3. COST OF CAPITAL

PROBLEM NO: 1

Calculation of K_d

From the given information

Face value = 100

NSP = 97.75

Redemption value = 105

Rate of Int = 15%

No of yrs (N) =7yrs

Tax Rate = 55%

We Know That

$$K_d = \frac{Int(1 - Tax) + \left(\frac{RV - NSP}{N}\right)}{\left(\frac{RV + NSP}{2}\right)}$$

$$= \frac{15(1-0.55)+\left(\frac{105-97.75}{7}\right)}{\left(\frac{105+97.75}{2}\right)} x100$$

$$= \frac{6.75+1.0357}{101.375} x100$$

= 7.68%

PROBLEM NO: 2

Calculation of K_d

Face value = 100

NSP = 90

Redemption value = 105

Rate of Int = 12%

No of yrs (N) = 5yrs

Tax Rate = 35%

We Know That

$$K_d = \frac{Int(1 - Tax) + \left(\frac{RV - NSP}{N}\right)}{\left(\frac{RV + NSP}{2}\right)} x100$$

$$= \frac{12(1-0.35)+\left(\frac{105-90}{5}\right)}{\left(\frac{105+90}{2}\right)} x100$$

$$= \frac{7.8+3}{97.5} x100$$

= 11.07%

PROBLEM NO: 3

14/16

Given information

Face value = 1000

Coupon rate = 15%

Redeemable period = 10yrs. NP = 1000 − 50 + 25 = 925

Discount = 5%

Floatation Cost = 2.5%

Assume: FV = AV.

$$kd = \frac{Int(1-Tax) + (RV - NP)/n}{\frac{RV + NP}{2}}$$

$$= \frac{150(1 - 0.35) + (1000 - 925)/10}{\frac{1000 + 925}{2}}$$

$$= 10.9$$

Assumption: 1.in the absence of information at what price debt/debentures are going to be redeem, it is assumed that redeemable at face value.

PROBLEM NO: 4

Given information,

Face Value = 100

Coupon rate = 15% NP = 100 − 5 + 1 = 96.

redeemable period = 7yrs

Discount = 5%

Floatation cost = 1%

Tax rate = 50%

$$kd = \frac{Interest(1-Tax) + (RP - NP)/n}{\frac{RV + NP}{2}}$$

$$= \frac{15(1 - 0.5) + (100 - 96)/7}{\frac{100 + 96}{2}}$$

$$= 8.61\%$$

PROBLEM NO: 5

Calculation of K_d

Face value = 1000

Flotation Cost = 100

NSP = 900 (1,000 – 100)

Interest Rate = 15%

Tax Rate = 50%

Step: 1 Calculation of CFS

Year	Installment	Int (1-Tax)	CFS
1	200	75	275
2	200	60	260
3	200	45	245
4	200	30	230
5	200	15	215

Step: 2 Calculation of K_d in IRR method.

IRR Calculation in company's point of vice because there is involvement of flotation co

NPV at 1st guess rate NPV at 2nd guess rate

Year	CFS	P.V.F @ 11% P Values		PVF @12% p. Values	
0	900	1	900	1	900
1	275	0.901	(248)	0.893	(245)
2	260	0.812	(211)	0.97	(207)
3	245	0.731	(179)	0.712	(174)
4	230	0.659	(152)	0.635	(146)
5	215	0.593	(127)	0.567	(122)
			(17)		6

$$IRR = L_1 + \frac{NPV\,at\,L_1}{NPV\,at\,L_1 - NPV\,at\,L_2} x(L_2 - L_1)$$

$$= 11\% + \frac{-17}{-17-6} x(12\% - 11\%)$$

$$= 11\% + \frac{17}{23}(1\%)$$

$$= 11.74\%(App.)$$

PROBLEM NO: 6

Given Information;

Face value = 100 NP = F.C – F.C

Coupon rate = 15% = 100 – 4

Floatation Cost = 4% = 96

Redeemable period = 10 yrs.

Ass : FV = RV.

