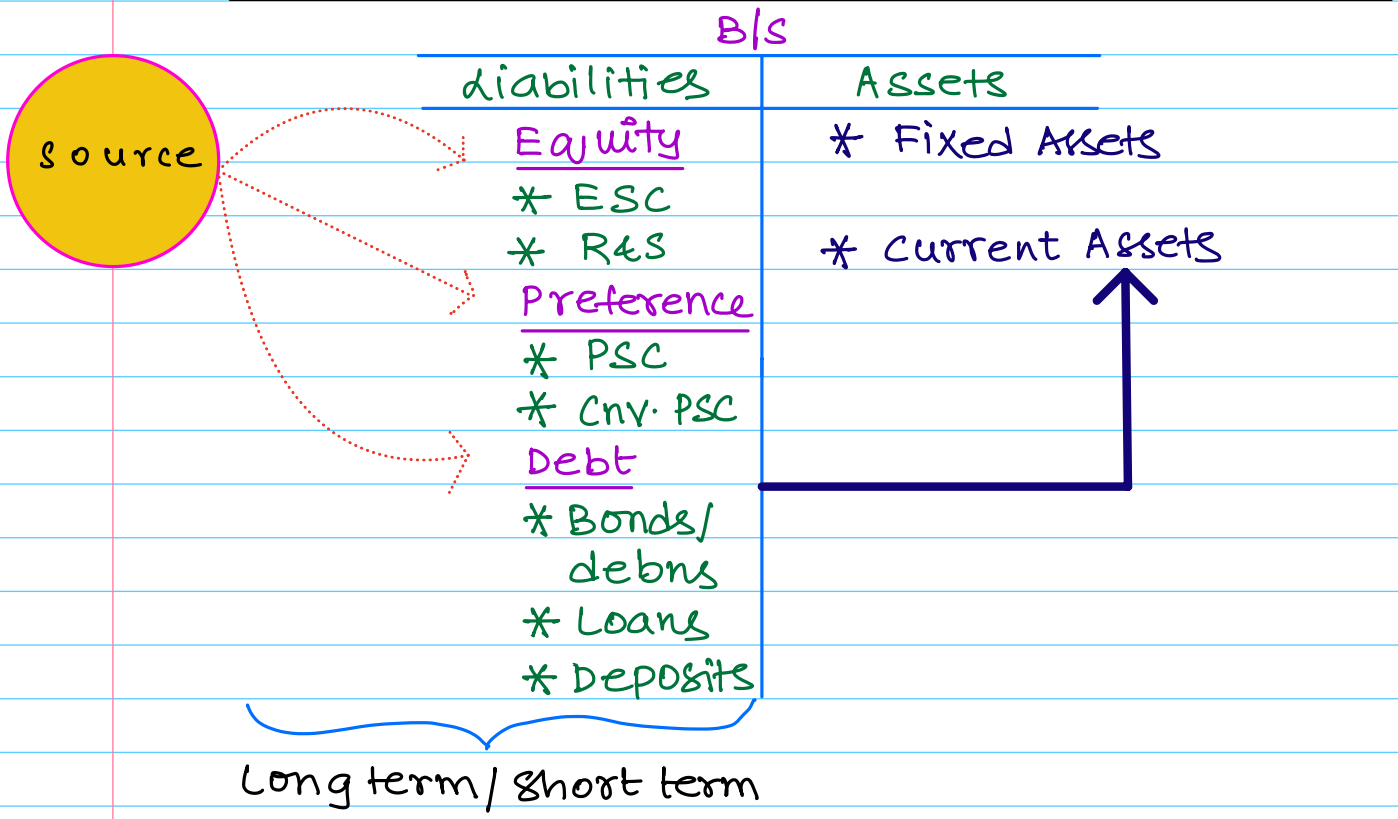
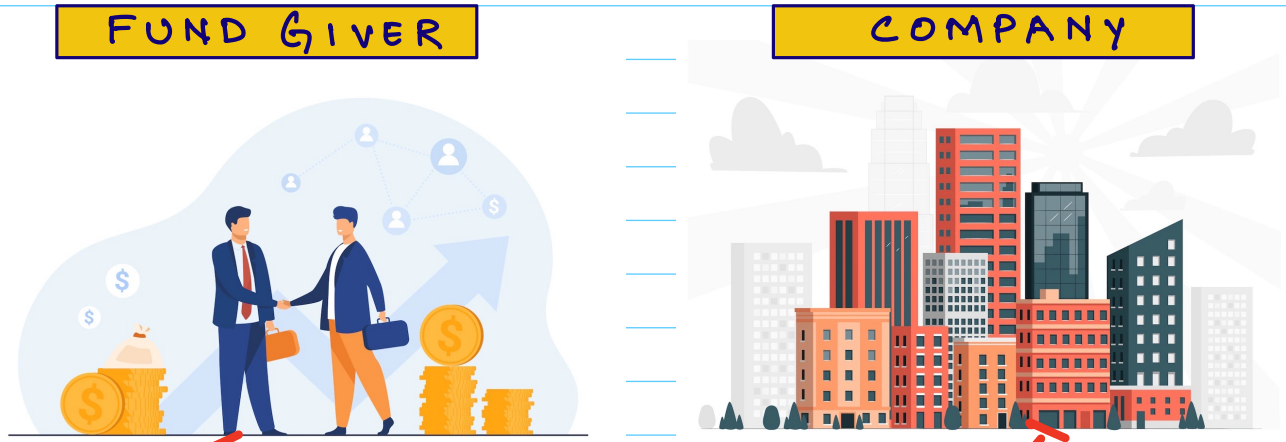
COST OF CAPITAL

learning objectives

* Introduction and basic concept of financing.
* Concept of cost of capital.
* Basic meanings of certain technical terms
  * Cost of Debt.
  * Cost of preference shares.
  * cost of equity.
  * Cost of reserves.
* Calculation of cost of debt
  * using formula approach (approximate)
  * using IRR approach (accurate)
  (understanding full concept of debt valuation with derivation to formula)
* understanding floatation costs.
* calculation of cost of preference shares.
* calculation of cost of equity.
* various issues governing cost of equity.
* calculation of weighted average cost of capital.
* calculation of WACC using BOOK value weights and market value weights.
* calculation of marginal cost of capital.

1. Financial needs and sources of finance





Equity shares → k_e

Preference shares → k_p

Debt → k_d

2. Types of Capital finances (Debt)

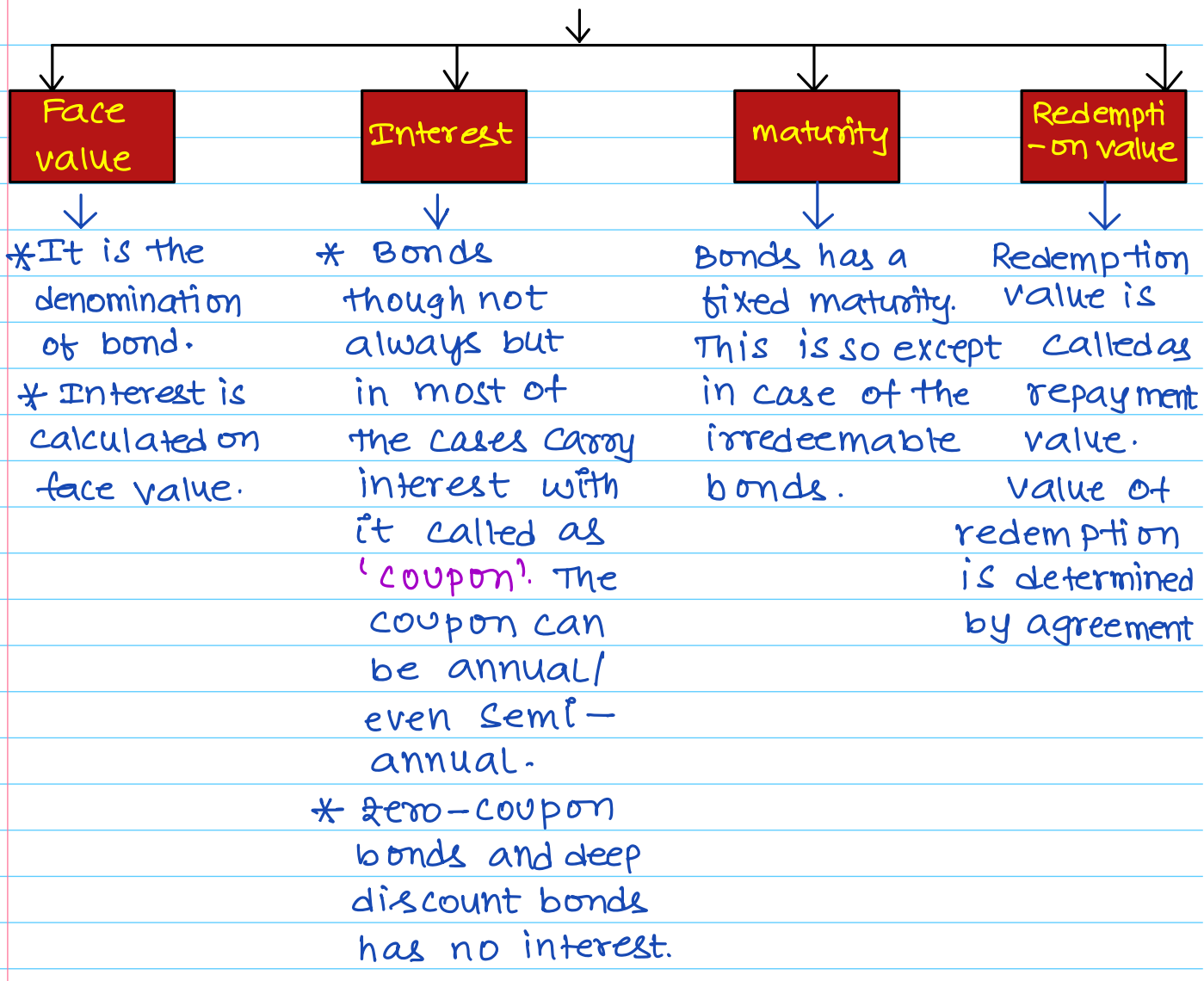
- **Long-term**
  - 5-10 years
  - * Plant & machinery
  - * Land
  - * Buildings
- **Medium-term**
  - 3-5 years
  - * Publicity
  - * Advertise-ments
- **Short-term**
  - ≤ 1 year
  - * Stock
  - * Cash
  - * Debtors
  - * W.Cap

