4 CHAPTER

Cost of Capital

THEORY

Meaning of Cost of Capital	❍ It is the rate of return expected by the providers of capital i.e. equity shareholders, preference shareholders and debt holders. ❍ It can also be referred as the discount rate that is used in determining the present value of the estimated future cash proceeds of the business/ new project and eventually deciding whether the business/new project is worth undertaking or now. ❍ It is also the minimum rate of return that a firm must earn on its investment which will maintain the market value of share at its current level. ❍ It can also be stated as the opportunity cost of an investment, i.e. the rate of return that a company would otherwise be able to earn at the same risk level as the investment that has been selected.
Significance of Cost of Capital	❍ It is used for **evaluation of investment options** by discounting the benefits and cost of the project with relevant cost of capital. ❍ **It helps in financing decision** to choose source of finance by comparing the cost of different sources. ❍ It helps in designing optimum credit policy for the customer by comparing the present value of cost and benefits calculated at cost of capital.
Components of Cost of Capital	(*a*) Cost of Debt (*b*) Cost of Preference Capital (*c*) Cost of Equity Capital (*d*) Cost of Retained Earnings
Cost of Debt	❍ A debt may be in the form of bond, debenture or long term loan. ❍ Approximation Method ➢ Cost of Irredeemable debenture $= \frac{I(1-t)}{NP}$ ➢ Cost of Redeemable debenture $= \frac{I(1-t)+(RV-NP)/2}{(RV+NP)/2}$

	❍ ***NPV* or *YTM* Approach** ➢ Identify the relevant cash flows from the debentures ➢ Calculate approximate cost of debt using approximation method. ➢ Calculate *NPV* at the approximate cost of debt calculated in step-2 ➢ *NPV* = Present value of future cash inflows – Present value of future cash outflows. ➢ If *NPV* is positive than increase the rate so that it becomes negative and If *NPV* is negative than decrease the rate so that it becomes positive. ➢ Interpolate the two NPVs to calculate cost of debentures using below formula: ➢ Cost of debt (*IRR*) (*Kd*) $\text{Lower rate} + \left[\frac{\text{Lower rate NPV}}{\text{Lower rate NPV} - \text{Higher rate NPV}}\right]$ (Higher rate - Lower rate) ❍ **Amortization of Bond** ➢ Calculate cash flows of each year ➢ Cash flow = [Interest × (1 – t)] + Amortized amount p.a. ➢ $Kd = IRR = \text{Lower rate} + \left[\frac{\text{LR NPV}}{\text{LR NPV} - \text{HR NPV}}\right]$ (Higher rate – Lower rate) ❍ **Convertible Debentures** ➢ Redeemable value = Higher of either cash or equity value ➢ Value of one equity share = $P0 \times (1 + g)^n$ ❍ **Intrinsic Value** ➢ It is the present value of all future income from security discounted at the required rate of return. ➢ If Intrinsic value > current value, it is case of under-priced security ➢ If Intrinsic value < current value, it is case of over-priced security
Cost of Preference Capital	❍ The cost of preference capital is the dividend expected by the shareholders. ❍ **Approximation Method** ➢ Cost of Irredeemable Preference Shares = $\frac{\text{PD}}{\text{NP}}$ ➢ Cost of Redeemable Preference Shares = $\frac{\text{PD} + \left(\frac{\text{RV} - \text{NP}}{\text{n}}\right)}{\left(\frac{\text{RV} + \text{NP}}{2}\right)}$

	❍ ***NPV* or *YTM* Approach** ➢ Identify the relevant cash flows from the preference share ➢ Calculate approximate cost of preference capital using approximation method. ➢ Calculate NPV at the approximate cost of preference capital calculated in step-2 ➢ *NPV* = Present value of future cash inflows – Present value of future cash outflows ➢ If NPV is positive than increase the rate so that it becomes negative and if NPV is negative than decrease the rate so that it becomes positive. ➢ Interpolate the two NPVs to calculate cost of preference using below formula: ➢ Cost of preference capital (IRR) (Kp) $= \text{Lower rate} + \left[\frac{\text{Lower rate NPV}}{\text{Lower rate NPV} - \text{Higher rate NPV}}\right]$ (Higher rate – Lower rate)
Cost of Equity Capital	❍ It is the expectation of equity shareholders. ❍ It can be computed by various methods which are as follows: ➢ Dividend price approach ➢ Earning price approach ➢ Dividend growth approach or Gordon model ➢ Realized yield approach ➢ Capital assets pricing model
Dividend Price Approach or Dividend Model	❍ According to this approach, the investor arrives at the market price of equity shares by capitalizing the set of expected dividend payments. ❍ $K_e = \frac{D}{NP}$ ❍ Where, *D* = Dividend per share ❍ *NP* = Net proceeds or market price
Earning Price Approach or Earning Model	❍ According to this approach, it is the earning per share which determines the market price of shares. ❍ $K_e = \frac{EPS}{NP}$ ❍ Where, *EPS* = Earning per share *NP* = Net proceeds or market price
Dividend Growth Model or Gordon Model	❍ According to this approach, the cost of equity capital depends upon the expected dividend rate plus the growth rate of dividend. ❍ $K_e = \frac{D_1}{NP} + G$

	❍ Where, D_1 = Next expected dividend = $D_0(1+g)$ ❍ NP = Net proceeds or market price ❍ G = Growth rate ❍ Estimation of Growth rate ➢ **Average method** – Growth rate = $\sqrt[n]{\frac{Do}{Dn}} - 1$ ➢ **Gordon's growth model** – $g = b \times r$ b = retention ratio r = rate of return on investment
Realized Yield Approach	❍ Return of one year = $\frac{\text{Dividend + Capital Gain}}{\text{Investment}}$ ❍ $Ke = \sqrt[n]{(1+r1)\times(1+r2)\times(1+r3)...(1+rn)} - 1$ ❍ If year wise price data is not given than use *YTM* method
Capital Assets Pricing Model	❍ It describes the risk-return trade-off for securities. ❍ This model compensate investor for time value of money and risk as well. ❍ Time value of money is compensated by risk free rate and risk is compensated by risk premium. ❍ Thus, required rate of return = Risk free rate + Risk premium ❍ Also, cost of equity (Ke) = $Rf + (Rm - Rf)(\beta)$ ❍ Where, Rf = Risk free rate R_m = Return on market portfolio B = Beta coefficient $R_m - R_f$ = Market risk premium ❍ Shortcomings of *CAPM* ➢ Calculation of Beta with historical data is unrealistic ➢ Market imperfections may lead investors to unsystematic risk
Cost of retained earnings	❍ The cost of retained earnings must be considered as the opportunity cost of the foregone dividends. ❍ Any earnings retained by the company could have been invested profitably by the equity shareholders themselves. Therefore, there is an opportunity cost involved in the firm's retaining the earnings and an estimation of this cost can be taken up as a measure of cost of capital of retained earnings. ❍ The cost of retained earnings is taken as equal to the cost of equity share capital since the retained earnings are taken as fresh subscription to the equity share capital. ❍ Although cost of equity remains high than the cost of retained earnings due to issue of shares at a price lower than current price and flotation cost.

	❍ For calculation of *Kr*, *P* or *NP* will be taken as current market price only. $K_r = \frac{D}{P}$ $K_r = \frac{EPS}{P}$ $K_r = \frac{D_1}{NP} + G$ ❍ As per opportunity cost approach, cost of retained earnings (*Kr*) is: Kr = Ke(1 – tp)(1 – f) Where, t_p = personal income tax and f = flotation cost
Weighted Average Cost of Capital	❍ Weighted average cost of capital is the average cost of the costs of various sources of financing used to raise the required finance for the firm where weights used can be either book value weights or market value weights. ❍ $WACC = (Ke \times We) + (Kr \times Wr) + (Kp \times Wp) + (Kd \times Wd)$
Market value weights	Market value weights are preferred because: (*a*) Market value of securities closely approximate the actual amount to be received from their sale (*b*) The cost of the specific sources of finance which constitute the capital structure of the firm are calculated using prevailing market prices.
Book Value Weights	Book value weights are preferred because: (*a*) They are readily available from the published records of the firm (*b*) Firms state their capital structure targets in terms of book values (*c*) The analysis of capital structure in terms of debt-equity ratio is based on book value
MV vs BV Weights	❍ It is preferred to use market value weights for calculation of WACC. ❍ Market value of retained earnings are included in the share price itself. ❍ To get market value of retained earnings, total market value will be apportioned between book value of retained earnings and face value of equity.
Marginal cost of capital	❍ The marginal cost of capital may be defined as the cost of raising an additional rupee of capital. ❍ Marginal cost of capital is derived, when we calculate the average cost of capital using the marginal weights. ❍ The marginal weights represent the proportion of funds the firm intends to employ.

EXAMPLE

Ex1. A person needs ₹10,00,000 after 7 years @ 8% p.a. How much money needs to be deposited today?

[**Sol.** ₹5,83,490]

Ex2. A person invest ₹5,00,000 for 6 years @ 7.5% p.a. How much money he will get after 6 years?

[**Sol.** ₹7,71,650]

Ex3. A person wants to receive ₹10,000 per annum for 3 years. Find the amount to be deposited today if the rate of interest is 9% p.a.

[**Sol.** ₹25,313]

Ex4. A person invest ₹6,000 per annum for 5 years. Find the amount to be received at end if the rate of interest is 8.5% p.a.

[**Sol.** ₹35,552]

Ex5. A person invest ₹20,000 in a scheme today. He is supposed to get ₹4,000 per annum for next 5 years and will receive ₹6,000 as additional bonus at end of year 5. Find the net present value of cash flows if the rate of return is 9% p.a.

