures	3,60,000	0.15	0.07	0.011
	24,00,000	**1.00**		**0.153**

Marginal cost of capital at existing capital structure is 15.3%

iii) Computation of amount that can be spent for capital investment before sale of new ordinary shares

Retained earnings = 2,00,000 shares x Rs. 1.3865 = Rs. 2,77,300

The ordinary equity (retained earnings) is 80% of total capital

Investment before issuing equity = 2,77,300 x 100/80 = Rs. 3,46,625

iv) Computation of marginal cost of capital if the company spends more than Rs. 3,46,625

$K_e = \frac{1.3865}{20} + 0.12$ = 0.1893

Capital structure	Proportion	Cost of capital	Product
Equity (new)	0.80	0.1893	0.1514
Preference capital	0.05	0.1224	0.0061
Debt	0.15	0.0714	0.0107
			0.1682

Marginal cost of capital at existing capital structure is 16.82%

ADDITIONAL PROBLEMS SOLUTIONS

PROBLEM – 1

Computation of cost of debt $= \frac{Interest(1-tax)}{NP} x100$

$= \frac{9(1-0.4)}{100} x100$ = 5.4%

Computation of cost of preference $= \frac{Dividend}{NP} x100$

$= \frac{12}{100} x100$ = 12%

Computation of cost equity $= \frac{D_1}{MP} + g$

$= \frac{3}{30} + 7$ = 17%

Computation of weighted overage cost of capital

Source of Finance	Market Value	Weights	Post tax cost of capital	NACC
Equity	60,00,000	0.6	17	10.2
Preference	10,00,000	0.1	12	1.2
Debentures	30,00,000	0.3	5.4	1.62
	1,00,00,000			13.02

PROBLEM NO: 2

Calculation of Effective cost of capital

Particulars	Option 1 14% institutional term loan (Rs. In lakhs)	Option 2 13% Non- convertible Debentures (Rs. In lakhs)
A. Effective capital to be raised face value	250.00	250.00
Less: Discount	Nil	(6.25)
	250.00	243.75
Less: Cost of Issue	Nil	(5.00)
Effective amount of capital	250.00	238.75
B. Annual interest charges on face value of Rs.250 Lakhs	35.0	32.50
Less: Tax benefit on interest @ 50%	17.5	16.25
	17.5	16.25
C. Effective cost of capital after tax (B/A x 100)	17.5/250 x 100 = 7.0%	16.25/238.75 x 100 =6.81 % (approx)

So, the better option is raising of funds of Rs.250 Lakhs by issue of 13% Non-Convertible Debentures

PROBLEM – 3

(a) No. of Equity Shares = 1,00,000 + 25,000 = 1,25,000

(b) Earnings = 10 Lakhs + 2.5 Lakhs = 12.5 Lakhs

$$EPS = \frac{12,50,000}{1,25,000} = 10$$

$$K_e = \frac{EPS}{MP_0} x100 = \frac{10}{100} x100 = 10\%$$

Assumptions: For 1 Lakh equity share we earned 10 Lakhs and assumed as for Extra 25,000 shares we earned 2,50,000 Extra it is assumed that the company may generate same Proportionate. Income also i.e., 2,50,000.

PROBLEM – 4

Case a: market value of debenture = $\frac{\text{Interest on Debenture}}{\text{Current yield Rate}} = \frac{12}{0.15}$ = Rs. 80

Recommendation: As the market value of debenture, as computed above is more than Rs. 75, hence the investor should buy these debentures at Rs. 75.

Case b: Effective Yield of an Investor

$$K_d = \frac{Int\,(1-T) + \left(\frac{RV-NP}{N}\right)}{\left(\frac{RV+NP}{2}\right)} x\,100 = \frac{12 + \left(\frac{100-80}{5}\right)}{\left(\frac{100+80}{2}\right)} x\,100 = \frac{12 + \left(\frac{100-80}{5}\right)}{\left(\frac{100+80}{2}\right)} x\,100 = \frac{16}{90} x\,100 = 17.77\%$$

PROBLEM – 5

(a) MV OP debenture = $\frac{160}{14\%}$ = Rs. 1143

No, it is not advisable to buy, I would not buy the debenture, for Rs. 1200 because us fair market value is Rs. 1143 they it is our valued.

(b) Estimation of yield rate investor bound on approximate method:

$$Kd = \frac{I + \frac{RV - NP}{n}}{\frac{RV + NP}{2}} = \frac{160 + \frac{1{,}000 - 1{,}040}{8}}{\frac{1{,}000 + 1{,}040}{2}}$$

$$= \frac{160 + (-5)}{1{,}020} = 15.196\%$$

$\therefore$ Kd = Yield rate.