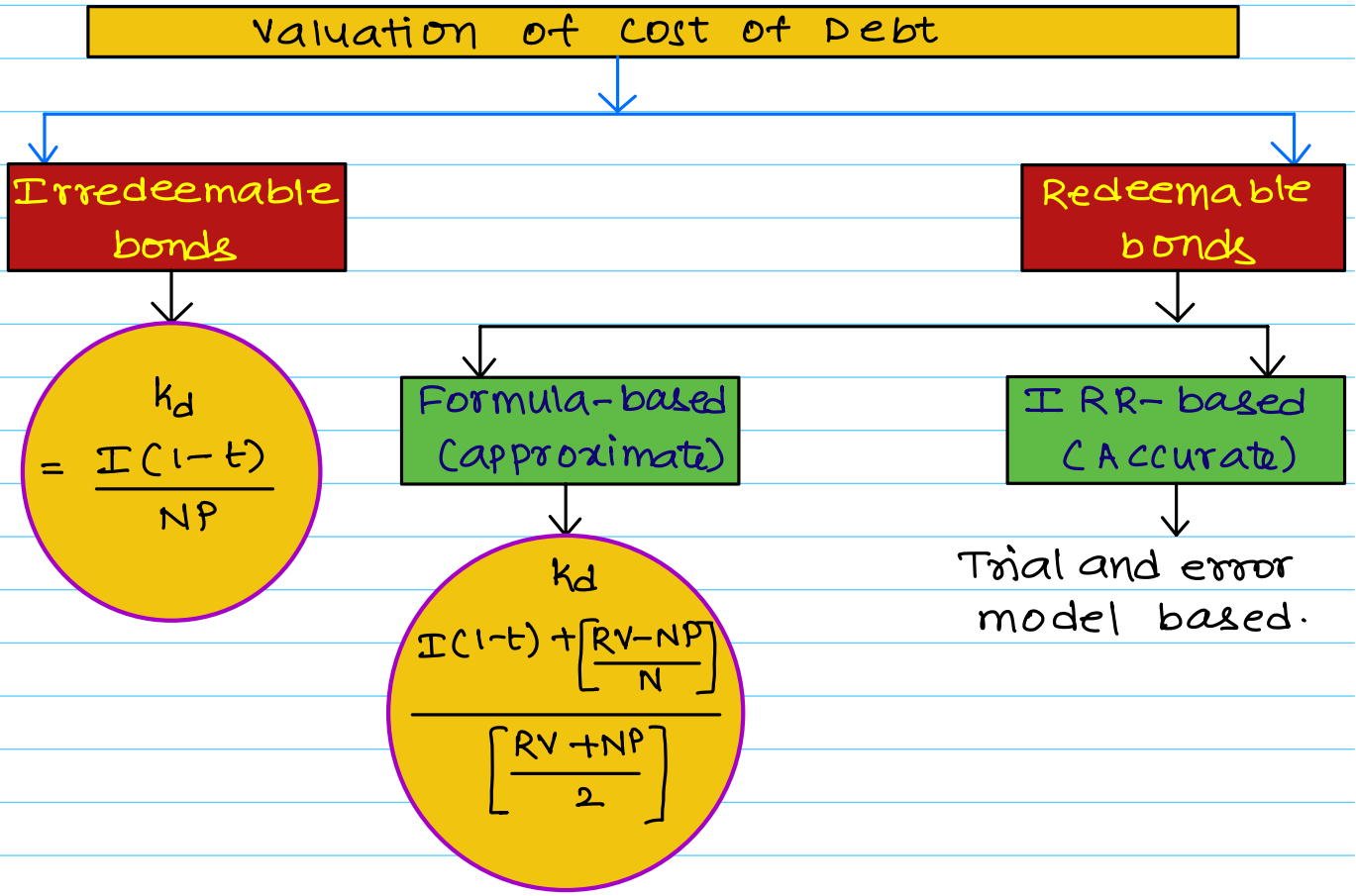
3. Cost of Capital

- **Cost of Debt**
  - * Debt holders expect a fixed return on the fund given called as cost of debt.
  - * It is so represented by 'K_d'
- **Cost of preference**
  - * Preference share holders expect a fixed dividend on fund given.
  - * Though they are termed as shares, by its nature it is a fixed commitment to the company.
  - * It is represented by 'K_p'.
- **Cost of equity**
  - * Equity share holders though not explicitly but implicitly expect good return.
  - * The return that they expect on their capital is called as cost of equity.
  - * It is represented by 'K_e'
- **Cost of reserves**
  - * The profits kept aside for future is called as 'retained earnings'.
  - * Cost of reserves is represe-nted by 'K_r'

4. COST OF DEBT

* Debt is an external borrowings made by a company.
* Debt is equally important like having equity capital because, right proportion of debt and equity in the capital structure ensure a leverage. (More on this will be discussed in chapters Capital structure theories and leverages).
* The summary of features of debt is as follows –





Illustrations from ISM

Pg No 4.7

1. Given information

Nature : Irredeemable, Interest : 12%,
Issue price : ₹103 (₹3 premium), par value : ₹100.
Cmp : ₹94, Tax rate : 35%

Required

Cost of debt (k_d)

$$k_d \text{ (irredeemable)} = \frac{I(1-t)}{NP}$$

$$= \frac{(₹100 \times 12\%)(1-0.35)}{₹94} \times 100$$

$$= 8.30\% \text{ p.a.}$$

Where,
I = Interest
t = Tax
NP = Net proceeds
I(1-t) = Interest after Tax.

Analysis: In the given question, issue price of ₹103 is given, but it is not used in formula, Why?

The reason is, ₹103 is issue price 5 years ago and it is not prevailing today. Today, if any investor want to invest, he has to do so @ ₹94. so, his investment will be ₹94. The formula if one observe, is the return on investment formula.

$$ROI\% = \frac{\text{Return} \rightarrow I \rightarrow ₹12}{\text{Invst} \rightarrow NP \rightarrow ₹94} = 12.77\%$$

$$\downarrow$$

$$₹12.77\% (1-0.35)$$

$$= 8.30\% \text{ p.a.}$$

Though the real ROI is 12.77% to the investor, tax impact has eroded the value of ROI.

valuation of cost of a redeemable bond

2. Given information [PG No. 4.9]

Interest = 10%, Par value = ₹100, Issue price = ₹110

Life = 2023 − 2028 (5 yrs), Tax = 35%.

$$K_d = \frac{I(1-t) + \left[\frac{RV - NP}{N}\right]}{\left[\frac{RV + NP}{2}\right]}$$

$$= \frac{(₹100 \times 10\%)(1-0.35) + \left[\frac{₹100 - ₹110}{5}\right]}{\left[\frac{₹100 + ₹110}{2}\right]}$$

$$= \frac{₹6.50 - ₹2}{105} \times 100$$

$$= 4.29\% \text{ (appx)}$$

Notes: In the given question, the bond is redeemable, which means, it has a fixed life. There are 2 assumptions in this question.

1. RV is at ₹100 (par).
2. Purchase is made at issue time only.

3. Given information (Pg No 4.9)

Interest = 10%, par = ₹100, Life = 10 years, Remaining life = 5 years
mps = ₹80, Tax @ 35%.

$$K_d = \frac{I(1-t) + \left[\frac{RV - NP}{N}\right]}{\left[\frac{RV + NP}{2}\right]}$$

$$= \frac{(₹100 \times 10\%)(1-0.35) + \left[\frac{₹100 - ₹80}{5}\right]}{\left[\frac{₹100 + ₹80}{2}\right]}$$

$$= \frac{₹6.50 + 4}{90} \times 100$$

$$= 11.67\% \text{ p.a (appx)}$$

YTM approach

YTM means Yield to maturity. This model considers IRR concept and there by gives accurate Kd%.

Q.) Why above formula is only an approximate?

In the above formula, there are 2 approximate numbers namely —

Annualised capital gain/loss (Numerator)
↓
Investment value = ₹80
Redemption value = ₹100
↓
Investor who invested ₹80 is sold back to company @ ₹100, eventually making a gain of ₹20 at the end of 5 years. But the formula

Average price of investment. (Denominator)
↓
since numerator has already considered RV & NP, to maintain uniformity, denominator considered average investment making formula as an average estimate but not

uses average capital gain p.a as it it is uniformly earned through out 5 years which is not true.

↓

But formula cant escape having this because the numerator to the formula is having 2 components namely

↓

↓ coupon

↓ coupon is p.a. terms

↓ capital gain/loss

↓ C.G/C.L should be in p.a terms to add to 1st part which is already in p.a. terms.

↓

TO make it more accurate, IRR is used.

accurate. TO make it accurate we use 'IRR' / 'YTM' model.

Calculation of IRR / YTM.