[**Sol.** ₹540.]

Ex6. A person invest ₹25,000 in a scheme today. He is supposed to get ₹4,500 per annum for next 4 years and will receive ₹8,000 as additional bonus at end of year 4. Find the net present value of cash flows if the rate of return is 10% p.a.

[**Sol.** ₹5,271]

Ex7. A person invest ₹20,000 in a scheme today. He is supposed to get ₹4,000, ₹4,200, ₹4,500 and ₹6,000 at the end of respective 4 years. Find the net present value of cash flows if the rate of return is 9% p.a.

[**Sol.** ₹5,074]

PRACTICAL QUESTIONS

1. SK Ltd. issued ₹100 lakhs 12% Debentures of ₹100 each. Calculate the cost of debt in each of the following cases. Assume tax rate being 40%.

(*a*) If Debentures are issued at par.

(*b*) If Debentures are issued at par with 5% floatation cost

(*c*) If Debentures are issued at 10% premium with 5% floatation cost.

[**Sol.** (*a*) 7.20%; (*b*) 7.58%; (*c*) 6.89%]

2. SK Ltd. issued ₹100 lakhs 12% Debentures of ₹100 each redeemable at premium of 5% after 5 years. Calculate the cost of debt in each of the following cases. Assume tax rate being 40%.

(*a*) If debentures are issued at par

(*b*) If debentures are issued at par with 5% floatation cost

(*c*) If debentures are issued at 10% discount with 5% floatation cost

[**Sol.** (*a*) 8%; (*b*) 9.20%; (*c*) 11.65%]

3. A company is considering raising of funds of about ₹100 lakhs by one of two alternative methods, viz. 14% institutional term loan and 13% non-convertible debentures. The term loan option would attract no major incidental cost. The debentures would have to be issued at a discount of 2.5% and would involve cost of issue of ₹1 lakh. Advise the company as to the better option based on the effective cost of capital in each case. Assume a tax rate of 35%.

[**Sol.** Loan = 9.10%; Debentures = 8.76%]

4. Five years ago, SK Ltd. issued 12% irredeemable debentures at ₹103, at ₹3 premium to their par value of ₹100. The current market price of these debentures is ₹94. If the company pays corporate tax at a rate of 35%, calculate its current cost of debenture capital?

[**Sol.** 8.298%]

5. SK Ltd. issued ₹10,00,000, 10% Debentures of face value ₹100 each, which are redeemable after 10 years. Current market price of debenture is ₹120 and flotation cost of 4%. If income tax rate is at 30%, compute cost of debenture using YTM method.?

[**Sol.** 5.03%]

6. SK Ltd. issued ₹10,00,000, zero coupon bond of face value ₹1,000 each at ₹350, which are redeemable after 12 years. Compute cost of bonds if there is no tax on capital gain.

You may use, $PVF_{(10\%, 12)} = 0.319$; $PVF_{(7\%, 12)} = 0.444$.

[**Sol.** 9.256 %]

7. SK Ltd. issued 10% Bonds of face value ₹1,000 each, which are redeemable after 5 years. The bonds are issued at ₹1,100 with 2% flotation cost. Tax rate is 30% and the bonds are amortized equally over the life of bonds. Compute cost of the bonds.

Years	1	2	3	4	5
PVF **@ 3%**	0.971	0.943	0.915	0.888	0.863
PVF **@ 5%**	0.952	0.907	0.864	0.823	0.784

[**Sol.** 4.14 %]

8. SK Ltd. issued 12% Bonds of face value ₹2,000 each, which are redeemable after 5 years. Tax rate is 30% and the bonds are amortized equally over the life of bonds. Compute the value of the bond if the investor expects a minimum return of 8% from the bonds.

[**Sol.** ₹2,020.26]

9. SK Ltd. issued ₹10,00,000, 12% Convertible Debentures of face value ₹100 each, which are redeemable after 6 years. At the time of redemption, the holder will have the option to convert the debenture into equity shares of the company in the ratio of 1:5 (5 shares for every 1 debenture). Current market price of equity share is ₹22 and of debenture is ₹120 with flotation cost of 4%. Historically, the equity share of the company grows by 6%p.a. If income tax rate is at 30%, compute cost of debenture using approximation method.

[**Sol.** 11.21%]

10. SK Ltd. issued ₹10,00,000, 10% Preference shares of face value ₹100 each, which are redeemable after 10 years. Compute cost of preference shares in each of the following conditions:

(*a*) Preference shares are issued at par and redeemable at par

(*b*) Preference shares are issued at par and redeemable at a premium of 10%

(*c*) Preference shares are issued at a discount of 10% and redeemable at par

(*d*) Preference shares are issued at a discount of 10% and redeemable at a premium of 10%.

[**Sol.** (*a*) 10%; (*b*) 10.48%; (*c*) 11.58%; (*d*) 12%]

11. An equity share of the company is selling for ₹50. The company had earned ₹6 per share at the end of last year. Dividend payout ratio is 60%. Dividend per share is expected to grow at the rate of 8% p.a. Calculate the cost of equity.

[**Sol.** 15.78%]

12. The shares of a chemical company are selling at ₹20 per share. The firm had paid dividend @ ₹2 per share last year. The estimated growth of the company is approximately 5% per year.

(*a*) Determine the cost of equity capital of the company.

(*b*) Determine the estimated market price of the equity share if the anticipated growth rate of the firm

(i) Rises to 8%

(ii) Fall to 3%

[**Sol.** (*a*) 15.50%; (*b*) (i) ₹28.80; (ii) ₹16.48]

13. A company's current price of share is ₹60 and dividend per share is ₹4. If its capitalization rate is 12%, what is the dividend growth rate?

[**Sol.** 5 %]

14. From the under mentioned facts, determine the cost of equity shares of company SK:

(*a*) Current market price of a share = ₹150

(*b*) Cost of floatation per share on new shares ₹3

(*c*) Dividend paid on the outstanding shares over the past five years:

Year	Dividend Per Share
1	₹10.50
2	₹11.02
3	₹11.58
4	₹12.16
5	₹12.76
6	₹13.40

(*d*) Assume a fixed dividend payout ratio

(*e*) Expected dividend on the new shares at the end of the current year is ₹14.10 per share.

[**Sol.** 14.59%]

15. The following is an extract from the financial statement of SK Ltd.

	(In Lakhs)
Operating profit	105
Less: Interest on debentures	33
	72
Less: Income tax	36
Net Profit	36
Equity share capital (shares of ₹10 each)	200
Reserves and surplus	100
15% Non-convertible debentures (of ₹100 each)	220
	520

The market price per equity shares is ₹12 and per debenture ₹93.75.

(*a*) What is earning per share?

(*b*) What is the percentage cost of capital of the company for the debentures funds and the equity?

[**Sol.** (*a*) ₹1.80; (*b*) 15%]

16. From the following information, calculate the cost of equity (*Ke*):

Risk free rate of interest	8%
Expected return of market portfolio	18%
Standard deviation of an asset	2.8%
Market standard deviation	2.3%
Correlation coefficient	0.8

[**Sol.** 17.74%]

17. (*a*) Calculate the expected rate of return of the security (*Ke*) from the following information:

Beta of security	0.5
Expected rate of return on market portfolio	15%
Risk-free rate of return	0.06

(*b*) If another security has an expected rate of return (*Ke*) of 18%, what would be its Beta?

[**Sol.** (*a*) 10.50%; (*b*) 1.33]

18. SK Ltd. has invested in four streams of business (*S*, *K*, *M* and *P*), the following sums: *S* – ₹10,000; K – ₹20,000; M – ₹16,000; P – ₹14,000.

The β values of these businesses are 0.80, 1.20, 1.40 and 1.75 respectively. If the risk free return is 4.25% and the market return is 11%,

(*a*) What is the β of SK Ltd. and its expected return/ cost of equity?

(*b*) If SK Ltd. encashes its investment in business K and reinvest the funds in RBI bonds yielding a return of 4.25%, what is the β value of the businesses and its expected return?

[**Sol.** (*a*) 13.126%; (*b*) 10.43%]

19. Following data relates to SK ltd.: **[SM]**

Year	1	2	3	4	5
Dividend per share	1.00	1.00	1.20	1.25	1.15
Price per share (at the beginning)	9.00	9.75	11.50	11.00	10.60

Calculate the cost of equity using realized yield approach.

[**Sol.** 15%]

20. Mr. S had purchased a share of SK Limited for ₹1,000. He received dividend for a period of five years at the rate of 10%. At the end of the fifth year, he sold the share for ₹1,128. You are required to compute the cost of equity as per realised yield approach. **[SM]**

[**Sol.** 12.002%]

21. An equity share of a company is presently selling at ₹125 per share. The earnings per share is ₹20 of which 60% is paid as dividend. The shareholders expect the company to earn a constant after tax rate of 10% on its investment of retained earnings. The flotation cost of new shares is expected to be 4% of issue price. Calculate the cost of equity and cost of retained earnings.

[**Sol.** Ke = 14.40%; Kr = 13.98%]

22. Calculate the cost of retained earnings from the following information:

Current market price of a share ₹140

Cost of brokerage per share 3%

Growth in expected dividend 5%

Expected dividend per share on new shares ₹14

Shareholder's marginal/personal income tax 22%

[**Sol.** 11.349%]

23. A company issues: **[SM, May 2022]**

- 15% convertible debentures of ₹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 ₹12.76 per share. Five years ago, it paid dividend of ₹10 per share. Flotation cost is 5% of issue amount.
- 5% preference shares of ₹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 the cost of preference shares.