1. Kd using Shortcut method :

$$Kd = \frac{ID + (RV - NP)/n}{\frac{RV + NP}{2}}$$

$$= \frac{15 + (100 - 96)/10}{\frac{100+96}{2}}$$

$$= 15.71\%$$

PROBLEM NO:7

Given information;

Face value = 100 RV = FV → Assumption

Coupon rate = 10% NP = FV – FC

Floation cost = 2% = 100-2

Redeemable period = 10y. = 98

Ass : RV = FV

$$kd = \frac{ID + (RV - NP)/n}{\frac{RV + NP}{2}} = \frac{10 + (100-98)/10}{\frac{100+98}{2}} = 10.3\%$$

PROBLEM NO: 8

Calculation of K_p

From the given information

Face value = 100

Flotation cost @ 4% = 4

NSP = 96 (100 – 4)

Rate of P.D = 15%

We Know That

$$K_p = \frac{P.D}{NSP}$$

$$= \frac{15}{96} \times 100$$

$$= 15.625\%$$

PROBLEM NO: 9

Calculation of K_p

i) If issued at 5% Discount from the given information.

Fv = 100

Discount = 5

Issue price = 100 - 5 = 95

Flotation cost = 0

NSP = 95

Rate of P.D = 10%

We Know That

$$K_p = \frac{P.D}{NSP} \times 100$$

$= \frac{10}{95} x 100$

= 10.5%

ii) If issued at 5% premium.

NSP = 105 (100 + 5(Premium))

$K_p = \frac{10}{105} x 100$

= 9.5%

PROBLEM NO: 10

From the given information

Face value = 100

DPS_0 (100x15%) = 15

Growth Rate (g) = 12%

DPS_1 = (15)(1.12) = 16.8

MP_0 = 168

We Know That

$$K_e = \frac{DPS_1}{MP_0} + g$$

$$= \frac{16.8}{168} + 0.12$$

= 0.1 + 0.12

= 0.22 = 22%

PROBLEM NO: 11

Given Information,

$DPS_1 = 1.4$

$mp_0 = 19.5$

growth rate = 12%

$$ke = \frac{DPS_1}{mp_0} + g = \frac{1.4}{19.5} + \frac{12}{100}$$

= 19.17%

PROBLEM NO: 12

Given information,

$DPS_0 = 4.5$

growth rate = 7% $NP = 95 - 5$

$mp_0 = ₹95$ $= 90$

Floatation cost = ₹5

$$Ke = \frac{DPS_0(1+g)}{NP} + g$$

$$= \frac{4.5(1+0.07)}{90} + 0.07$$

$= 12.35\%$

PROBLEM NO: 13

Given information,

$DPS_0 = ₹10$

$g = -8\%$

$ke = 15\%$

$mp_0 = ?$

$$mp_0 = \frac{DPS_0(1+g)}{ke - g}$$

$$= \frac{10[1+(-0.08)]}{0.15+0.08}$$

$= ₹40.$

PROBLEM NO: 14

Calculation of cost of equity (IRR method) NPV at 1st guess rate 11% NPV at 2nd guess rate 12%

Year	CFS	PVF@11%	P Values	PVF@12%	P Values
0	(318)	1	(318)	1	(318)
1	20	0.901	18.02	0.893	17.86
2	20	0.812	16.24	0.797	15.94
3	22	0.731	16.08	0.712	15.664
4	22.5	0.659	14.82	0.635	14.29
4th	400	0.659	263.6	0.635	254
		NPV	10.76		(0.25)

$$IRR = L1 + \frac{NPV\ at\ L_1}{NPV\ at\ L_1 - NPV\ at\ L_2} + (L_2 - L_1)$$

$$= 11\% + \frac{10.76}{10.76 + 0.25}(12\% - 11\%)$$

$= 11.98\%$

PROBLEM NO: 15

Given information,

$R_f = 8\%$

$R_m = 13\%$

Beta = 1.6

ke = ?

According to CAPM approach,

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

$= 8\% + 1.6(13\% - 8\%)$

$ke = 16\%$

PROBLEM NO: 16

Given that.

$R_f = 9\%$

$R_m = 18\%$

Beta = 1.5

ke = ?

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

$= 9\% + 1.5(18\% - 9\%)$

$ke = 22.5\%$

Now,

estimation of mp_0 as on today

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we know that,

$$\frac{DPS_1}{ke - g} = mp_0$$

$$\Rightarrow mp_0 = \frac{3}{22.5 - 8\%} = 20.68 \text{ (or) } 21.$$

PROBLEM NO: 17

Calculation of Weighted Average Cost of Capital (WACC)

Source	Amount (₹)	Weight	Cost of Capital after tax	WACC
Equity Capital	65,00,000	0.619	0.163	0.1009
12% Preference Capital	12,00,000	0.114	0.120	0.0137
15% Redeemable Debentures	20,00,000	0.190	0.105*	0.020
10% Convertible Debentures	8,00,000	0.076	0.07**	0.0053
Total	1,05,00,000	1.0000		0.1399

* Cost of Debentures (after tax) = 15 (1 – 0.30) = 10.5% = 0.105

** Cost of Debentures (after tax) = 10 (1 – 0.30) = 7% = 0.07

Weighted Average Cost of Capital = 0.1399 = 13.99%

(Note: In the above solution, the Cost of Debentures has been computed in the above manner without considering the impact of special features i.e. redeemability and convertibility in absence of requisite information.)