Year	CF	PV@10%	PVCF	PV@15%	PVCF
1 – 5	6.50	3.791	24.64	3.352	21.79
5	100	0.621	62.10	0.497	49.70
			V_B = 86.74		V_B = 71.49

PV	V_B	Desired V_B	change
@10%	₹86.74	₹80.00	+ ₹6.74
@15%	₹71.49	₹80.00	− ₹8.51
Δ: 5%	Δ: 15.25		

Accurate rate

From 10% POV

5% ⟶ ₹15.25

? ⟵ ₹6.74

↓

+2.21%

↓

10 + 2.21 = 12.21% p.a

From 15% POV

5% ⟶ ₹15.25

? ⟵ ₹8.51

↓

−2.79%

↓

15 − 2.79 = 12.21% pa

Analysis on Bond value

Lets say for eg:

S1: yr	CF	S2: yr	CF	S3: yr	CF
0	(80)	0	(100)	0	(110)
1-5	10	1-5	10	1-5	10
5	100	5	100	5	100
r = 12.21%		r = 10%		r < 10%	

Following conclusions can be drawn

↓

- Bond issued at par and redeemed at par → ↓ → ROI(K_d) = coupon
- Bond issued at discount and redeemed at par. → ↓ → ROI(K_d) = coupon + capital gain
- Bond issued at a premium and is redeemed at par → ↓ → ROI(K_d) = coupon − capital loss.

PG NO 4.12

4. Valuation of Zero Coupon / DD Bond.

Zero coupon bonds / Deep discount bonds are those bonds which are issued at a discounted price and are redeemed at par. As such, no interest will be paid during the term of bond. The implied return on ZCB can be calculated as under.

$$PV_{ZCB} = \frac{\text{maturity value (MV)}}{(1+r)^n}$$

$$PV = \frac{FV}{(1+r)^n} \quad ; \quad ₹2,500 = \frac{₹1,00,000}{(1+r)^{25}}$$

$$(1+r)^{25} = \frac{₹1,00,000}{₹2,500} \quad ; \quad (1+r)^{25} = 40$$

$$1+r = \sqrt[25]{40}$$

$$1+r = 1.159$$

$$r = 0.159 \text{ (or) } r = 15.90\%.$$

IMPORTANT

How to calculate any root to a number using calculator ?

$\sqrt[x]{y}$

* Press the desired number.
* Press $\sqrt{}$ 15 times.
* Press -1
* Press $\div$ (root number)
* Press $+1$
* Press "x" "=" 15 times

The number obtained is $(1+r)$, reduce -1 to get correct number.

Valuation of an amortised bond

An amortised bond is a bond which repays the portion of principal along with interest if any. Therefore, cashflows every year will be uneven.

pg No. 4.13

5. Given information

Life = 5 years, Issue price = ₹5,000, coupon = 8%
r = 6%, scheme of amortisation = equally p.a.

		Ⓐ "₹"		Ⓑ	A+B		
Year	op.pr	pay	cl.pr.	I	Total	PV@6%	PVCF
1	5000	(1,000)	4,000	(400)	(1,400)	0.943	1,320.20
2	4,000	(1,000)	3,000	(320)	(1,320)	0.900	1,188.00
3	3,000	(1,000)	2,000	(240)	(1,240)	0.840	1,041.60
4	2,000	(1,000)	1,000	(160)	(1,160)	0.792	918.72
5	1,000	(1,000)	–	(80)	(1,080)	0.747	806.76
							₹5,275.28

Convertible bonds concept

* Convertible bonds gives the holder, an option to convert into shares (or) to redeem for cash.
* Calculation of value of CB is same as calculating the value of redeemable bond.
* When it comes to redemption value, the higher of
  - Cash value redemption and
  - Stock value redemption

  is considered.

Example in pg No. 4.14

* Coupon rate = 15% * Par = ₹100 * Life = 5 yrs.
* Conversion ratio = 1:10 * Mps = ₹12, g = 5%, Tax = 35%

Step 1: Calculation of redemption value.

Redemption value :-

Cash value of redemption = ₹100 (at par)

Stock value of debentures = ₹153.15

a) Mps (P_0) = ₹12

b) g (p.a) = 5%

c) Mps (Ps) = ₹ 12(1.05)^5 = 15.315

d) No. of shares / bond = 10

e) Conversion value on redemption = ₹153.15

Step 2: **Calculation of k_d (appx)**

$$k_d = \frac{I(1-t) + \left[\frac{RV - NP}{N}\right]}{\left[\frac{RV+NP}{2}\right]}$$

$$= \frac{15(1-0.35) + \left[\frac{153.15 - 100}{5}\right]}{\left[\frac{153.15+100}{2}\right]} \times 100$$

$$= \frac{9.75 + 10.63}{126.575} \times 100 = 16.10\%$$

5. Cost of Preference Share Capital

* As per Companies Act 2013, PSC means a share capital which will be given relatively more preference in terms of ———

- Dividend
- Repayment of capital
  - (or)
  - on winding up
  - Before

* Payment of dividend is not mandatory but when paid, it is paid in preference to equity.
* PSC has fixed rate of dividend.
* Preference dividend is not a charge against the profits, but its appropriation out of profits.
* That means, PD is appropriation out of PAT.

since tax is already deducted, no additional tax implications on preference dividend.

* PSC is of 2 types ——

- Irredeemable
- Redeemable

Formula for kp

- Cost of irredeemable 'PS' → $k_p = \frac{PD}{NP}$
- Cost of redeemable 'PS' → $k_p = \frac{PD + \left[\frac{RV - NP}{N}\right]}{\left[\frac{RV + NP}{2}\right]}$ (approximation)

PD = Preference div p.a
NP = Net proceeds
RV = Redemption value
k_p = Cost of PSC.

accuracy can be obtained by using IRR model (Trial & error)

pg. 4.16

6. Given information

*Rate of PD = 10% * Par = ₹100, * Issue price = ₹95.

since information about its redemption i.e. life is not given, it is an irredeemable preference share.

$$k_p = \frac{PD \text{ p.a}}{NP} = \frac{₹100 \times 10\%}{₹95} = \frac{₹10}{₹95} \times 100 = 10.53\% \text{ p.a.}$$

Cost of preference share capital with costs.

* Whenever PS are issued, that issue involve lot of costs like ——

- Prospectus costs
- Legal costs
- Regn costs etc.

* Therefore, out of the amount raised, certain

percent will be used to incur those costs and company can utilise only that balance left out after its expenses.
Hence, for the purpose of calculating the kp, those floatation costs shall be deducted from issue inflow to arrive at Net proceeds.

Net proceeds

Total amount raised	= XXX
↳ floatation costs (%)	= (XXX)
Net proceeds	= XXX

pg. 4.16

7. Given information

a. Net proceeds = Issue price − floatation cost
= ₹100 − (₹100 × 3%)
= ₹97.

b. $kp = \frac{PDP \cdot q}{NP} = \frac{₹12}{₹97} = 12.37\%\ p.a.$

pg. 4.18

8. Given information

* Dividend = 10%, * Par = ₹100, * Issue price = ₹95
* Life = 10 years

$$kp = \frac{PD + \left[\frac{RV - NP}{N}\right]}{\left[\frac{RV + NP}{2}\right]}$$

$$= \frac{(₹100 \times 10\%) + \left[\frac{₹100 - ₹95}{10}\right]}{\left[\frac{₹100 + ₹95}{2}\right]}$$

$$= \frac{₹10 + ₹0.50}{₹97.50} \times 100$$

= 10.77% p.a. (approx)

Calculation of IRR / YTM.

Year	CF	PV@9%	PVCF	PV@11%	PVCF
1–10	10	6.418	64.18	5.889	58.89
10	100	0.422	42.20	0.352	35.20
			V_{PS} = 106.38		V_{PS} = 94.09

PV	V_{PS}	Desired V_{PS}	Change
@9%	₹106.38	₹95.00	+ ₹11.38
@11%	₹94.09	₹95.00	− ₹0.91
Δ = 2%	Δ = 12.29		

Accurate rate

From 9% POV

2% ⟶ ₹12.29

? ⟵ ₹11.38

↓

+1.85%

↓

9 + 1.85% = 10.85%

From 11% POV

2% ⟶ ₹12.29

? ⟵ ₹0.91

↓

−0.15

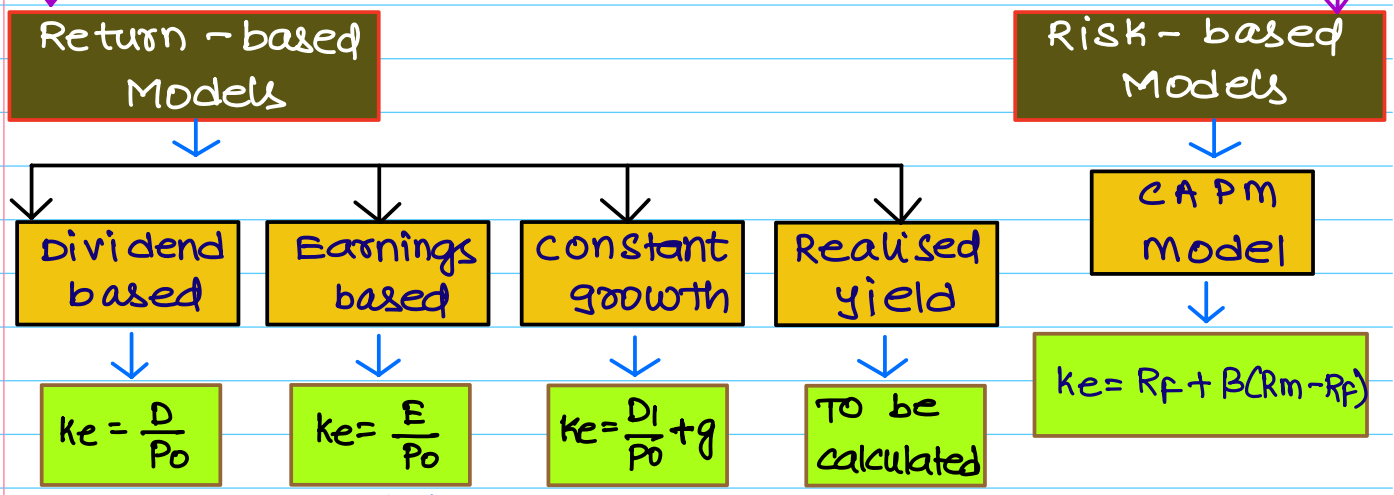
↓

11 − 0.15 = 10.85%

6. Cost of equity (Ke)

* Like debt and preference share holders, equity share holders also expect a return on their capital called as "cost of equity".