Year	1	2	3	4	5	6	7	8	9	10
$PVIF0._{03,t}$	0.971	0.943	0.915	0.888	0.863	0.837	0.813	0.789	0.766	0.744
$PVIF0._{05,t}$	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
$PVIFA0._{03,t}$	0.971	1.913	2.829	3.717	4.580	5.417	6.230	7.020	7.786	8.530
$PVIFA0._{05,t}$	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

[**Sol.** (i) 13.24%; (ii) 4.60%]

24. For varying levels of debt-equity mix, the estimates of the cost of debt (after tax) and equity capital are given below:

Debt as % of total capital employed	Cost of Debt	Cost of equity
0	7.0	15.0
10	7.0	15.0
20	7.0	16.0
30	8.0	17.0
40	9.0	18.0
50	10.0	21.0
60	11.0	24.0

You are required to decide on the optimal debt-equity mix for the company by calculating the composite cost of capital.

[**Sol.** 15%; 14.20%; 14.20%; 14.30%; 14.140%; 15.50%; 16.20%]

25. From the following capital structure of a company, calculate the overall cost of capital, using (a) book value weights, and (b) market value weights.

Source	Book Value	Market Value
Equity share capital (₹10 shares)	45,000	90,000
Retained earnings	15,000	
Preference share capital	10,000	10,000
Debentures	30,000	30,000

The after tax cost of different sources of finance is as follows:

Equity share capital – 14%

Retained earnings – 13%

Preference share capital – 10%

Debentures – 5%

[**Sol.** (*a*) 10.75%; (*b*) 11.44%]

26. The capital structure of a company as on 31st March 2021 is as follows:

	₹
Equity capital: 6,00,000 equity shares of ₹100 each	6 crores
Reserve and surplus	1.20 crores
12% debentures of ₹100 each	1.80 crores

For the year ended 31st March 2021, the company is expected to pay equity dividend @ 24%. Dividend is likely to grow by 5% every year. The market price of equity share is ₹600 per share. Income tax rate applicable to the company is 30%.

Required:

(*a*) Compute the current weighted average cost of capital

(*b*) The company has plan to raise a further ₹3 crores by way of long-term loan at 18% interest. If loan is raised the market price of equity share is expected to fall to ₹500 per share. What will be the new weighted average cost of capital of the company?

[**Sol.** (*a*) 8.88%; (*b*) 10.29%]

27. The latest Balance Sheet of SK Ltd. is given below: **(₹'000)**

Ordinary shares (50,000 shares)	500
Share Premium	100
Retained profits	600
	1,200
8% Preference shares	400
13% Perpetual debts (Face value ₹100 each)	600
	2,200

The ordinary shares are currently priced at ₹39 ex-dividend each and ₹25 preference share is priced at ₹18 cum-dividend. The debentures are selling at 110% ex-interest and tax is paid by SK Ltd. at 40%. SK Ltd. has a beta of 0.90, risk free return is 10% & market return is 20%. Calculate the weighted average cost of capital, (based on market value) WACC of SK Ltd. **[Similar Nov 2022]**

[**Sol.** 15.68%]

28. SK Ltd. evaluates all its capital projects using discounting rate of 15%. Its capital structure consists of equity share capital, retained earnings, bank term loan and debentures redeemable at par.

Rate of interest on bank term loan is 1.5 times that of debenture. Remaining tenure of debenture and bank loan is 3 years and. 5 years respectively. Book value of equity share capital, retained earnings and bank loan is ₹10,00,000, ₹15,00,000 and ₹10,00,000 respectively. Debentures which are having book value of ₹15,00,000 are currently trading at ₹97 per debenture. The ongoing P/E multiple for the shares of the company stands at 5. You are required to calculate the rate of interest on bank loan and debentures if tax rate applicable is 25%. **[RTP Nov 2022]**

[**Sol.** Interest on debentures = 10.36%; Interest on bank loan = 15.54%]

29. An entity has ₹50 lakhs existing funds financed ₹20 lakhs from equity share capital, ₹15 lakhs form retained earnings and ₹15 lakhs from 12% debentures. It requires additional funds of ₹20 lakhs. These can be financed ₹10 lakhs from 14% debentures and ₹10 lakhs from new issue of equity shares. Tax rate applicable to the company is 35%. The company is expecting to pay ₹4 per share at the end of the year. The company's growth rate of dividends is expected to be 8% perpetually. Market price per equity share is ₹40 per share. Issue price of the new equity shares is expected to be ₹35 per share. Floatation cost to the issue is ₹3 per share. Compute weighted marginal cost of capital.

[**Sol.** 14.80%]

30. SK Ltd. wishes to raise additional finance of ₹30 lakhs for meeting its investment plans. The company has ₹6,00,000 in the form of retained earnings available for investment purposes. The following are further details: **[Similar Nov 2019]**

- Debt/Equity - 30 : 70
- Cost of debt – at the rate of 11% (before tax) upto ₹3,00,000 and 14% (before tax) beyond ₹3,00,000
- Previous earning per share – ₹15
- Dividend pay-out – 70% of earnings
- Expected growth rate in dividend - 10%
- Current market price per share - ₹90
- Company's tax rate is 30% and shareholder's personal tax rate is 20%

You are required:

(*a*) To determine the post-tax average cost of additional debt

(*b*) To determine the cost of retained earnings and cost of equity

(*c*) Compute the overall weighted average (after tax) cost of additional finance

[**Sol.** (*a*) 9.10%; (*b*) 18.26%; 22.83%; (*c*) 17.797%]

31. The SK Ltd. is planning a ₹10 crores expansion of its chain of restaurants to several neighbouring states. This expansion will be financed, in part with debt issued with a coupon interest rate of 15%. The bonds have a 10 years maturity and ₹1,000 face value and they will be sold to new Ewing ₹990 after issue costs. The company's marginal tax rate is 40%.

Preference share capital will cost SK Ltd. 14%. The company paid an equity dividend of ₹2 per share last year. The current market price per share is ₹15 and new shares can be sold to net ₹14 per share. The company's dividends are expected to increase at an annual rate of 5% for the foreseeable future. SK Ltd. expects to have ₹2 crores of retained earnings available to finance the expansion. The company's target capital structure is:

Debt	20%
Preference shares	5%
Equity shares	75%

Calculate the weighted cost of capital that is appropriated to use in evaluating this expansion programme.

[**Sol.** 17.33%]

32. The SK Company has following capital structure at 31st March, 2021 which is considered to be optimum: **[Similar to SM, Similar MTP Nov 2019]**

13% debenture	₹3,60,000
11% Preference share capital	₹1,20,000
Equity share capital (2,00,000 shares)	₹19,20,000

The company's share has a current market price of ₹27.75 per share. The expected dividend per share in next year is 50% of the 2021 EPS. The EPS of last 10 years is as follows. The past trends are expected to continue

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
EPS	1.000	1.120	1.254	1.405	1.574	1.762	1.974	2.211	2.476	2.773

The company can issue 14% new debenture. The company's debenture is currently selling at ₹98. The new preference issue can be sold at a net price of ₹9.80, paying a dividend of ₹1.20 per share. The company's marginal tax rate is 50%.

(*a*) Calculate the after tax cost (*i*) of a new debts and new preference share capital, (ii) of ordinary equity assuming new equity comes from the retained earnings.

(*b*) Calculate the marginal cost of capital

(*c*) How much can be spent for capital investment before new ordinary share must be sold? Assuming that retained earnings available for next year's investment are 50% of 2021 earnings.

(*d*) What will be marginal cost of capital {cost of fund raised in excess of the amount calculated in part (*c*)} if the company can sell new ordinary shares to net ₹20 per share? The cost of debt and of preference capital is constant.

[**Sol.** (*a*) (i) Kp = 12.24%; Kd = 7.14%; (ii) 17%; (*b*) 15.283%; (*c*) ₹3,46,625; (*d*) 16.827%]

PRACTICE QUESTIONS

33. A company issued 10,000 debentures of ₹100 each at a premium of 10% on 1.4.2023 to be matured on 1.4.2028. The debentures will be redeemed on maturity. Compute the cost of debentures assuming 35% as tax rate **[SM]**

[**Sol.** 4.28%]

34. A company issued 10,000, 10% debentures of ₹100 each at par on 1.4.2018 to be matured on 1.4.2028. the company wants to know the cost if its existing debt on 1.4.2023 when the market price of the debenture is ₹80. Compute the cost of existing debentures assuming 35% tax rate**.** **[SM]**

[**Sol.** 11.67%]

35. Institutional Development Bank (IDBI) issued Zero interest deep discount bonds of face value of ₹1,00,000 each issued at ₹2,500 and repayable after 25 years. Compute the cost of debt if there is no corporate tax. **[SM]**

You may use $PVF_{(15\%,25)} = 0.030$ and $PVF_{(16\%, 25)} = 0.024$.