PROBLEM NO: 18

Part – I Calculation of WACC

Step - 1 Calculation of Specific COC

i) Calculation of K_d

K_d = 10% (1 - 0.5) = 5%

ii) Calculation of K_p

K_p = 9%

iii) Calculation of K_e

$K_e = \frac{DPS_1}{MP_0} + g$

$= \frac{9}{102} + 5\%$

=13.82%

Step-2

$$WACC = 5\% \left(\frac{3L}{10L}\right) + 9\% \left(\frac{2L}{10L}\right) + 13.82\% \left(\frac{5L}{10L}\right) = 10.21\%$$

Part – II Calculation of WACC

Step1 : Calculation of Specific COC

i) Calculation of K_d

Kd_1 = 10% (1-0.5) = 5%

Kd_2 = 12% (1-0.5) = 6%

ii) Calculation of K_p

K_p = 9%

iii) Calculation of K_e

$K_e = \frac{DPS_1}{MP_0} + g$

$= \frac{9}{96} + 5\%$

= 14.375%

MP_0 : New market Price i.e. Rs.96 per share

Step2: Calculation of WACC

$$WACC (K_0) = \left(\frac{3L}{15L}\right)(5\%) + \left(\frac{5L}{15L}\right)(6\%) + \left(\frac{2L}{15L}\right)(9\%) + \left(\frac{5L}{15L}\right)(14.375\%)$$

= 9%

PROBLEM NO: 19

Part - A

Step-1: Calculation of Specific Cost of Capital

Cost of equity capital (K_e) $= \frac{DPS_1}{MP_0} + g = \frac{2 \times 105\%}{80} + 0.05 = \frac{2.1}{80} + 0.05 = 7.625\%$

Cost of reserves (K_r) = Cost of equity = 7.625%

Cost of debentures (K_d) = K_i (1-t) = 14% (1-50%) = 7%

Step-2: Calculation of WACC

$$WACC = 7.625\% \left(\frac{10L}{15L}\right) + 7\% \left(\frac{3L}{15L}\right) + 7.625\% \left(\frac{2L}{15L}\right) = 7.5\%$$

Therefore K_o = 7.5%

Part - B

Step-1: Calculation of Specific Cost of Capital

Cost of equity capital (K_e) = $\frac{DPS_1}{MP_0} + g$ = $\frac{(10 \times 20\%) \times 105\%}{50} + 0.05$ = 9.2%

Cost of reserves (K_r) = 9.2%

Cost of 14% debentures (K_d) = K_i (1-t) = 14% (1-0.5) = 7% (After tax)

Cost of 16% long term loan = 16% (1 - 0.5) = 8%

Step-2: Calculation of Weighted Average Cost of Capital (WACC)

$$WACC = 9.2\% \left(\frac{10L}{20L}\right) + 9.2\% \left(\frac{2L}{20L}\right) + 7\% \left(\frac{3L}{20L}\right) + 8\% \left(\frac{5L}{20L}\right) = 8.57\%$$

Therefore, K_o = 8.57%

PROBLEM NO: 20

Step: 1 Calculation of Specific COC

i) Calculation of K_d

$$K_d = \frac{Int(1-t)}{MP_0}$$

$$= \frac{12\%(100)}{80} = \frac{12}{80} = 15\%$$

ii) Calculation of K_p

K_p = N.A

iii) Calculation of K_e

$$K_e = \frac{DPS_1}{MP_0} + g$$

Where $DPS_1 = DPS_0 (1 + g)$

= 2 (1 + 0.1)

= 2.2

$$= \frac{2.20}{27.50} + 10\%$$

= 18%

iv) Calculation of K_r

$K_r = K_e$ = 18%

Step: 2 calculation of WACC

Source	Amount	Spec. CoC	Cost
Equity	2200000 (80,000 x 27.5)	18%	396000
Debt	320000 (4,00,000 x 80%)	15%	48000
	2520000		444000