* **Methods of calc Ke**



D = Current dividend
D1 = Expected dividend
Po = Current price
E = Current earnings
Rf = Risk-free rate
B = Beta co-efficient
Rm = Market return
Rm - Rf = Risk premium.

Dividend - based model - No growth

* In this model it is assumed that same dividend will be paid perpetually. Since same dividend is paid uniformly through out the life, MPS is also constant.
* This model is generally used by investor when their intention is to get a fixed dividend every year irrespective of earnings a company make.

Self - made Illustration

* Dividend expected = ₹ 3 p.a.
* MPS = ₹ 30.

Calculate Ke.

$$Ke = \frac{D}{Po} = \frac{₹3}{₹30} = 10\%$$

Earnings - based model - constant growth

* In this model it is assumed that same earnings will be earned perpetually. Since same earning is assumed uniformly through out the life, changes in dividend policy donot affect the Ke.
* This model is generally resorted when the acquisition is not on small scale but is made on large scale like take-overs / substantial acqns.

self - made Illustration

* EPS p.a = ₹10 DPS MPS = ₹100

yr	%	₹
1	10%	1
2	30%	3
3	50%	5

Sol: $Ke = \frac{E}{P} = \frac{₹10}{₹100} = 10\%$.

Dividend Growth model

As per dividend growth model, it is assumed that dividend will be paid every year with a constant mark-up till perpetuity.

$$Ke = \frac{D1}{Po} + g$$

* $D_1 = D_0(1+g)$
* $g = b \times r$, b = retention proportion, r = ROE
* D_0 = current dividend
* Ke = cost of equity.
* $g = \frac{P_1 - P_0}{P_0}$ (alternative way)

self-made illustration

D_6 = ₹3, D (6 years back) = ₹2.115, constant 'g'. calculate what is the growth rate.

Sol: D_0 = ₹2.115, $D_1 = D_0(1+g) = ₹2.115(1+g)^1$

$D_2 = D_1(1+g) = D_0(1+g)(1+g) = D_0(1+g)^2 = ₹2.115(1+g)^2$

$D_3 = D_2(1+g) = D_0(1+g)(1+g)(1+g) = D_0(1+g)^3 = ₹2.115(1+g)^3$.

$D_4 = ₹2.115(1+g)^4$

$D_5 = ₹2.115(1+g)^5$

$D_6 = ₹2.115(1+g)^6$

$\Rightarrow D_6 = ₹3 = ₹2.115(1+g)^6$

$\Rightarrow ₹3 = ₹2.115(1+g)^6$

$\Rightarrow (1+g)^6 = ₹3 / ₹2.115$

$\Rightarrow (1+g)^6 = 1.4184$

$\Rightarrow 1+g = \sqrt[6]{1.4184}$

$\Rightarrow 1+g = 1.06$

$\Rightarrow g = 0.06 / 6\%$.

pg No 4.21

9. Given information

* Dividend paid = ₹1/sh. * face value = ₹10 * g = 10% p.a.
* MPS = ₹55, * k_e = ?

Sol:

$$k_e = \frac{D_1}{P_0} + g$$

$$= \frac{D_0(1+g)}{P_0} + g$$

$$= \frac{₹1(1+0.10)}{₹55} + 0.10$$

$$= 0.12 \text{ (or) } 12\%.$$

Notes: How to identify dividend as D_1 & D_0?

- Dividend paid / just paid → D_0
- Expected dividend → D_1
- Dividend for several years → D_0

Realised yield model – IRR model

* All the previous models either consider the present dividend / earnings, compare them with Mps and then calculate ke (either with/ without growth).
* Realised yield model concentrates on actual return an investor has actually earned over its holding period.
* It is all about calculating IRR of investment.

10. **Calculation of IRR/ YTM**

Amount invested = ₹ 1,000 (par)

Realised amount = ₹ 1,128 (5th year)

Average return for holding period = 12·80% p.a. (appx)

$$\frac{₹\,1,128 - ₹\,1,000}{₹\,1,000} \times 100$$

(₹)

Year	CF	PV@ 11%	PVCF	PV@13%	PVCF
1	100	0·901	90·10	0·885	88·50
2	100	0·812	81·20	0·783	78·30
3	100	0·731	73·10	0·693	69·30
4	100	0·659	65·90	0·613	61·30
5	100	0·593	59·30	0·543	54·30
5	1,128	0·593	668·90	0·543	612·50
			1038·50		964·20

PV	Vps	Desired Vps	Change
@ 11%	1038·50	1,000	+38·50
@ 13%	964·20	1,000	− 35·80
Δ = 2%	Δ = 74·30		

Accurate rate

From 11% POV		From 13% POV	
2%	₹74.30	2%	₹74.30
?	₹38.50	?	₹35.80
	+1.04		−0.96
	11+1.04 = 12.04%		13−0.96 = 12.04%

pg No 4.24

11. **Step 1: Calculation of Realised yield p.a.**

Year	D_1	P_1	P_0	$D_1+(P_1-P_0)\div P_0$
1	₹1	₹9.75	₹9	19.44%
2	₹1	₹11.50	₹9.75	28.21%
3	₹1.20	₹11	₹11.50	6.09%
4	₹1.25	₹10.60	₹11	7.73%

Step 2: Calculation of yield for maturity

Let us assume an investor has entered into the market with ₹100 at the beginning of year 1, re-invested the amount so realised in the market, he will end up as under :-

year 1: ₹100 × 1.1944 = ₹119.44
year 2: ₹119.44 × 1.2821 = ₹153.13
year 3: ₹153.13 × 1.0609 = ₹162.45
year 4: ₹162.45 × 1.0773 = ₹175.00

$$FV = PV(1+r)^n$$

$$₹175 = ₹100\,(1+r)^4$$
$$(1+r)^4 = 1.75$$
$$(1+r) = \sqrt[4]{1.75}$$
$$1+r = 1.15$$
$$r = 15\%.$$

UTILITY THEORY - INVESTOR BEHAVIOUR

* From the securities, Marcowitz shifted the attention on the investor. He identified that there are 3 types of investor, namely ⟶

↓

Risk averse ↓

Those who dont want to take any risk. If they have to take any risk, they will demand higher return / premium.

↓

All Portfolio theories

Risk lovers ↓

Those who pay premium for taking the risk

↓

They focus on maximum return than certainity of its occurence.

Risk neutrals ↓

Those who want only return & ignores element of risk

NO Portfolio theory.

CAPITAL ASSET PRICING MODEL (CAPM)

1.

Assumptions

* The investors are rational. That means they invest on the basis of risk & return profile and not on sentiments
* Investors are risk-averse.
* All investors have similar expectation
* All are having full information about markets
* There is a risk-free asset and borrowing and lending is possible at that rate.

Formula

$$Ke = R_F + \beta(R_m - R_f)$$

Where
Ke = Return that is expected by SH.
R_F = Risk free rate
R_m = Market return
$R_m - R_f$ = Risk premium
$\beta(R_m - R_f)$ = security risk premium.

2. **Types of risks and their impact on CAPM.**

* Risk means a chance of non-occurence. That means, a chance of not getting expected return itself is a risk.
* That risk can be of 2 types namely ——

Systematic

* Risk originates from macro-economic factors.
* Uncontrollable
* can ask a premium
* Measured using "β"
* Examples :-
  - High inflation
  - Adverse govt policies
  - Recission etc

Unsystematic

* Risk originates from company-specific factors.
* Controllable through diversification.
* Cannot ask a premium.
* Measured using error "ε"
* Examples :-
  - No technology adv.
  - High litigation costs
  - Mis-mgt etc.

3. **TYPES OF BETA 'β'**

- **Aggressive** → $\beta > 1$ → Riskier than market PF
- **Moderate** → $\beta = 1$ → same risk as market PF
- **Defensive** → $\beta < 1$ → less riskier than market PF.

CAPM (ke) in a different form

$\beta = 1$ (when risk is same as market)

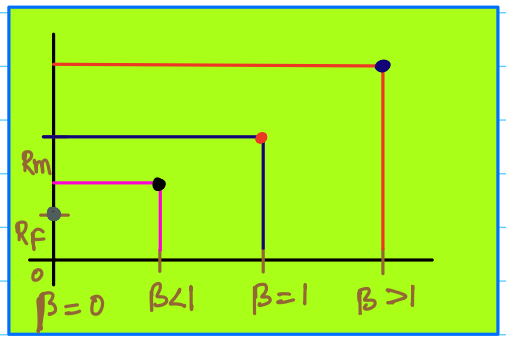
$k_e = R_m$

Derivation

$k_e = R_f + 1(R_m - R_f)$

$= R_f + R_m - R_f$

$k_e = R_m$



$\beta = 0$

$k_e = R_f$

$k_e = R_f + 0(R_m - R_f)$

$k_e = R_f$

12. Given information

pg No 4.27

$R_f = 10\%$, $\beta = 1.75$, $R_m = 15\%$

Calculation of CAPM (ke)

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

$= 10 + 1.75(15 - 10)$

$= 18.75\%$

Cost of Retained earnings (kr)

* Like equity, retained earnings also have a cost associated with it.
* Generally, retained earnings are not subjected to any costs.
* So, all models like dividend, earnings and growth models used for ke will equally apply to kr.
* In simple terms kr = ke without floatation costs.