[**Sol.** 15.83%]

36. RBML is proposing to sell a 5-year bond of ₹5,000 at 8 per cent rate of interest per annum. The bond amount will be amortised equally over its life. Calculate the bond's present value for an investor if he expects a minimum rate of return of 6 percent? **[SM]**

[**Sol.** ₹5,262.62]

37. TT Ltd. issued 20,000, 10% convertible debentures of ₹100 each with a maturity period of 5 years. At maturity the debentures holders will have the option to convert debentures into equity shares of the company in ratio of 1:5 (5 shares for each debentures). The current market price of the equity share is ₹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: **[Nov 2020]**

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

[**Sol.** Approximation method = 10.67%; *IRR* = 11.08%]

38. SK Ltd. issues, 20,000 10% preference shares of ₹100 each at ₹95 each. Calculate the cost of preference shares. **[SM]**

[**Sol.** 10.53%]

39. If SK Ltd. is issuing preferred stock at ₹100 per share, with a stated dividend of ₹12 and a flotation cost of 3% then, calculate the cost of preference share? **[SM]**

[**Sol.** 12.37%]

40. SK Ltd. issues 2,000 10% preference shares of ₹100 each at ₹95 each. The company proposes to redeem the preference shares at the end of 10th year from the date of issue. Calculate the cost of preference share? **[SM]**

[**Sol.** 10.77%]

41. A company has paid dividend of ₹1 per share (of face value of ₹10 each) last year and it is expected to grow @10% every year. Calculate the cost of equity if the market price per share is ₹55. **[SM]**

[**Sol.** 12%]

42. SK Company's Equity Share is quoted in the market at ₹25 per share currently. The company pays a dividend of ₹2 per share and the Investor's Market expects a growth rate of 6% per year. You are required to: **[SM]**

(*a*) Calculate the company's cost of equity capital

(*b*) If the anticipated growth rate is 8% per annum, calculate the indicated market price per share

(*c*) If the company issues 10% debentures of face value of ₹100 each and realizes ₹96 per debenture while the debentures are redeemable after 12 years at a premium of 12% what will be the cost of debentures using YTM? [Tax = 50%]

You may use following discount factors:

Discount Rate	PVF (r, 12)	PVAF (r, 12)
5%	0.557	8.863
10%	0.319	6.814

[**Sol.** (*a*) 14.48%; (*b*) ₹33.33; (*c*) 6.45%]

43. From the following information, calculate the cost of equity according to

(*a*) Dividend price approach;

(*b*) Dividend price plus growth approach;

(*c*) Earning Price Ratio approach;

(*d*) Earning price plus growth approach;

(*e*) Capital assets pricing model;

- Current market price of an equity share : ₹100
- Expected earnings per share at the end of the year : ₹10
- Dividend Payout ratio : 80%
- Growth Rate : 6%
- Rate of return on risk free investment : 8%
- Rate of return on market portfolio : 18%
- Volatility of securities return relative to the return of a broad based market portfolio : 1.275

[**Sol.** (*a*) 8%; (*b*) 14%; (*c*) 10%; (*d*) 16%; (*e*) 20.75%]

44. Calculate the cost of equity capital of SK Ltd., whose risk-free rate of return equals 10%. The firm's beta equals 1.75 and the return on market portfolio equals to 15%. **[SM]**

[**Sol.** 18.75%]

45. Face value of equity shares of a company is ₹10, while current market price is ₹200 per share. Company is going to start a new project, and is planning to finance it partly by new issue and partially by retained earnings. You are required to calculate cost of equity shares as well as cost of retained earnings if issue price will be ₹190 per share and flotation cost will be ₹5 per share. Dividend at the end of first year is expected to be ₹10 and growth rate will be 5%. **[SM]**

[**Sol.** $Ke = 10.41\%$; $Kr = 10\%$]

46. SK company provides the following details:

$D0 = ₹4.19$ $P0 = ₹50$ $g = 5\%$

Calculate the cost of retained earnings. **[SM]**

[**Sol.** 13.80%]

47. SK company provides the following details:

$R_f = 7\%$ $(R) = 1.20$ $R_m - R_f = 6\%$

Calculate the cost of retained earnings based on *CAPM* method. **[SM]**

[**Sol.** 14.20%]

48. M/s Navya Corporation has a capital structure of 40% debt and 60% equity. The company is presently considering several alternative investment proposals costing less than ₹20 lakhs. The corporation always raises the required funds without disturbing its present debt equity ratio.

The cost of raising the debt and equity are as under: **[RTP Nov 2018]**

Project Cost	Cost of debt	Cost of equity
Upto ₹2 lakhs	10%	12%
Above ₹2 lakhs & upto ₹5 lakhs	11%	13%
Above ₹5 lakhs & upto ₹10 lakhs	12%	14%
Above ₹10 lakhs & upto ₹20 lakhs	13%	14.5%

Assuming the tax rate at 50%, CALCUALTE:

(*a*) Cost of capital of two projects *X* and *Y* whose fund requirements are ₹6.5 lakhs and ₹14 lakhs respectively.

(*b*) If a project is expected to give after tax return of 10%, DETERMINE under what conditions it would be acceptable?

[**Sol.** (*a*) 6%; 6.50%]

49. Calculate the WACC using the following data by using: **[RTP Nov 2020, Similar Jan 2021]**

(*a*) Book value weights (*b*) Market value weights

The capital structure of the company is as under:

	(₹)
Debentures (₹100 per debenture)	5,00,000
Preference shares (₹100 per share)	5,00,000
Equity shares (₹10 per share)	10,00,000
	20,00,000

The market price of these securities are:

Debentures	₹105 per debenture
Preference shares	₹110 per preference share
Equity shares	₹24 per equity share

Additional information:

(*a*) ₹100 per debenture redeemable at par, 10% coupon rate, 4% flotation costs, 10 year maturity.

(*b*) ₹100 per preference share redeemable at par, 5% coupon rate, 2% flotation cost and 10 year maturity.

(*c*) Equity shares has ₹4 flotation cost and market price of ₹24 per share.

The next year expected dividend is ₹1 with annual growth rate of 5%. The firm has practice of paying all earnings in the form of dividend.

Corporate tax rate is 30%. Use YTM method to calculate cost of debentures and preference shares.

[**Sol.** (a) 7.74%; (b) 8.59%]

50. SK Ltd. has 5,00,000, ₹1 ordinary shares whose current ex-dividend market price is ₹1.50 per share. The company has just paid a dividend of 27 paise per share, and dividends are expected to continue at this level for some *W*. If the company has no debt capital, compute the weighted average cost of capital? **[SM]**

[**Sol.** 18%]

51. Cost of equity of a company is 10.41% while cost of retained earnings is 10%. There are 50,000 equity shares of ₹10 each and retained earnings of ₹15,00,000. Market price per equity share is ₹50. Calculate WACC using market value weights if there are no other sources of finance. **[SM]**

[**Sol.** 10.10%]

52. The following details are provided by the company: **[SM]**

	(₹)
Equity share capital	65,00,000
12% Preference share capital	12,00,000
15% Redeemable debentures	20,00,000
10% Convertible debentures	8,00,000

The cost of equity capital for the company is 16.30% and income tax rate for the company is 30%. You are required to calculate the weighted average cost of capital of the company.

[**Sol.** 13.99%]

53. Book value of capital structure of B Ltd. is as follows: [Dec**ember 2021]**

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

Currently, the market value of debenture is ₹110 per debenture and equity share is ₹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.

[**Sol.** 10.77%]

54. Determine the cost of capital of SK ltd. using the book value and market value weights from the following information: **[SM, Similar RTP May 2022]**

Sources	Book Value (₹)	Market Value (₹)
Equity shares	1,20,00,000	2,00,00,000
Retained earnings	30,00,000	–
Preference shares	36,00,0000	33,75,000
Debentures	9,00,000	10,40,000

Additional information:

(*a*) Equity: Equity shares are quoted at ₹130 per share and a new issue priced at ₹125 per share will be fully subscribed; flotation cost will be ₹5 per share.

(*b*) Dividend: During the previous 5 years, dividends have steadily increased from ₹10.60 to ₹14.19 per share. Dividend at the end of the current year is expected to be ₹15 per share.

(*c*) Preference shares: 15% Preference shares with face value of ₹100 would realise ₹105 per share.

(*d*) Debentures: The company proposes to issue 11-year 15% debentures but the yield on debentures of similar maturity and risk class is 16%; flotation cost is 2%.

(*e*) Tax: Corporate tax rate is 35%. Ignore dividend tax.

(*f*) Flotation cost would be calculated on face value.

[**Sol.** *Ko* (*BV*) = 17.29%; *Ko* (*MV*) = 17.51%]

55. SK has issued 10,000 ordinary shares of ₹100 each. Details of the company's dividends per share during the past 4 years are as follows:

Year ended	Dividend per share (₹)
2017	26
2020	30

The current market value of each ordinary share of SK is ₹235 cum-dividend. The 2020 dividend of ₹30 per share has just been paid. You are required to estimate the cost of capital for SK ordinary share capital.

[**Sol.** 20.25%]

56. Capital structure of *D* Ltd. as on 31st March, 2023 is given below: **[May 2023]**

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

- Current market price of equity share is ₹80 per share. The company has paid dividend of ₹14.07 per share. Seven years ago, it paid dividend of ₹10 per share. Expected dividend is ₹16 per share.
- 8% Preference shares are redeemable at 6% premium after five years. Current market price per preference share is ₹104.
- 12% debentures are redeemable at 20% premium after 10 years. Flotation cost is ₹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 ₹30,00,000 from bank. This financial decision is expected to increase dividend on equity share from ₹16 per share to ₹18 per share. However, the market price of equity share is expected to decline from ₹80 to ₹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

[**Sol.** (i) 18.40%; (ii) 16.76%]

57. The following items have been extracted from the Liabilities side of the Balance Sheet of SK Company as at 31 December 2020:

Paid up capital

4,00,000 Equity Shares of ₹10 each	40,00,000
Reserves and Surplus	60,00,000
Loans: 15% Non-convertible Debentures	20,00,000
14% Institutional Loans	60,00,000

Other information about the company as relevant is given below:

Year ended 31 Dec	Dividend per share	Earnings per share	Average market price per share
31 Dec	share	share	price per share
2020	4.00	7.50	50.00
2019	3.00	6.00	40.00
2018	4.00	4.50	30.00

You are required to calculate the weighted average cost of capital, using book values as weights and Earnings/Price (E/P) ratio as the basis of cost of equity. Assume tax rate is 40%.

