4. 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	At par	10% premium	10% discount
a) Interest (1- tax)	10.5	10.5	10.5	10.5
b) Net Proceeds	100	95 (100-5% of 100)	104.5 (100+10% of 100-5% of 110	85.5 (100-10% of 100-5% of 95)
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) $K_d = \frac{\text{Interest}(1-t)+\frac{RV-NP}{n}}{\frac{RV+NP}{2}}$	$\frac{12(1-0.4)+\frac{100-95}{10}}{\frac{100+95}{2}} \times 100$ = 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 = $\frac{100 \times 15\%}{12\%} = \frac{15}{0.12} = 125$

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

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

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 an amount of Rs. 90 when 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	80	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,

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

IRR = 11.79%

PROBLEM NO: 5

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

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

PROBLEM NO: 6

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: 7

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;

$$K_p = \frac{\text{Preference dividend} + \left(\frac{\text{Redeemable Value} - \text{Net Proceeds}}{\text{Redeemable Period}}\right)}{\left(\frac{RV + NP}{2}\right)} \times 100 = \frac{15 + \left(\frac{100 - 96}{10}\right)}{\left(\frac{100 + 96}{2}\right)} \times 100 = 15.71\%$$

PROBLEM NO: 8

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: 9

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: 10

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

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

Where,

K_e = Cost of equity share capital

D_1 = Expected dividend at the end of year 1

P_0 = Current market price of the share

g = Expected growth rate of dividend

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:

$$g = br \text{ i.e. } = 0.10 \times 0.60 = 0.06 = 6\%$$

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:

$0.075 = b_1 \times 0.01$

$b_1 = 0.75$ 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 $D_1 = 13.44 \times 0.40 = 5.376$

Accordingly new k_e will be

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

PROBLEM NO: 11

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: 12

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

PROBLEM NO:13

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.

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

$\therefore P_0$ = Rs. 21

$\therefore$ 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: 14

Given information,

Cost of Retained Earnings (K_s) =?

Cost of equity(K_e) = 12%

(t_p) = 25%

Brokerage = 2%

$K_s = K_e(1 - \text{brokerage})(1 - t_p)$

$K_s = 0.12(1 - 0.02)(1 - 0.25)$

$K_s = 0.882$

$K_s = 8.82\%$

PROBLEM NO: 15

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

K_0 = Weighted average cost of capital $= \frac{6 \times 6,00,000}{20,00,000} + \frac{10 \times 4,00,000}{20,00,000} + \frac{15.09 \times 10,00,000}{20,00,000} = 11.34\%$

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

K_0 or WACC $= 6\%\left(\frac{6,00,000}{30,00,000}\right) + 7\%\left(\frac{10,00,000}{30,00,000}\right) + 10\%\left(\frac{4,00,000}{30,00,000}\right) + 17.42\%\left(\frac{10,00,000}{30,00,000}\right) = 10.67\%$

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: 16

Working Notes:

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

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

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

= 0.06287 or 6.29%.

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

= $R_f + ß (R_m - R_f)$

= Risk free rate + (Beta × Risk premium)

= 0.1+(1.06 x 0.06)

= 0.1636 or 16.36%

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

(4). Cost of Term Loan (K_T) = 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: 17

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

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

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%

THE END