Differences blw Cost of equity & Cost of retainings.

Particulars	Cost of equity	cost of reserves
1. Fund owner	Equity shareholder	Equity share holder
2. Nature	original fund	Return on invst
3. Formula	$ke = \frac{D_1}{P_0} + g$	$kr = ke(1-FL)\frac{(1-br)}{(1-tp)}$

* R.E are accumulated profits of the company which can be used as source of financing
* R.E. belongs to ESH. Therefore, using RE is same as using ESH money.
* The cost of ESH money is ke. Therefore, primafacie ke = kr.
* However, sometimes kr < ke due to the following reasons:
  a. Raising money through equity involves floatation cost but 'RE' usage doesnot have floatation costs.
  b. If the 'SH' receives dividend and invest elsewhere, he has to pay brokerage for making such investment. But, foregoing dividend and allowing 'RE' to be used by the company doesnot have brokerage.
  c. The ESH suffer a personal tax if he invest on his own (say FD, Govt sec). But, he allow company to invest through retained earnings, the profit

earned and distributed as dividend is exempt from tax.

* Therefore, $K_r = K_e(1 - \text{floating cost})(1 - \text{brokerage})(1 - \text{tax})$

pg No 4.28

13. Given information

* Face value = ₹10, * mps = ₹200, * Issue price = ₹190
* floatation cost = ₹5, * D_1 = ₹10, g = 5%, K_e = ?, K_r = ?

S1: Calculation of K_e (New)

$$K_e = \frac{D_1}{P_0} + g = \frac{₹10}{(₹190 - ₹5)} + 0.05$$

$$= \frac{₹10}{₹185} + 0.05$$

$$= 10.41\%$$

S2: Calculation of K_r (old K_e)

$$K_r = \frac{D_1}{P_0} + g = \frac{₹10}{₹200} + 0.05$$

$$= 10\%.$$

Notes:

a. since Fl. cost is given in ₹ terms, we cant use formula as aforesaid.

b. Ke takes IP since they are not yet into the market.

c. Reserves belong to Existing SH, therefore they will have mps not IP.

pg No 4.29

Example – 5

K_e = 20%, floatation cost = 5%, tax = 30%, K_r = ?

Sol: $K_r = K_e(1 - F)(1 - t_p)$

$= 20\%(1 - 0.05)(1 - 0.30)$

$= 13.30\%$

pg No 4.29

14. Given information

D_0 = ₹4.19, P_0 = ₹50, g = 5%, K_r = ?

Sol: $K_r = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g$

$= \frac{₹4.19(1+0.05)}{₹50} + 0.05$

$= 13.80\%$

pg No 4.30

15. Given information

$R_f = 7\%$, $\beta = 1.20$, $R_m - R_f = 6\%$

Sol: As per CAPM, $k_e = R_f + \beta(R_m - R_f)$

$= 7 + 1.20(6)$

$= 14.20\%$.

weighted average cost of capital (WACC-k_o)

* If company desires to raise only using any one way, then cost of capital is only that cost of source.
* But, normally company don't get only from one source, it raise from multiple sources. So, the cost of capital in such a case is called as "Overall cost of capital" (or) "weighted average cost of capital".

STEPS IN CALCUCATING WACC

1. Calculate specific COC
2. Identify the amounts involved
3. Calculate proportion of each specific capital to the overall capital. (This will be weights)
4. multiply specific COC of each source with its corresponding weight to obtain k_o.

FORMULA

$(W_d \cdot k_d) + (W_p \cdot k_p) + (W_e \cdot k_e) + (W_r \cdot k_r) = k_o / WACC$.

Example-6 Pg No. 4.31

$k_o = W_d \cdot k_d + W_p \cdot k_p + W_e \cdot k_e + W_r \cdot k_r$

$= (0.5 \times 6) + (0.15 \times 9) + (0.10 \times 11) + (0.25 \times 10)$

$= 7.95\%$

WACC with Book value and market value weights

1. If the proportions are calculated using book value, the weights are called as "Book value weights" and if the proportions are calculated using market value, the weights are called as "market value weights".
2. When we calculate MV weights, RE as a source will not be there because, the market price is the value

both for capital and retained earnings.

3. Generally, MV represents the true value of the capital. But, for unlisted companies whose shares and debentures are not trading in RSE, the only value available is "Book value".

4. When it is given a different cost of capital for both k_e & k_r in a problem, we need to calculate k_e & k_r in proportion to their Book values.

pg No 4.33

16.

Step 1: Calculation of proportion of capital & RE

Book value of capital = ₹ 5,00,000

Book value of RE = ₹ 15,00,000

proportion of capital to total = $\frac{₹\,5,00,000}{₹\,20,00,000} = 0.25$

proportion of RE to total = $\frac{₹\,15,00,000}{₹\,20,00,000} = 0.75$

Step 2: Calculation of proportionate values

MV of eq. capital (50,000 × 50) = ₹ 25,00,000 × 0.25 = ₹ 6,25,000.

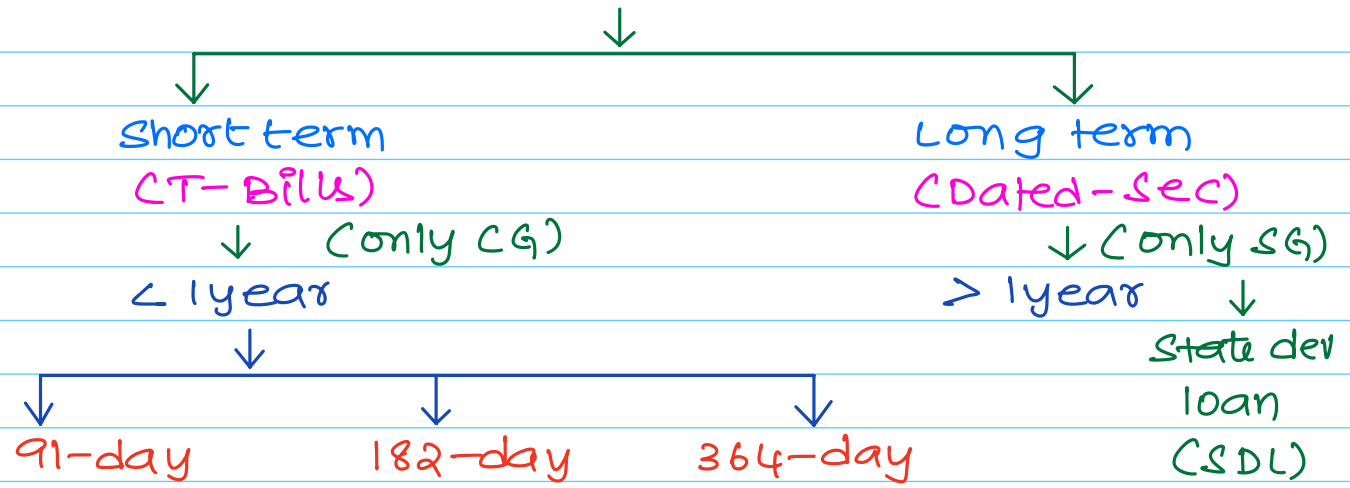
MV of RE = ₹ 25,00,000 × 0.75 = ₹ 18,75,000.

Step 3: Calculation of cost of capital (k_o)

Sources	Amount (₹)	proportion	Cost	wt. cost
Eq.	6,25,000	0.25	10.41	2.6025
RE	18,75,000	0.75	10.00	7.5000
	25,00,000			k_o = 10.1025

A brief analysis on Debt markets in India

* Like equity segment where variable Income securities called shares are traded, there is a much more big market called as Debt market.
* Normally, we as an individual are negligible participants. Individuals cannot participate every where in that market. It is market that is fully dominated by banks, goverment institutions, government itself. They are the major players in debt market.
* In the debt market, one of the major participant is government securities (G-Sec). RBI is the only regulator of this market. This is operated thru' an office called as (PDO) "PUBLIC DEBT OFFICE". Through PDO goverment raises money by issue of G-Sec.
* The problem is, government raises money thru' taxes and then has to use that money for its sovereign functions e.t.c. But, public service is done every day but taxes are collected in instalments. To tackle this liquidity problem, the govt issues govt sec.
* G-Sec are of 2 types namely ——



* T-Bills are purchased only by authorised participants (allowed by RBI). Generally the Banks, mmmfs invest in this T-Bills since, investment in T-bill quality for SLR.
* T-Bills are to be purchased not on the basis of price fixed by any one person but on the basis of auctioned prices. Auctioned prices means, it works as it like a stock market where the participants have liberty to quote their prices.
* T-Bill (91-day) auction takes place on every wednesday. T-Bill (182/364 day) auction takes place on every alternative wednesday. Auction looks as under ——

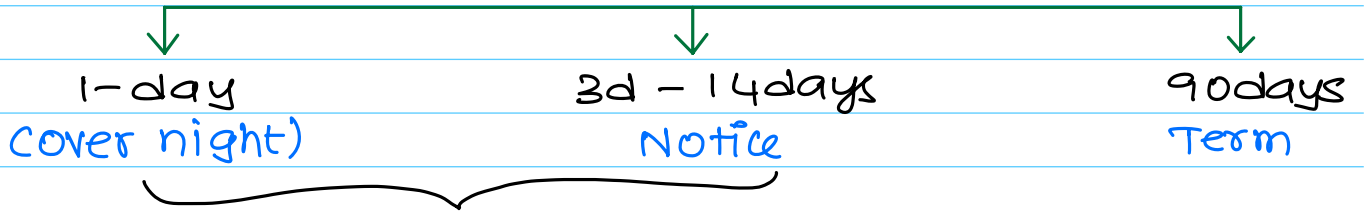
Bid No	Amount	price	Govt need
1	₹ 100cr	₹97.90	₹1,000 crore
2	₹ 500cr	₹98.90	
3	₹ 250cr	₹98.00	
4	₹ 400cr	₹99.10	
5	₹ 150cr	₹97.60	

re-arranging them in the descending order of prices

Bid No	Amount	price	Cum. Amt
4	₹ 400	99.10	₹ 400
2	₹ 500	98.90	₹ 900
3	₹ 100 ⊛	98.00	₹ 1,000
1 ⊛			
5 ⊛			

Bidder-3 qualifies only upto ₹ 100cr and bidder 1 & 5 are rejected out right.
Since bid closed by accepting Bidder-3, Bid closes @ final price of ₹98 to all participants.