[**Sol.** 12.10%]

58. SK Ltd. has the following book-value capital structure as on March 31, 2003.

	₹
Equity share capital (2,00,000 shares)	40,00,000
11.5% Preference shares	10,00,000
10% debentures	30,00,000
	80,00,000

The equity share of the company sells for ₹20. It is expected that the company will pay next year a dividend of ₹2 per equity share, which is expected to grow at 5% p.a. forever. Assume a 35% corporate tax rate. Required:

(*a*) Compute weighted average cost of capital (WACC) of the company based on the existing capital structure.

(*b*) Compute the new WACC, if the company raises an additional ₹20 lakhs debt by issuing 12% debentures. This would result in increasing the expected equity dividend to ₹2.40 and leave the growth rate unchanged, but the price of equity share will fall to ₹16 per share.

(*c*) Comment on the use of weights in the computation of weighted average cost of capital.

[**Sol.** (*a*) 11.375%; (*b*) 12.66%]

59. SK Ltd. has the following book value capital structure:

Equity capital (in share of ₹10 each fully paid up at par)	₹15 crores
11% Preference capital (in shares of ₹100 each fully paid up at par)	₹1 crores
Retained Earnings	₹20 crores
13.5% Debentures (of ₹100 each)	₹10 crores
15% Term loans	₹12.5 crores

The next expected dividend on equity shares per share is ₹3.60. The dividend per share is expected to grow at the rate of 7%. The market price per share is ₹40. Preference stock, redeemable after 10 years, is currently selling at ₹75 per share. Debentures, redeemable after six years, are selling at ₹80 per debenture. The income tax rate for the company is 40%.

You are required to determine the weighted average cost of capital (*Ko*) of the *XYZ* Ltd. using:

(*a*) Book value weights (*b*) Market value weights

[**Sol.** (*a*) 13.93%; (*b*) 14.59%]

60. The capital structure of SK Ltd. is as under:

9% Debenture	₹2,75,000
11% Preference shares	₹2,25,000
Equity shares (face value: ₹10 per share)	₹5,00,000
	₹10,00,000

Additional information:

(*a*) ₹100 per debenture issued and redeemable at par has 2% floatation cost and 10 years of maturity. The market price per debenture is ₹105.

(*b*) ₹100 per preference share issued & redeemable at par has 3% floatation cost and 10 year of maturity. The market price per preference share is ₹106.

(*c*) Equity share has ₹4 floatation cost and market price per share of ₹24 the next year expected dividend is ₹2 per share with annual growth of 5%. The firm has a practice of paying all earnings in the form of dividends.

(*d*) Corporate income tax rate is 35%

Required: Calculate weighted average cost of capital (WACC) using market value weights.

[**Sol.** 13.02%]

61. SK Ltd. wishes to raise additional finance of ₹10 lakhs for meeting its investment plans. It has ₹2,10,000 in the form of retained earnings available for investment purposes. Further details are as follows: **[SM, Similar RTP Nov 2023]**

(1)	Debt\Equity mix	3:7
(2)	Cost of debt	
	Up to ₹1,80,000	10% (before tax)
	Beyond ₹1,80,000	16% (before tax)
(3)	Earnings per share	₹4
(4)	Dividend pay out	50% of earnings
(5)	Expected growth rate of dividend	10%
(6)	Current market price per share	₹44
(7)	Tax rate	50%

You are required to:

(*a*) Determine the pattern for raising the additional finance

(*b*) Determine the post-tax average cost of additional debt

(*c*) Determine the cost of retained earnings and cost of equity

(*d*) Compute the overall weighted average after tax cost of additional finance.

[**Sol.** (*b*) 6.20%;(*c*) 15%; (*d*) 12.36%]

62. Alpha Ltd. has furnished the following information:

- Earning per share (EPS)	₹4
- Dividend payout ratio	₹25%
- Market price per share	₹50
- Rate of tax	30%
- Growth rate of dividend	10%

The company wants to raise additional capital of ₹10 lakhs including debt of ₹4 lakhs. The cost of debt (before tax) is 10% upto ₹2 lakhs and 15% beyond that. Compute the after tax cost of equity and debt and the weighted average cost of capital.

[**Sol.** $Ke = 12.20\%$; $Kd = 8.75\%$; $Ko = 10.82\%$]

63. Following are the information of TT Ltd.: **[July 2021]**

Particulars	
Earnings per share	₹10
Dividend per share	₹6
Expected growth rate in Dividend	6%
Current market price per share	₹120
Tax rate	30%
Requirement of Additional Finance	₹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

[**Sol.** (*b*) 6.125%;(*c*) 11.3%; (*d*) 7.85%]

64. MR Ltd. is having the following capital structure, which is considered to be optimum as on 31.03.2022. **[Nov 2023]**

Equity share capital (50,000 shares)	₹8,00,000
12% Pref. share capital	₹50,000
15% Debentures	₹1,50,000
	₹10,00,000

The earning per share (EPS) of the company were ₹2.50 in 2021 and the expected growth in equity dividend is 10% per year. The next year's dividend per share (DPS) is 50% EPS of the year 2021. The current market price per share (MPS) is ₹25.00. the 15% new debentures can be issued by the company. The company's debentures are currently selling at ₹96 per debenture. The new 12% Pref. Share can be sold at a net price of ₹91.50 (face value ₹100 each). The applicable tax rate is 30%.

You are required to calculate:

(*i*) After tax cost of

(*a*) New debt

(*b*) New preference share capital and

(*c*) Equity shares assuming that new equity shares comes from retained earnings.

(*ii*) Marginal cost of capital

(*iii*) How much can be spend for capital investment before sale of new equity shares assuming that retained earnings for next year investment is 50% of 2021?

[**Sol.** (i) (*a*) 10.94%; (*b*) 13.11%; (*c*) 15%; (ii) 14.30%; (iii) ₹78,125]

65. Amrit corporation has the following book value capital structure: **[RTP May 2023]**

Equity capital (50 lakh shares of ₹10 each)	₹5,00,00,000
15% Preference shares (50,000 shares of ₹100 each)	₹50,00,000
Retained earnings	₹4,00,00,000
Debentures 14% (2,50,000 debentures ₹100 each)	₹2,50,00,000
Term loan 13%	₹4,00,00,000

The companies last year earnings per share was ₹5, and it maintains a dividend pay-out ratio of 60% and returns on equity is 10%. The market price per share is ₹20.80. Preference shares redeemable after 10 years is currently selling for ₹90 per share. Debentures redeemable after 6 years are currently selling for ₹90 per share. Debentures redeemable after 6 years are currently selling for ₹75 per debenture. The income tax rate is 40%.

(*a*) Calculate the weighted average cost of capital (WACC) using market value proportions.

(*b*) Determine the marginal cost of capital (MACC) if it needs ₹5,00,00,000 next year assuming the amount will be raised by 60% equity, 20% debt and 20% retained earnings. Equity issues will fetch a net price of ₹14 and cost of debt will be 13% before tax up to ₹40,00,000 and beyond ₹40,00,000 it will be 15% before tax.

[**Sol.** (*a*) 15.74%; (*b*) 22.73%]

SOLUTIONS

33. I = Interest on debenture =10% of ₹100 = ₹10

NP = Net Proceeds =110% of ₹100 = ₹110

RV = Redemption value = ₹100

n = Period of debenture = 5 years

t = Tax rate = 35% or 0.35

$$\text{Cost of Debenture}(K_d) = \frac{I(1-t)+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}} = \frac{₹10(1-0.35)+\frac{(₹100-₹110)}{5 \text{ years}}}{\frac{(₹100+₹110)}{2}}$$

= ₹4.5/₹105 = 0.0428 = 4.28%

34. I = Interest on debenture = 10% of ₹100 = ₹10

NP = Current market price = ₹80

RV = Redemption value = ₹100

n = Period of debenture = 5 years

t = Tax rate

Cost of debenture (K_d)=

$$\frac{1(1-t)+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}}=\frac{₹10(1-0.35)+\frac{(₹100-₹80)}{5\text{ years}}}{\frac{(₹100+₹80)}{2}}=\frac{₹10.5}{₹90}=0.11666 \text{ or } 11.67\%$$

35. NP = ₹2,500; RV = ₹1,00,000; n = 25 years; I = 0

NPV at 15% = [I × (1 – t) × PVAF $_{(15\%, 10)}$] + [RV × PVF $_{(15\%,10)}$] – NP

= 0 + [1,00,000 × 0.030] – 2,500 = ₹500

NPV at 16% = [I × (1 – t) × PVAF $_{(16\%, 10)}$] + [RV × PVF $_{(16\%, 10)}$] – NP

= 0 + [1,00,000×0.024] – 2,500 = -₹100

Cost of debt (YTM) =

$$\text{Lower rate} + \left[\frac{\text{Lower rate NPV}}{\text{Lower rate NPV} - \text{Higher rate NPV}}\right](\text{Higher rate} - \text{Lower rate})$$

$$=15+\left[\frac{500}{500-(-100)}\right](16-15)=15.83\%$$

36.