$\therefore$ WACC $= \frac{444000}{2520000} \times 100$

$= 17.62\%$

PROBLEM NO: 21

(i) Calculation of Cost of Capital for each source of capital:

(a) Cost of Equity share capital:

$$K_e = \frac{D_0(1+g)}{\text{Market Price per share}(P_0)} + g = \frac{25\% \times ₹100(1+0.05)}{₹200} + 0.05$$

$$= \frac{₹26.25}{₹200} + 0.05 = 0.18125 \text{ or } 18.125\%$$

(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) Weighted Average Cost of Capital on the basis of book value weights

Source	Amount (₹)	Weights (a)	After tax Cost of Capital (%) (b)	WACC (%) (c) = (a) × (b)
Equity share	80,00,000	0.40	18.125	7.25
9% Preference share	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) Weighted Average Cost of Capital on the basis of market value weights

Source	Amount (₹)	Weights (a)	After tax Cost of Capital (%) (b)	WACC (%) (c) = (a) × (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: 22

Working Notes:

Determination of Cost of capital:

(i) Cost of Debentures (K_d)

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

Where,

I = Annual Interest Payment

NP = Net proceeds of debentures net of flotation costs

RV = Redemption value of debentures

t = Income tax rate

n = Life of debentures

$$K_d = \frac{₹8(1-0.5) + \frac{₹100 - ₹96^*}{20\,\text{years}}}{\frac{₹100 + ₹96^*}{2}} = \frac{₹4.20}{₹98} = 0.0429 \text{ or } 4.29\%$$

* Net Proceeds = Par value per shares - 4% Flotation cost per share

= ₹100 – 4% of ₹100 = ₹96

(ii) Cost of Preference Shares (K_p)

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

Where,

PD = Preference Dividend per share

NP = Net proceeds of share net of flotation costs

RV = Redemption value of shares

n = Life of preference shares

$$K_p = \frac{₹10 + \frac{₹100 - ₹95^*}{15\,\text{years}}}{\frac{₹100 + ₹95^*}{2}} = \frac{₹10.33}{₹97.5} = 0.106 \text{ or } 10.60\%$$

* Net Proceeds = Par value per shares - 5% Flotation cost per share

= ₹100 – 5% of ₹100 = ₹95

(iii) Cost of Equity (K_e)

$$K_e = \frac{\text{Expected dividend } (D_1)}{\text{Current market price } (P_0)} + \text{Growth rate } (g) = \frac{₹2}{₹22 - ₹2} + 0.05 = 0.15 \text{ or } 15\%$$

(i) **Computation of Weighted Average Cost of Capital based on Book Value Weights**

Source of Capital	Book Value (₹)	Weights to Total Capital	After tax Cost of capital (%)	WACC (%)
Debentures	8,00,000	0.40	4.29	1.716
Preference Shares	2,00,000	0.10	10.60	1.060
Equity Shares	10,00,000	0.50	15.00	7.500
	20,00,000	1.00		10.276

(ii) **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 (8,000 units × ₹110)	8,80,000	0.2651	4.29	1.137
Pref. Shares (2,000 shares × ₹120)	2,40,000	0.0723	10.60	0.766
Equity Shares (1,00,000 shares × ₹22)	22,00,000	0.6626	15.00	9.939
	33,20,000	1.00		11.842

PROBLEM NO: 23

Calculation of WACC

Particulars	A	B	C
i) Cost of Equity	18% $\left[\frac{2.70}{15}x100\right]$	20% $\left[\frac{4}{20}x100\right]$	24% $\left[\frac{2.88}{12}x100\right]$
ii) Cost of Debt	N.A	4% $\left[\frac{5}{125}x100\right]$	5% $\left[\frac{4}{80}x100\right]$
iii) WACC	18% $\left[\frac{6L}{6L}x18\% + 0\right]$	16.8% $\left[\frac{5L}{6.25L}(20\%) + \frac{1.25L}{6.25L}(4\%)\right]$	19.25% $\left[\frac{6L}{8L}(24\%) + \frac{2L}{8L}(5\%)\right]$
Workings			
Market value of Eq	Rs.600000 $\left[\frac{400000}{10}x15\right]$	Rs.500000 $\left[\frac{250000}{10}x20\right]$	Rs.600000 $\left[\frac{500000}{10}x12\right]$
Market value of debt	N.A.	Rs.125000 $\left[\frac{100000}{100}x125\right]$	Rs.200000 $\left[\frac{250000}{100}x80\right]$
Total market value	Rs.600000	Rs.625000	Rs.800000

THE END