* Other popular components of Debt markets are
  - Call money
  - Repo
  - commercial paper / COD.
* In case of Repo market, Banks will borrow from other banks keeping T-Bills as a security. They give T-Bills at a lower price with a guaranteed buying price in future.
* Commercial papers & COD are corporate ST debt inst.
* Call money



Txn b/w Bank and another Bank through a e-system called "Negotiated dealing system". (NDS)
(All call money requirements of one bank will be known to another bank using this NDS.)

↓

The MIBOR rate is extracted as volume w.Avg interest rates quoted in NDS

↓

Rates are monitored by "Financial benchmarks India Ltd (FBIL)". In the FBIL, participants are
- FIMMDA – Fixed income money market derivative assn.
- IBA – Indian bankers association.
- FEDAI – Forex dealers association of India.

↓

The w.avg rates are then calculated by CCIL and published between 9am & 11am every day.

* Hence, one can understand that reference rates are uninfluenced. MIBOR is therefore an indep-endent rate.

Summary of Cost of Capital chp

* Value of any asset is PV of its Future CFs disc@ ROR.
* The assets under this chapter are ———
  - Bonds
  - Pref. Shares
  - Eq. Shares.
* Various capitals and their associated costs & the formulae is as under ———

Capital	Notation	Formula
I. Debt	K_d	a. Irredeemable * $\frac{I(1-t)}{NP}$ (without fl. cost)
* In case of redeemable bonds, K_d calculated using the formula is a mere approximate. For accurate kd, one must calculate IRR.		* $\frac{I(1-t)}{NP-FC}$ (with fl. cost) b. Redeemable * $\frac{I(1-t)+\left(\frac{RV-NP}{n}\right)}{\frac{RV+NP}{2}}$ (without fl. cost) * $\frac{I(1-t)+\left(\frac{RV-(NP-FC)}{n}\right)}{\frac{RV+(NP-FC)}{2}}$ (with fl. cost)

II. Preference Kp

a. Irredeemable

* $\frac{PD}{NP}$ (without fl. cost)

* $\frac{PD}{NP - FC}$ (with fl. cost)

* In case of redeemable prefsh, Kp calculated using the formula is a mere approximate. For accurate kp, one must calculate IRR.

b. Redeemable

* $\frac{PD + \frac{(RV - NP)}{N}}{\frac{(RV + NP)}{2}}$

(without fl. cost)

* $\frac{PD + \frac{RV - (NP - FC)}{N}}{\frac{RV + (NP - FC)}{2}}$

(with fl. cost)

III. Equity Ke

a. constant div model

$Ke = \frac{D}{P}$

b. constant earnings

$Ke = \frac{E}{P}$

c. constant growth

* $Ke = \frac{D1}{Po} + g$ (without fl. cost)

* $Ke = \frac{D1}{Po - FC} + g$ (with fl. cost)

d. Realised yield

$Ke = \frac{D1 + (P1 - Po)}{Po} \times 100$

e. CAPM

$ke = Rf + \beta(Rm - Rf)$

IV	Retained earnings	k_r	a. General case If comparison is blw old k_e & k_r, both are same. That means, all the aforesaid 5 models can be reused for reserves. b. special case If comparison is blw new issue k_e & k_r, both are not same. In such a case, k_r is as follows: $k_r = k_e (1 - fl \cdot C)(1 - br)(1 - tax)$
V	WACC	k_o	a. Using BV weights $k_o = w_d \cdot k_d + w_p \cdot k_p + w_e k_e + w_r \cdot k_r$ (w_d, w_p, w_e, w_r at BV proportion to total capital) b. Using MV weights * $k_e = k_r$ $k_o = w_d \cdot k_d + w_p \cdot k_p + w_e k_e$ * $k_e \neq k_r$ When k_e is $\neq k_r$, then S1: Calc MV of equity. S2: Identity BV prop. S3: MV is divided blw equity & reserves in propn to BV S4: Calc respective wt. cost. $k_o = w_d \cdot k_d + w_p \cdot k_p + w_e \cdot k_e + w_r \cdot k_r$. ($w_d$, w_p, w_e, w_r @ MV propns)

I 17.

Step 1: Calculation of k_d (post-tax)

a. Formula

$$k_d = \frac{I(1-t) + \left[\frac{RV - NP}{N}\right]^{*}}{\left[\frac{RV + NP}{2}\right]}$$

NP = NP − Fl. costs.

b. Application

$$= \frac{10(1-0.30) + \left[\frac{100 - 100.80}{10}\right]}{\left[\frac{100 + 100.80}{2}\right]}$$

NP = ₹105 − 4%
= ₹100.80

$$= \frac{7 - 0.08}{100.40} = 6.89\% \text{ p.a.}$$

c. Calc of IRR (Accurate k_d)

Year	CF	PV@5%	PVCF	PV@7%	PVCF
1 − 10	₹	7.722	54.05	7.024	49.17
10	100	0.614	61.40	0.508	50.80
			V_B = 115.45		V_B = 99.97

Alt-1

PV	V_B	Desired V_B	Δ
@ 5%	₹115.45	₹105	+ 10.45
@ 7%	₹99.97	₹105	− 5.03
Δ = 2%	₹15.48		

5% POV

2% ⟶ ₹15.48
? ⟵ +₹10.45
= + 1.35
k_d = 5 + 1.35
= 6.35%

7% POV

2% ⟶ ₹15.48
? ⟵ −₹5.03
= − 0.65
k_d = 7 − 0.65
= 6.35%

Alt-2

As per ICAI suggested answers, sometimes IRR will be calculated taking NP − FC as comparitive. That means, in this question, instead of taking Desired

V_B as ₹105, we consider ₹100·80 (₹105 − 4%).

K_d = 6·89%

Step 2: Calc of cost of pref. capital

a. Formula

K_p (redeemable) (with fl. cost):

$$K_p = \frac{PD + \left[\frac{RV - NP}{N}\right]}{\frac{RV + NP}{2}}$$

NP = NP − FC
= ₹110 − 2%
= ₹107·80

b. Appln

$$= \frac{₹5 + \left[\frac{₹100 - ₹107·80}{10}\right]}{\frac{₹207·80}{2}}$$

$$= \frac{₹4·22}{₹103·90} = 4·06\%$$

c. IRR calc

Year	CF	PV@5%	PVCF	PV@3%	PVCF
1 − 10	5	7·722	₹38·61	8·530	₹42·65
10	100	0·614	₹61·40	0·744	₹74·40
			V_P = ₹100·00		V_P = ₹117·05

PV	VP	Desired V_B	Δ
@3%	₹117·05	₹107·80	+9·25
@5%	₹100·00	₹107·80	−7·80
Δ = 2%	₹17·05		

3% POV

2% ⟶ ₹17·05

? ⟵ +₹9·25

= +1·09

K_p = 3 + 1·09

= 4·09%

5% POV

2% ⟶ ₹17·05

? ⟵ −₹7·08

= −0·91

K_p = 5% − 0·91%

= 4·09%

Step 3: Calc of cost of equity Ke.

a. Formula

$$Ke = \frac{D1}{P_0 - FC} + g$$

$$= \frac{₹1}{₹24 - ₹4} + 0.05$$

$$= \frac{₹1}{₹20} + 0.05$$

$$= 0.05 + 0.05$$

$$= 10\%$$

Step 4: Calc of WACC @ Book values

Source	Amount (₹)	Prop	cost	wt. cost
Debt	5,00,000	0.25	6.89	1.723
pref.	5,00,000	0.25	4.09	1.023
Equity	10,00,000	0.50	10.00	5.000
	20,00,000		Ko =	7.746%

Step 5: Calc of WACC @ market values

Source	Amount (₹)	Prop	cost	wt. cost
Debt	5,25,000	0.15	6.89	1.034
pref.	5,50,000	0.16	4.09	0.654
Equity	24,00,000	0.69	10.00	6.900
	34,75,000		Ko =	8.588%

(I18)

Step 1: Calculation of individual costs

a. Cost of debt

Since life is not given, the bond is assumed as irredeemable.

$$Kd\ (post\text{-}tax) = \frac{I(1-t)}{NP}$$

$$= \frac{₹16(1-0.50)}{₹96}$$

$$= (₹8/₹96) \times 100$$

$$= 8.33\%\ p.a.$$

b. **cost of preference shares**

since life is not given, it is assumed that the pref. shares are irredeemable.