Year	Principal Outstanding	Principal Repayment	Interest Payment Net of Tax	Total Cash Flows
1	5,000	1,000	5,000 × 8% = 400	1,400
2	4,000	1,000	4,000 × 8% = 320	1,320
3	3,000	1,000	3,000 × 8% = 240	1,240
4	2,000	1,000	2,000 × 8% = 160	1,160
5	1,000	1,000	1,000 × 8% = 80	1,080

Value of the bond

= [1,400 × $PVF_{(6\%,1)}$] + [1,320 × $PVF_{(6\%,2)}$] + [1,240 × PVF$_{(6\%,3)}$] + [1,160 × PVF$_{(6\%,4)}$] + [1,080 × $PVF_{(6\%,5)}$]

= (1,400 × 0.943) + 1,320 × 0.890) + (1,240 × 0.840) + (1,160 × 0.792) + (1,080 × 0.747)

=₹5,262.62

37. Value of equity shares after 5 years = 20 × (1 + 0.04)5 = ₹24.33

Redemption value of debenture will be higher of:

(*a*) Cash value of debenture = ₹100

(*b*) Value of equity shares = 5 × 24.33 = ₹121.65

∴ Higher redemption value of the above two = ₹121.65

Approximation Method:

Cost of Debentures (*Kd*)

$$= \frac{I(1-t)+\{(RV-NP \div n\}}{\{(NP+RV)\div 2\}} = \frac{10(1-0.25)+\{(121.65-100)\div 5\}}{\{(100+121.65\div 2\}} = \frac{11.83}{110.825} = 10.67\%$$

Internal Rate of Return Method:

NPV at 10% = PVCI – PVCO = PV of Interest + PV of Redemption Value – Investment

= [10 × (1 – 0.25) × 3.790] + [121.65 × 0.621] – 100 = ₹3.96965

NPV at 15% = PVCI – PVCO = PV of Interest + PV of Redemption Value – Investment

= [10 × (1 – 0.25) × 3.353] + [121.65 × 0.497] – 100 = –₹14.39245.

Cost of Debentures (Kd) = $L + \left[\frac{NPV_L}{NPV_L - NPV_H}\right](H-L)$

$$= 10 + \left[\frac{3.96965}{3.96965-(-14.39245)}\right](15-10) = 11.08\%.$$

38. $K_P = \frac{PD}{P_o} = \frac{(10\times 2{,}000)}{(95\times 2{,}000)} = \frac{10}{95} = 0.1053$ or 10.53%.

39. P_o = ₹100 – 3% of ₹100 = ₹97

$K_p = \frac{PD}{P_o} = \frac{₹\,12}{₹\,97} = 0.1237$ or 12.37%.

40. $K_p = \frac{PD + \frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}} = \frac{10+\left(\frac{100-95}{10}\right)}{\left(\frac{100+95}{2}\right)} = 0.1077$ or 10.77% (approx.)

41. $K_e = \frac{D_1}{P_o} + g = \frac{₹\,1(1+0.1)}{₹\,55} + 0.1 = 0.12$ or 12%

42. (*a*) $Ke = \frac{D_1}{P_0} + g = \frac{2(1+0.06)}{25} + 6\% = 14.48\%$

(*b*) $Ke = \frac{D_1}{P_0} + g \Rightarrow 0.1448 = \frac{2(1+0.08)}{MPS} + 8\% \Rightarrow MPS = ₹\,33.33$

(*c*) Cost of Debenture (K_d) :

Using Present Value method (*YTM*)

Identification of relevant cash flows

Year	Cash flows
0	Current market price (P_0) = ₹96
1 to 12	Interest net of tax [I (1 – t)] = 10% of ₹100(1 – 0.5) = ₹5
12	Redemption value (RV) = ₹100 (1.12) = ₹112

Calculation of Net Present Values (NPV) at two discount rates

Year	Cash flows(₹)	Discount factor @ 5%(L)	Present Value(₹)	Discount factor @ 10% (H)	Present Value(₹)
0	(96)	1.000	(96.00)	1.000	(96.00)
1 to 12	5	8.863	44.32	6.814	34.07
12	112	0.557	62.38	0.319	35.73
NPV			+10.7		–26.2

$$IRR = L + \frac{NPV_L}{NPV_L - NPV_H}(H - L) = 5\% + \frac{₹\,107}{₹\,10.7 - (₹ - 26.2)}(10\% - 5\%) = 5\% + \frac{₹\,53.5}{₹\,36.9} - 6.45\%$$

Therefore, $K_d = 6.45\%$.

43. (*a*) **Dividend Price Approach**

$$Ke = \frac{D_1}{P_0} = \frac{80\% \text{ of } 10}{100} = 8\%$$

(*b*) **Dividend Price Plus Growth Approach**

$$Ke = \frac{D_1}{P_0} + g = \frac{80\% \text{ of } 10}{100} + 6\% = 14\%$$

(*c*) **Earning Price Approach**

$$Ke = \frac{E_1}{P_0} = \frac{10}{100} = 10\%$$

(*d*) **Earning Price plus Growth Approach**

$$Ke = \frac{E_1}{P_0} + g = \frac{10}{100} + 6\% = 16\%$$

(*e*) **Capital Assets Pricing Model**

$Ke = Rf + \beta \times (Rm - Rf) = 8\% + 1.275 \times (18\% - 8\%) = 20.75\%$.

44. $K_e = R_f + B\,(R_m - R_f) = 0.10 + 1.75(0.15 - 0.10) = 0.1875$ or 18.75%.

45. $K_r = \frac{D_1}{P_0} + g = \frac{10}{200} + 0.05 = 10\%$

$K_e = \frac{D_1}{P_0} + g = \frac{₹\,10}{₹\,190 - ₹\,5} + 0.05 = 10.41\%$.

46. $K_r = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g = \frac{₹\,4.19(1+0.05)}{₹\,50} + 0.05 = 0.088 + 0.05 = 13.8\%$

47. $K_r = R_f + B\,(R_m - R_f) = 7\% + 1.20\,(6\%) = 7\% + 7.20 = 14.2\%$.

48. (*a*) For fund requirement of ₹6.5 lakh

Weighted Average Cost of Capital

Source of Capital	Weight	Cost	WMCC
Equity	0.60	14%	8.40
Debt	0.40	6%*	2.40
	1.00		**10.80%**

*Cost of debt = $I \times (1 - t) = 12 \times (1 - 0.50) = 6\%$

For fund requirement of ₹14 lakh

Weighted Average Cost of Capital

Source of Capital	Weight	Cost	WMCC
Equity	0.60	14.50%	8.70
Debt	0.40	6.50%*	2.60
	1.00		**11.30%**

*Cost of debt = $I \times (1 - t) = 13 \times (1 - 0.50) = 6.50\%$.

(*b*) If a Project is expected to give after tax return of 10%, it would be acceptable provided its project cost does not exceed ₹5 lakhs or, after tax return should be more than or at least equal to the weighted average cost of capital.

49. (i) Cost of Equity $(K_e) = \frac{D_1}{P_0 - F} + g = \frac{₹1}{₹24 - ₹4} + 0.05 = 0.1$ or 10%

(ii) Cost of Debt (K_d)

Current market price (P0) = 105 – 4% = ₹100.80

Interest net of tax = $I\ (1 - t) = (10\% \times 100)(1 - 0.30) = ₹7$

Redemption value = RV = ₹100

Calculation of NPV at discount rate of 5% and 7%

Year	Cash flows (₹)	Discount factor @ 5%	Present Value (₹)	Discount factor @ 7%	Present Value (₹)
0	100.8	1.000	(100.8)	1.000	(100.8)
1 to 10	7	7.722	54.05	7.024	49.17
10	100	0.614	61.40	0.508	50.80
NPV			+14.65		– 0.83

Cost of debt = $Kd = 5\% + \frac{14.65}{14.65 - (-0.83)}(7\% - 5\%) = 5\% + \frac{14.65}{15.48}(7\% - 5\%) = 6.89\%$

(iii) **Cost of Preference shares (K_p)**

Current market price = $P0 = 110 - 2\% = ₹107.80$

Preference dividend = $5\% \times 100 = ₹5$

Redemption value = $RV = ₹100$

Calculation of NPV at discount rate of 3% and 5%

Year	Cash flows (₹)	Discount factor @ 3%	Present Value (₹)	Discount factor @ 5%	Present Value (₹)
0	107.8	1.000	(107.8)	1.000	(107.8)
1 to 10	5	8.530	42.65	7.722	38.61
10	100	0.744	74.40	0.614	61.40
NPV			+ 9.25		– 7.79

Cost of Preference = $Kp = 3\% + \frac{9.25}{9.25-(-7.79)}(5\%-3\%) = 3\% + \frac{9.25}{17.04}(5\%-3\%) = 4.08\%$

(*a*) **Calculation of WACC using book value weights**

Source of capital	Book Value	Weights	After tax cost of capital	WACC (K_o)
	(₹)	(a)	(b)	(c)=(a)×(b)
10% Debentures	5,00,000	0.25	0.0689	0.01723
5% Preference shares	5,00,000	0.25	0.0408	0.0102
Equity shares	10,00,000	0.50	0.10	0.05000
	20,00,000	1.00		0.07743

WACC(K_o) = 0.07743 or 7.74%

(*b*) **Calculation of WACC using market value weights**

Source of capital	Market Value	Weights	After tax cost of capital	WACC (K_0)
	(₹)	(a)	(b)	(c) = (a) × (b)
10% Debentures (₹105 × 5,000)	5,25,000	0.151	0.0689	0.0104
5% Preference shares (₹110 × 5,000)	5,50,000	0.158	0.0408	0.0064
Equity shares (₹24 × 1,00,000)	24,00,000	0.691	0.10	0.0691
	34,75,000	1.000		0.0859

$WACC(K_0) = 0.0859$ or 8.59%

50. Market value of equity, E = 5,00,000 shares × ₹1.50 = ₹7,50,000

Market value of debt, D = Nil

Cost of equity capital, $K_e = \frac{D_1}{P_0} = \frac{₹\,0.27}{₹\,1.50} = 0.18$

Since there is no debt capital, $WACC = K_e$ = 18 percent.