Because * No Flotation Cost / alternatively (RR. Of Investor)
* No Tax Benefit

PROBLEM – 6

Given D_0 = 15

D_1 = 15 x (1+0.12) = 16.8

MP_0 = 168

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

$$K_e = \frac{16.8}{168} + 12 \quad = 22\%$$

PROBLEM – 7

Given D_1 = 1.4

MP_0 = 19.5

g = 12%

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

$$K_e = \frac{1.4}{19.5} + 12 \quad = 19.18\%$$

PROBLEM – 8

Given D_0 = 4.5

MP_0 = 9.5

Flotation cost = 5

Net proceeds = 95 – 5 = 90

g = 7%

$$K_e = \frac{D_0(1+g)}{NP} + g$$

$$K_e = \frac{4.5(1+0.07)}{90} + 0.07 \quad = 12.35\%$$

PROBLEM – 9

R_f = 9%

R_m = 18

B = 1.5

$K_e = R_f + B\,(R_m - R_f)$

K_e = 9% + 1.5 (18% – 9%)

K_e = 9% + 13.5% = 22.5%

D_1 = 3

G = 8%

MP_0 = ?

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

$MP_0 = \frac{D_1}{K_e - g} = \frac{3}{22.5 - 8} = 20.68$

PROBLEM NO: 10

Computation of Cost of Equity:

Particulars	A	B	C
a) Dividend Per Share	2.70	4	2.88
b) Market Price	15	20	12
c) Cost of Equity (Ke)(a/b)	18%	20%	24%

Computation of Cost of Debt

Particulars	A	B	C
a) Interest	-	100 X 10% =10	100 X 8% = 8
b) Market Price	-	125	80
c) Cost of Debt (Kd)(a/b)	-	8%	10%

Computation of Weighted Average Cost of Capital:

Particulars	A	B	C
WACC	18% x 4/4	(20% x 2.50/3.50) + (8% x 1/3.50)	(24% x 5/7.50) + (10% x 2.50/7.50)
	18%	16.56%	19.33%

PROBLEM NO: 11

i. **Computation of Costs of Different Components of Capital :**

a) **Equity Shares:**

$K_e = \frac{D_1}{p_0} + g = \frac{D_0(1+g)}{p_0} + g = \frac{3.60(1.09)}{54} + 0.09 = 0.0727 + 0.09 = 16.27\%$

b) **Preference Shares:**

K_P = Preference Share Dividend / P_o **= 11/95 = 11.58%**

c) **Debt at 12%:**

K_d (1 – t) = 12% (1 – 0.4) = 12% × 0.6 = 7.20%.

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

WACC = $W_dK_d + W_pK_p + W_eK_e$

WACC = 0.25 (7.2%) + 0.15 (11.58%) + 0.60 (16.27%)

= 1.8 + 1.737 + 9.762 = 13.30%.

PROBLEM NO: 12

i. **Cost of Equity (Ke) =** $\frac{D_1}{P_0 - F} + g = \frac{15}{125-5} + 0.06 = 0.185$

Working Note: **Calculation of 'g'**

10.6 $(1+g)^5$ = Rs.14.19 Or, $(1+g)^5$ = 14.19/10.6 = 1.338

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

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

iii. **Cost of Preference Shares (Kp) = $\frac{PD}{P_0}$ = $\frac{15}{105}$ = 0.1429**

iv. **ost of Debentures (Kd) = $\frac{I(1-t)+\frac{RV-NP}{n}}{\frac{RV+NP}{2}}$ = $\frac{15(1-0.35)+\frac{100-91.75*}{11 years}}{\frac{100+91.75}{2}}$ = 0.1095**

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

Market price of debentures (approximation method) = Coupon rate ÷ Market rate of interest = Rs. 15 ÷ 0.16 = Rs. 93.75

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

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

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

P_0 = Rs.15 × 5.029 + Rs.100 × 0.195

P_0 = Rs.75.435 + Rs.19.5 = Rs. 94.935

Net Proceeds = Rs.94.935 – 2% of Rs.100 = Rs. 92.935

Accordingly, the cost of debt can be calculated

Cost of capital [BV weights and MV weights] **(amount in lakh of rupees)**

Source of capital	Weights		Specific Cost (K)	Total cost	
	BV	MV		(BV × K)	(MV × K)
Equity Shares	120	160*	0.1850	22.2	29.6
Retained Earnings	30	40*	0.1800	5.4	7.2
Preference Shares	9	10.4	0.1429	1.29	1.49
Debentures	36	33.75	0.1095	3.94	3.70
Total	195	244.15		32.83	41.99

*Market Value of equity has been apportioned in the ratio of Book Value of equity and retained earnings

Weighted Average Cost of Capital (WACC):

Using Book Value = 32.83/ 195 = 0.1684 or 16.84%

Using Market Value = 41.99 /244.15 = 0.172 or 17.2 %

PROBLEM NO. 13

Step 1: Specific cost of capital

$$Ke = \frac{2 X 110\%}{27.5} + 0.10 = 18\%$$

$$Kd = \frac{I}{Bo} = \frac{12 X 4,00,000}{4,00,000 x 80\%} = 15\%$$

Step 2: WACC based on Market value weights

MV of equity = $\frac{8,00,000}{10}$ x 27.5 = 22,00,000

(Induces all the funds belonging to equity shares)

MV of debt – 4,00,000 x 80% = $\frac{3,20,000}{25,20,000}$

$$18\left(\frac{22,00,000}{25,20,000}\right) + 15\left(\frac{3,20,000}{25,20,000}\right) = 17.62\%$$

The End