$$k_p = \frac{PD}{NP} = \frac{₹1.10}{₹9.20} \times 100 = 12\% \text{ p.a.}$$

c. **cost of equity**

(i) **Calc of growth rate (g)**

$$\frac{EPS(2021) - EPS(2020)}{EPS(2020)} \times 100$$

$$= \frac{₹2.36 - ₹2.15}{₹2.15} \times 100$$

$$= 10\%$$

(ii) **Calc of ke**

$$k_e = \frac{D_1}{P_0} + g$$

$$= \frac{₹1.18^{*}}{₹23.60} + 0.10$$

$$= 15\%$$

* $D_1 = EPS_{2021} \times 50\%$
$= ₹2.36 \times 50\%$
$= ₹1.18.$

Step 2: Calc of marginal COC

a. marginal COC means, additional cost of capital. It is the cost of raising additional capital.

b. Since, additional capital is raised in market value terms, marginal COC is already in MV converted mode.

c. In case of marginal COC questions, if new capital to be raised is not mentioned, then assume that it is issued in proportion to existing capital structure.

sources	prop	cost	wt. cost
Debt	0.15	8.33	1.25
Pref	0.05	12.00	0.60
Eq. (RES)	0.80	15.00	12.00
		Marginal k_o =	13.85%

Step 3: Calc of new capital investment

* since, capital structure is given in the question, we assume that any project will be financed in that proportion.
* Hence, every project will be financed as under ———
  20% Debt & preference
  80% Equity.
* The new capital investment shall be necessarily made out of aforesaid capitals and in the same proportion.
* It is mentioned in the question that equity financing will not be out of new equity issue, but it will be out of reserves of 2022.
* But no restriction on new issue of debt and preference.
* since, debt, preference and equity carry same cost with same weights, MCOC for new cap. investment will be same.

New capital investment

source	Prop	Amount
Debt, pref (*)	0.20	? (2950) (*) (2.36 × 10,000 × 50%)
Reserves (*)	0.80	11,800
total		14,750

Step 4: If excess invst is made with new eq. issue

If excess investment has to be made, such capital shall raised as new equity issue.

$$k_e(new) = \frac{D_1}{P_0} + g$$

$$= \frac{₹\ 1.18}{₹\ 20} + 0.10$$

$$= 15.90\%$$

Calc of revised WACC

Source	prop	cost	wt·cost
Debt	0·15	8·33	1·25
pref·	0·05	12·00	0·60
equity	0·80	15·90	12·72
		k_0 =	14·57%

Practical illustrations

(Q1:) Since, company is expected to pay same dividend in the future, there is no growth. Therefore, k_e shall be calculated as per constant dividend model.

$$k_e = \frac{D}{P}$$

$$= \frac{₹\,0·27}{₹\,1·50} = 18\%$$

since, company has only one source of financing,
WACC = k_e = 18%.

(Q2:)

Step 1: Calc of individual costs

* k_e = 16·30%. (given)
* k_p = 12·00%.
* k_d = 15·00%. (1 − 0·30) = 10·50%
* k_{CD} = 10·00%. (1 − 0·30) = 7·00%

Step 2: Calc of WACC

Source	Amt (₹ in L)	prop	cost	wt·cost
Equity	65	0·62	16·30%	10·11%
pref	12	0·11	12·00%	1·32%
Debt	20	0·19	10·50%	2·00%
CD	8	0·08	7·00%	0·56%
	105		k_0 =	13·99%

(Q3.)

Step 1: Calculation of Ke

$$Ke = \frac{D1}{Po} + g$$

$$= \frac{Do(1+g)}{Po} + g$$

$$= \frac{₹2(1.06)}{₹25} + 0.06$$

$$= 14.50\%$$

Step 2: Calc of Kd.

$$Kd = \frac{I(1-t) + \left[\frac{RV - NP}{N}\right]}{\frac{RV + NP}{2}}$$

$$= \frac{10(1-0.30) + \left[\frac{₹112 - ₹96}{12}\right]}{\frac{₹112 + ₹96}{2}}$$

RV = FV × 112%
= ₹100 × 112%
= ₹112

$$= 6.09\%$$

Accurate Kd (YTM / IRR)

Year	CF	PV@5%	PVCF	PV@7%	PVCF
1-12	5	8.863	44.315	7.943	39.715
12	112	0.557	62.384	0.444	49.728
		VB	= 106.70	VB	= 89.443

PV	VB	Desired VB	Δ
@ 5%	₹106.700	₹96	+ ₹10.70
@ 7%	₹ 89.443	₹96	− ₹6.56
Δ = 2%	₹ 17.26		

POV of 5%

2% ⟶ ₹17.26

? ⟵ + ₹10.70

⇒ + 1.24

= 5 + 1.24

= 6.24%

POV of 7%

2% ⟶ ₹17.26

? ⟵ − ₹6.56

= − 0.76

= 7 − 0.76

= 6.24%

(Q6.)

Step 1: Income statement for 2 proposals

"₹"

Particulars	old scheme	New scheme
EBIT	34,50,000 (given)	48,75,000 (34,50,000 + 14,25,000)
(-) Interest	(7,50,000)	(13,50,000) [(7,50,000 + (75,00,000 × 8%)]
EBT	27,00,000	35,25,000
(-) Tax	NA	NA
EAT	27,00,000	35,25,000

Before new proposal

Step 2: Calculation of MV of debt/equity.

a) MV of debt

$K_d = \frac{I}{NP}$ (since question is not given in per bond terms, answer is done in the volume terms).

K_d (given) = 8%, I (given) = ₹7,50,000

$8\% = \frac{₹7,50,000}{\text{MV of Debt}}$

MV of debt = ₹7,50,000 ÷ 8% = ₹93,75,000

b) MV of equity

$K_e = \frac{E}{P}$ (since, question is not given in per share terms, answer will be done in volume terms)

K_e (given) = 16%, EAT (given) = ₹27,00,000

$16\% = \frac{₹27,00,000}{\text{MV of equity}}$

MV of equity = ₹27,00,000 ÷ 16% = ₹1,68,75,000.

Before new proposal

Step 3: Calculation of K_o

Source	Amount (₹)	Prop	Cost	Wt · Cost
Debt	93,75,000	0.36	8%	2.88
Equity	1,68,75,000	0.64	16%	10.24
	2,62,50,000		K_o =	13.12%

Step 4: Calculation of Revised Ke.

Due to raising of new debt without raising any equity, the ESH are getting an additional gain of ₹8,25,000 (₹35,25,000 − ₹27,00,000) which in turn increases the Ke (return).

$$\text{New Ke} = \frac{\text{Revised EAT}}{\text{MV of equity}}$$

$$= \frac{₹35,25,000}{₹1,68,75,000} \times 100$$

$$= 20.90\%.$$

Step 5: Revised MV of debt

Existing Debt value = ₹93,75,000

(+) Additional debt = ₹75,00,000

Revised Debt value = ₹1,68,75,000

Step 6: Calc of revised proportions.

a. Proportion of debt:-

$$\frac{\text{MV of Debt}}{\text{Total Capital}} = \frac{₹1,68,75,000}{₹3,37,50,000} \times 100$$

$$= 50\%$$

b. Proportion of equity:-

$$\frac{\text{MV of equity}}{\text{Total Capital}} = \frac{₹1,68,75,000}{₹3,37,50,000} \times 100$$

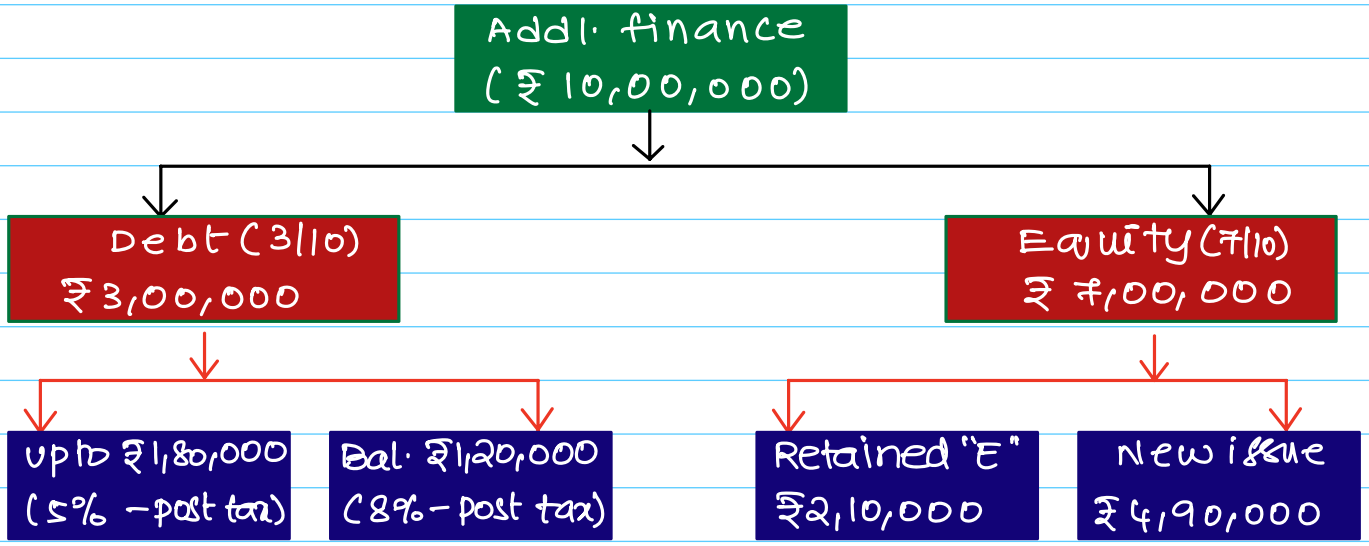
$$= 50\%$$

Step 7: Calc of revised WACC.