51. Book value of paid up equity capital = ₹5,00,000

Book value of retained earnings = ₹15,00,000

Ratio of Paid up equity capital & retained earnings = 5,00,000 : 15,00,000 = 1:3

Market value of paid up equity capital & retained earnings = ₹50,000 × ₹50 = ₹25,00,000

Market value of paid up equity capital = ₹25,00,000 × 1/4 = ₹6,25,000

Market value of retained earnings = ₹25,00,000 × 3/4 = ₹18,75,000

Calculation of WACC using market value weights

Source of capital	Market Value (₹)	Weights (*a*)	Cost of capital (*b*)	WACC (Ko) (*c*) = (*a*) × (*b*)
Equity shares	6,25,000	0.25	0.1041	0.0260
Retained earnings	18,75,000	0.75	0.1000	0.0750
	25,00,000	1.000		0.1010

WACC (K_0) = 0.1010 or 10.10%

52.

Calculation of Weighted Average Cost of Capital (*WACC*)

Source	(₹)	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	0.070**	0.0053
Total	1,05,00,000	1.0000		0.1399

Weighted Average Cost of Capital (WACC) = 0.1399 = 13.99%

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

** Cost of 10% Convertible Debentures (after tax) = 10(1 – 0.30) = 7% or 0.070

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

53. $Ke = \frac{EPS}{P0} = \frac{(24\% \times 100)}{180} = 0.1333 = 13.33\%$

$Kr = Ke = 13.33\%$

$Kd = \frac{I(1-t)}{Po} = \frac{(12\% \times 100)(1-0.30)}{110} = \frac{840}{110} = 7.64\%$

Computation of WACC (By Market Value Weights)

Source	Market Value (A)	Cost (B)	A × B
12% Debentures	$\frac{6,00,000}{100} \times 110 = 6,60,000$	7.64%	50,424
Equity Shareholder Fund	4,500×180 = 8,10,000	13.33%	1,07,973
	14,70,000		1,58,397

Weighted Average Cost of Capital = $\frac{1,58,397}{14,70,000} \times 100 = 10.77\%$

54. (i) Calculation of :

₹10.6 $(1+g)^5$ = ₹14.19 Or, $(1+g)^5 = \frac{14.19}{10.6} = 1.338$

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

Cost of Equity $(K_e) = \frac{D_1}{P_0 - F} + g = \frac{₹15}{₹125 - ₹5} + 0.06^* = 0.125 + 0.06 = 0.185$

(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 $(K_p) = \frac{PD}{P_0} = \frac{₹15}{₹105} = 0.1429$

(iv) Cost of Debentures $(K_d) = \frac{I(1-t) + \left(\frac{RV - NP}{n}\right)}{\frac{RV + NP}{2}} = \frac{₹15(1-0.35) + \left(\frac{₹100 - ₹91.75^*}{11 \text{ years}}\right)}{\frac{₹100 + ₹91.75^*}{2}}$

= ₹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) = ₹15 ÷ 0.16 = ₹93.75

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

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

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

P_0 = ₹15 × 5.029 + ₹100 × 0.195 = ₹94.935

Net Proceeds =₹94.935 – 2% of ₹100 = ₹92.935

Accordingly, the cost of debt can be calculated

Total Cost of capital [BV weights and MV weights] **(Amount in (₹) lakh)**

Source of capital	Weights		Specific Cost (K)	Total cost	
	BV	MV		(BV×K)	(MV×K)
Equity Shares	120	160*		22.2	29.6
Retained Earnings	30	40*	0.1850	5.4	7.2
Preference Shares	36	33.75	0.1800	5.14	4.82
Debentures	9	10.4	0.1429	0.986	1.139
	195	244.15	0.1095	33.73	42.76

*Market Value of equity has been apportioned in the ratio of Book Value of equity and retained earnings i.e., 120:30 or 4:1.

Weighted Average Cost of Capital (WACC):

$$\text{Using Book Value} = \frac{₹33.73}{₹195} = 0.1729 \text{ or } 17.29\%$$

$$\text{Using Market Value} = \frac{₹42.76}{₹244.15} = 0.17551 \text{ or } 17.51\%$$

55. In order to find out the cost of equity capital the growth rate, g, may be ascertained as follows:

$26\ (1+g)^3 = 30 \Rightarrow g = 4.9\%$

Ex-dividend price of the share = ₹235 – ₹30 = ₹205

$$Ke = \frac{D_1}{P_o} + g = \frac{30(1.049)}{205} + 0.049 = 20.25\%$$

56. Growth rate in dividend

$14.07 = 10 \times FVIF_{(i,7\text{ years})}$

$FVIF_{(i,\ 7\text{ years})} = 1.407$

$FVIF_{(5\%,\ 7\text{ years})} = 1.407$

$i = 5\%$

Growth rate in dividend = 5%

$$(b)\ Ke = \frac{D_1}{P_0} + g = \frac{16}{80} + 0.05 = 25\%$$

$$(c)\ Kp = \frac{PD + \left(\frac{RV - NP}{n}\right)}{\left(\frac{RV + NP}{2}\right)} = \frac{8 + \left(\frac{106 - 104}{5}\right)}{\left(\frac{106 + 104}{2}\right)} = 8\%$$

$$(d)\ Kd = \frac{I(1-t) + \left(\frac{RV - NP}{n}\right)}{\left(\frac{RV + NP}{2}\right)} = \frac{12(1-0.4) + \left(\frac{120 - 95}{10}\right)}{\left(\frac{120 + 95}{2}\right)} = 9.02\%$$

(*i*) Statement of WACC

Source	Book Value	Cost of capital	Total cost
Equity share capital	30,00,000	25%	7,50,000
Preference share capital	10,00,000	8%	80,000
Debentures	10,00,000	9.02%	90,200
	50,00,000		9,20,200

$$WACC = \frac{9,20,200}{50,00,000} \times 100 = 18.40\%$$

(*ii*) Cost of long term debt = 15(1 – 0.40) = 9%

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

Statement of WACC

Source	Book Value	Cost of capital	Total cost
Equity share capital	30,00,000	30%	9,00,000
Preference share capital	10,00,000	8%	80,000
Debentures	10,00,000	9.02%	90,200
Long term debt	30,00,000	9%	2,70,000
	80,00,000		13,40,200

$$WACC = \frac{13,40,200}{80,00,000} \times 100 = 16,76\%$$

57. $Ke = \frac{EPS}{MPS} = \frac{7.50}{50} = 15\%$

Kd (15% N. C. D) $= \frac{15(1-0.4)}{100} = 9\%$

Kd (14% Loan) $= \frac{14(1-0.4)}{100} = 8.4\%$

Statement Showing Computation of WACC:

Capital Structure	Amount	Cost of Capital	Weights	WACC
Equity Share Cap. & Reserves	1 Crore	15%	0.55	8.25%
15% Non-convertible Debentures	20 Lakh	9%	0.11	0.99%
14% Institutional Loan	60 Lakh	8.4%	0.33	2.86%
		15%	1.00	21.1%

58. (*a*) Weighted Average Cost of Capital of the Company is as follows:

Capital Structure	Amount	Cost of Capital	Weights	WACC
Equity Share Capital	40,00,000	15%	0.500	7.50%
11.5% preference shares	10,00,000	11.5%	0.125	1.4375%
10% debentures	30,00,000	6.5%	0.375	2.4375%
	80,00,000		1.000	11.375%

Working Notes:

1. Cost of equity capital $(Ke) = \frac{D_1}{P_o} + g = \frac{2}{20} + 5\% = 15$

2. Cost of preference share capital $(Kp) = \frac{D}{P} = \frac{11.5}{100} = 11.5\%$

3. Cost of new debentures $(Kd) = \frac{I(1-t)}{P} = \frac{10(1-0.35)}{100} = 6.5\%$

(*b*) **New Weighted Average Cost of Capital of the Company is as follows:**

Capital Structure	Amount	Cost of Capital	Weights	WACC
Equity Share Capital	40,00,000	20%	0.40	8.00%
11.5% preference shares	10,00,000	11.5%	0.10	1.15%
10% debentures	30,00,000	6.5%	0.30	1.95%
12% debentures	20,00,000	7.8%	0.20	1.56%
	1,00,00,000		1.00	12.66%

Working Notes: Cost of equity capital $(Ke) = \frac{D_1}{P_o} + g = \frac{2.40}{16} + 5\% = 20\%$

(*c*) **Comment:** (*i*) **Book Value Weights:** The weights are said to be book value weights if the proportions of different sources are ascertained on the basis of the face values i.e., the accounting values. The book value weights can be easily calculated by taking the relevant information from the capital structure as given in the balance sheet of the firm. Based on the value proportions in the Company's Balance Sheet, this represents the proportion a particular source of financing has in the Balance Sheet total.

(*ii*) **Market Value Weights:** The weights may also be calculated on the basis of the market value of different sources i.e., the proportion of each source at its market value. In order to calculate the market value weights, the firm has to find out the current market price of the securities in each category. However, a problem may arise if there is no market value available for a particular type of security.

59. $Ke = \frac{D_1}{P_o} + g = \frac{3.6}{40} + 7\% = 16\%$

$Kp = \frac{11 + (100 - 75)/10}{(100 + 75)/2} = 15.43\%$

$$Kd(\text{Debenture}) = \frac{13.5(1-0.4)+(100-80)/6}{(100+80)} = 12.7\%$$

$$Kd\ (\text{term loan}) = \frac{15(1-0.4)}{100} = 9\%$$

Weighted average cost of capital: (On the basis of Book Value Weights)

Source	Amount	Weights	Cost of Capital	WACC
Equity Capital	35 crore	0.598	16%	9.57
Preference Capital	1 crore	0.017	15.43%	0.26
Debentures	10 crore	0.171	12.7%	2.17
Term Loan	12.5 crore	0.214	9%	1.93
	58.5 crore	1.000		13.93%

Weighted Average Cost of Capital (On the basis of Market Value Weights)

Source	Amount	Weights	Cost of Capital	WACC
Equity Capital	60 crore	0.598	16%	9.57
Preference Capital	0.75 crore	0.017	15.43%	0.26
Debentures	8 crore	0.171	12.7%	2.17
Term Loan	12.5 crore	0.214	9%	1.93
	81.25 crore	1.000		13.93%

60. Computation of Specific Cost of Capital:

$$Ke = \frac{D1}{Po} + g = \frac{2}{24-4} + 5\% = 15\%$$

$$Kd = \frac{I(1-t)+(RV-NP)/n}{(RV+NP)/2} = \frac{11+(100-97)/10}{(100+97)/2} = \frac{11.30}{98.50} = 11.47\%$$

Calculation of WACC using Market Value Weights

Source of Capital	Market Value	Weights	Specific Cost	Total Cost
Debentures (₹105 per debenture)	2,88,750	0.1672	6.11%	1.02%
Preference Share (₹106 per share)	2,38,500	0.1381	11.47%	1.58%
Equity Share (₹24 per share)	12,00,000	0.6947	15%	10.42%
	17,27,250	1.00		13.02%

WACC using market value weights = 13.02%

61. Pattern for raising the additional finance:

Equity 70% of ₹10,00,000 = ₹7,00,000

Debt 30% of ₹10,00,000 = ₹3,00,000

The capital structure after raising additional finance:

		(₹)
Shareholders' funds		
Equity Capital	(₹7,00,000-₹2,10,000)	4,90,000
Retained earnings		2,10,000
Debt (Interest at 10% p.a.)		1,80,000
(Interest at 16% p.a.)	(₹3,00,000-₹1,80,000)	1,20,000
Total Funds		10,00,000

Determination of post-tax average cost of additional debt:

I = Interest Rate t = Corporate tax-rate On ₹1,80,000 = 10%(1 – 0.5) = 5% or 0.05 On ₹1,20,000 =16% (1 – 0.5) = 8% or 0.08.

$$\text{Average Cost of Debt} = \frac{I(1-t)}{P0} = \frac{(₹\,1,80,000 \times 0.05) + (₹\,1,20,000 \times 0.08)}{3,00,000} \times 100 = 6.2\%$$

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

D_0= Dividend paid =50% of EPS = 50% × ₹4 = ₹2

g = Growth rate =10%

P_0= Current market price per share =₹44.

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

Particulars	Amount (₹)	Weights	Cost of funds	Weighted Cost (%)
Equity (including retained earnings)	7,00,000	0.70	15%	10.5
Debt	3,00,000	0.30	6.2%	1.86
WACC	10,00,000			12.36

62. Cost of Equity Share Capital $(K_e) = \frac{D1}{P0} + g = \frac{(4 \times 25\%)(1 + 0.10)}{50} + 0.10 = 0.122 = 12.20\%$

$$\text{Cost of Debt } (Kd) = \frac{I(1-t)}{NP} = \frac{[(2,00,000 \times 10\%) + (2,00,000 \times 15\%)](1 - 0.30)}{4,00,000} \times 100 = 8.75\%$$

Weighted Average Cost of Capital (WACC)

Source (1)	Amount In ₹(2)	Weights (3)	Cost of capital (4)	Weighted Average Cost (5)= (3) × (4)
Equity	6,00,000	0.6	12.20	7.32
Debt	4,00,000	0.4	8.75	3.50
		1		10.82

Weighted Average Cost of Capital (WACC) = 10.82%

[Note: Ke can be computed alternatively without taking growth rate into consideration ($D_0/P_0 + g$). The values of Ke and WACC then would change accordingly.]

63. (*a*) **Pattern of raising capital**

Debt (30,00,000 × 2/3)	= ₹20,00,000
Equity (30,00,000 × 1/3)	= ₹10,00,000
Equity Fund:	
Equity (additional)	= ₹10,00,000
	₹10,00,000
Debt Fund:	
10% Debt	= ₹5,00,000
9% Debt	= ₹5,00,000
8% Debt	= ₹10,00,000
	₹20,00,000

(*b*) $Kd = \frac{\text{Interest}(1-t)}{P0} \times 100$

$$= \frac{[(5,00,000 \times 10\%) + (5,00,000 \times 9\%) + (10,00,000 \times 8\%)(1-0.30)]}{20,00,000} \times 100$$

= 1,22,500/20,00,000 × 100 = 6.125%

(*c*) $Ke = \frac{D(1+g)}{P0} + g = \frac{6 \times (1+0.06)}{120} + 0.06 = \frac{5.36}{120} + 0.06 = 0.113 = 11.3\%$

(*d*) Weighted average cost of capital

Source	Amount (₹)	Weight	Cost of capital after tax	WACC
Equity Fund	10,00,000	1/3	11.3	3.767
Debt Fund	20,00,000	2/3	6.125	4.083
Total	**30,00,000**	**1**		**7.85**

64. (i) (*a*) Cost of new debt $(Kd) = \frac{I(1-t)}{P0} = \frac{15(1-0.30)}{96} = 0.1094 = 10.94\%$

(*b*) Cost of new preference shares $(Kp) = \frac{PD}{Po} = \frac{12}{91.5} - 0.1311 = 13.11\%$

(*c*) Cost of equity $(Ke) = \frac{D1}{Po} + g = \frac{(2.50 \times 50\%)}{25} + 0.10 = 0.15 = 15\%$

(ii) Marginal cost of capital = (*Ke*)(*We*) + (*Kd*)(*Wd*) + (*Kp*)(*Wp*)

= (0.15)(0.80) + (.01994)(0.15) + (0.1311)(0.05) = 0.1430 = 14.30%

(iii) Amount that can be spend for capital investment = 50% × EPS × No. of shares

= 50% × 2.50 × 50,000 = ₹62,500

Portion of equity capital is 80% of total capital.

Thus, ₹62,500 is 80% of total capital

Amount of capital investment= $\frac{62,500}{80\%}$ =₹ 78,125

65. (a) **Calculation of cost of equity**

$D_0 = 5 \times 60\% = ₹3$

$g = b \times r = (1 - 0.60) \times 0.10 = 0.04 = 4\%$

$$\text{Ke} = \frac{D1}{P0} + g = \frac{3(1+0.04)}{20.80} + 0.04 = 0.19 = 19\%$$

Calculation of cost of preference shares

$$\text{Kp} = \frac{PD + \left(\frac{RV - NP}{N}\right)}{\left(\frac{RV + NP}{2}\right)} = \frac{15 + \left(\frac{100 - 90}{10}\right)}{\left(\frac{100 + 90}{2}\right)} = \frac{16}{95} = 0.1684 = 16.84\%$$

Calculation of cost of debentures

$$\text{Kd} = \frac{I(1-t) + \left(\frac{RV - NP}{N}\right)}{\left(\frac{RV + NP}{2}\right)} = \frac{14(1-0.40) + \left(\frac{100 - 75}{6}\right)}{\left(\frac{100 + 75}{2}\right)} = \frac{4.23}{87.5} = 0.1437 = 14.37\%$$

Calculation of cost of term loan

$Kd = I\ (1 - t) = 13(1 - 10.40) = 7.8\%$

Calculation of WACC (using market weights)

Source	Market Value	Weights (A)	Cost of Capital (B)	Product (A × B)
Equity	50,00,000 × 20.8 = 10,40,00,000	0.6218	19%	11.81%
Preference Shares	90 × 50,000 = 45,00,000	0.0269	16.84%	0.45%
Debentures	75 × 2,50,000 = 1,87,50,000	0.1121	14.37%	1.61%
Term loan	4,00,00,000	0.2392	7.80%	1.87%
Total	**16,72,50,000**	**1**		**15.74%**

WACC = 15.74%

(b) Required capital of ₹5,00,00,000 will be raised as follows:

Equity = 60% × 5,00,00,000 = ₹3,00,00,000

Debt = 20% × 5,00,00,000 = ₹1,00,00,000

Retained earnings = 20% × 5,00,00,000 = ₹1,00,00,000

$$\text{Marginal cost of equity} = \frac{D1}{Po} + g = \frac{3(1+0.04)}{1.4} + 0.04 = 26.28\%$$

$$\text{Marginal cost of debt} = \frac{I(1-t)}{P0} = \frac{\left[\left(40,00,000 \times 13\%\right) + \left(60,00,000 \times 15\%\right)\right](1-0.40)}{1,00,00,000}$$

$$= \frac{8,52,000}{1,00,00,000} = 8.52\%$$

Calculation of Marginal Cost of Capital (MACC)

Source	Market Value	Weights (A)	Cost of Capital (B)	Product (A × B)
Equity	3,00,00,000	0.60	26.28%	15.77%
Reserves	1,00,00,000	0.20	26.28%	5.26%
Term loan	1,00,00,000	0.20	8.52%	1.70%
Total	**5,00,00,000**	**1**		**22.73%**

Marginal cost of capital (MACC) = 22.73%