Source	Amount (₹)	Prop	Cost	Wt. Cost
Debt	1,68,75,000	0.50	8%	4.00%
Equity	1,68,75,000	0.50	20.90%	10.45%
	3,37,50,000		Ko =	14.45%

(Q.4.)

1. Pattern of raising additional finance



2. Calc of w. Avg K_d.

Debt	Amount	prop	cost	wt. cost
I	₹ 1,80,000	0.60	5%	3%
II	₹ 1,20,000	0.40	8%	3.2%
	₹ 3,00,000		wt. avg K_d	6.2%

3. Calc of K_e & K_r.

Since, no information is provided w.r.t floatation costs etc and existing P_0 & Issue price seperately,

$K_r = K_e$.

$$K_e = \frac{D_1}{P_0} + g$$

$$= \frac{D_0(1+g)}{P_0} + g$$

$$= \frac{(EPS \times DPR)(1+g)}{P_0} + g$$

$$= \frac{(₹4 \times 50\%)(1.10)}{₹44} + 0.10$$

$$= \frac{2.20}{44} + 0.10$$

$$= 15\%.$$

4. Calc of WACC.

Source	Amount (₹)	prop	cost	wt. cost
Debt	3,00,000	0.30	6.2%	1.86
Equity	7,00,000	0.70	15%	10.50
	10,00,000		Ko =	12.36%

(Q.5.)

Step 1: Calc of ke (new issue)

$$ke = \frac{D1}{Po} + g$$

a. Calc of growth %

yr	Div
0	₹10.60
5	₹14.19

$FV = PV(1+r)^n$

$₹14.19 = ₹10.60(1+r)^5$

$(1+r)^5 = ₹1.3387$

$r = 6\%$

b. Calc of D1

(Given) D1 = ₹15

c. Calc of revised Po

Po − fl. cost = ₹125 (Issue price) − ₹5 = ₹120.

d. Calc of ke (new issue)

$$ke = \frac{D1}{Po} + g$$

$$= \frac{₹15}{₹120} + 0.06$$

$$= 0.125 + 0.06$$

$$= 18.50\%$$

Step 2: Calc of kr.

kr is ideally calculated for existing SH of company. It has nothing to do with issue price. Hence, kr calculation should be based on Po which is the existing mps. But, ICAI has wrongly taken issue price for calculation of kr.

k_r (Actual)

$$k_r = \frac{D_1}{P_0} + g$$

$$= \frac{₹15}{₹130} + 0.06$$

$$= 17.54\%$$

k_r (ICAI)

$$k_r = \frac{D_1}{P_0} + g$$

$$= \frac{₹15}{₹125} + 0.06$$

$$= 18\%$$

Step 3: Calc of division of MV b/w Eq & RE

MV of Equity (₹ 2,00,00,000)

Eq. shares (BV prop)	Reserves
$\frac{₹1,20,00,000}{₹1,50,00,000}$	$\frac{₹30,00,000}{₹1,50,00,000}$
= 0.80	= 0.20
MV division = ₹ 1,60,00,000 (₹2,00,00,000 × 80%)	= ₹ 40,00,000. (2,00,00,000 × 20%)

Step 4: Calc of k_p.

$$k_p = \frac{PD}{NP}$$

$$= \frac{₹15}{₹105} = 14.29\%$$

Step 5: Calc of k_d using IRR method.

a. $$k_d = \frac{I(1-t) + \left[\frac{RV - NP^{\circledast}}{N}\right]}{\frac{RV+NP}{2}} \times 100$$

$$= \frac{15(1-0.35) + \left[\frac{100-98}{11}\right]}{99} \times 100$$

$$= \frac{9.75 + 0.18}{99} \times 100$$

$$= 10.03\%$$

$^{\circledast}NP = NP - FC$
$= 100 - 2$
$= 98$

Since, NP is not clearly given in the question, we calculated YTM assuming it is issued at par. But in that case YTM is 10.03% which is not near to the market YTM of 16%. Therefore, NP is not ₹100. we need to calculate NP as MV of bond.

b. Calculation of NP (Value of bond)

Year	CF	PV @ 16%	PVCF
1-11	₹15	5.029	75.435
11	₹100	0.195	19.500
			VB= 94.935

Note: Interest is assumed as after tax interest. That means ₹15 is not subjected to tax again. (ICAI ISM)

VB = NP = ₹94.935. This amount is subject to fl. cost which is assumed as a % on par value.

₹94.935 − (₹100 × 2%) = ₹92.935. (ICAI ISM)

Recalc of YTM

$$\frac{I(1-t) + \left[\frac{RV - NP}{N}\right]}{\frac{RV + NP}{2}}$$

NP = ₹92.935

$$= \frac{15(1-0.35) + \left[\frac{100 - 92.935}{11}\right]}{96.47}$$

= 10.77%.

Step 6: Calc of WACC (BV weights)

Source	Amount (₹)	Prop	Cost	Wt. Cost
Equity	1,20,00,000	0.615	18.5%	11.38%
RE	30,00,000	0.154	18 (ICAI)	2.77%
Pr. Sh	36,00,000	0.185	14.29%	2.64%
Debt	9,00,000	0.046	10.77%	0.495%
	1,95,00,000		(ICAI - 2nd)	17.29%

Step 7: Calc of WACC (mv weights)

Source	Amount (₹)	Prop	Cost	wt·cost
Equity	1,60,00,000	0·655	18·5%	12·12%
RE	40,00,000	0·164	18 (ICAI)	2·95%
Pr·Sh	33,75,000	0·138	14·29%	1·97%
Debt	10,40,000	0·043	10·77%	0·46%
	2,44,15,000		(ICAI - 2nd)	17·50%

(Q 7)

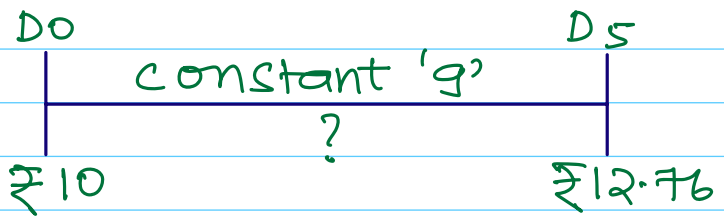
Step 1: Calculation of CAPM (Ke)

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

$= 10 + 1·25(18\%)$

$= 32·50\%$

Step 2: Calculation of growth rate (g)



$D_1 = D_0(1+g) = ₹10(1+g)^1$

$D_2 = D_1(1+g) = ₹10(1+g)^2$

$D_3 = D_2(1+g) = ₹10(1+g)^3$

$D_4 = D_3(1+g) = ₹10(1+g)^4$

$D_5 = D_4(1+g) = ₹10(1+g)^5$

$D_5 = ₹10(1+g)^5 = ₹12·76$

$\Rightarrow (1+g)^5 = 1·276$

$\Rightarrow 1+g = \sqrt[5]{1·276}$

$\Rightarrow 1+g = 1·05$

$\Rightarrow g = 0·05$ (or) 5%.

Step 3: Calculation of price of Sh

$$P_0 = \frac{D_1}{k_e - g}$$

$$P_0 = \frac{D_0(1+g)}{k_e - g}$$

$$= \frac{₹12.76(1.05)}{32.50\% - 5\%}$$

$$= \frac{₹13.40}{27.50\%}$$

$$= ₹48.72$$

Alternative : Recommended

Life of Convertible bond = 6 years.

D_5 = ₹12.76

CB come for conversion @ 6th year i.e. P_6

$$P_6 = \frac{D_7}{k_e - g}$$

$$= \frac{D_5(1+g)^2}{k_e - g}$$

$$= \frac{12.76(1.05)^2}{32.50\% - 5\%}$$

$$= \frac{₹14.07}{27.5\%}$$

$$= ₹51.16$$

Value of CB on conversion = ₹51.16 × 2

= ₹102.32.

ICAI answer tends to be inaccurate due to impractical assumption.

Step 4: Calculation of Kd (appx)

$$K_d = \frac{I(1-t) + \left[\frac{RV - NP}{N}\right]}{\left[\frac{RV + NP}{2}\right]}$$

$$= \frac{15(1-0.40) + \left[\frac{₹102.32 - ₹95}{6}\right]}{₹98.66}$$

$$= \frac{9 + 1.22}{98.66} = 10.35\%$$

Step 5: Calculation of Kp

$$K_p = \frac{PD + \left[\frac{RV - NP}{N}\right]}{\frac{RV + NP}{2}}$$

$$= \frac{₹5 + \left[\frac{₹100 - ₹103.40}{10}\right]}{₹101.70}$$

$$= 4.58\% \text{ (appx)}$$

Accurate YTM

year	CF	PV @ 4%	PVCF	PV @ 5%	PVCF
1-10	5	8.110	40.55	7.722	38.61
10	100	0.675	67.50	0.614	61.40
			108.05		100.00

PV	Vps	DV	Δ
@ 4%	₹108.05	₹103.40	+4.65
@ 5%	₹100.00	₹103.40	−3.40
1%	₹8.05		

From 4% POV

1% ⟶ ₹8.05

? ⟵ +₹4.65

⇒ +0.577

= 4.58%.

From 5% POV

1% ⟶ ₹8.05

? ⟵ −₹3.40

= −0.42

= 5 − 0.42

= 4.58%