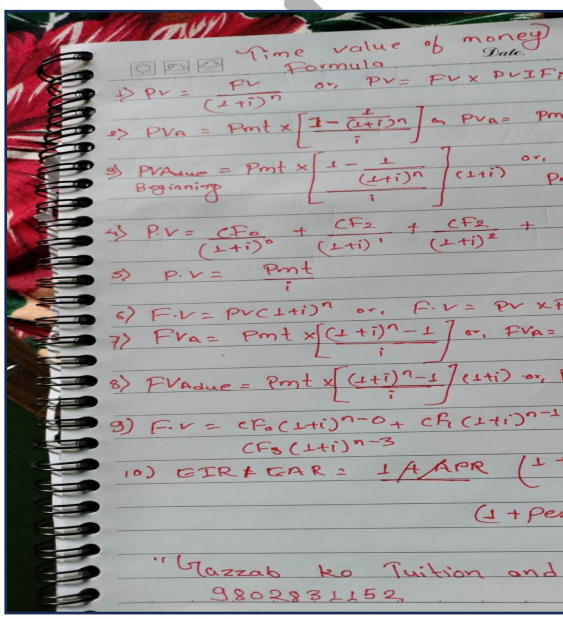
T.U. - 2076

Rita established a scholarship scheme that promises to pay needy students Rs 180,000 per year forever. How much should she deposit today to get this perpetual payment if the required interest rate is 12%?



Given,
PMT = Rs. 180,000
Interest rate (I) = 12%
$P.V_A$ (perpectual payement) = PMT / i
180,000/0.12
=Rs. 15,00,000

Per year, Each year, Every year, Equal installment = Pmt
Current, Now , past year , deposited, last year = Pv
Accumulated, Will , Will be , future, expected = Fv
F.V = P.V(1+i)^n
P.v = F.v / (1+i)^n

T.U. - 2073

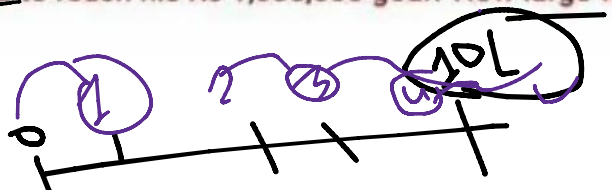
Nepal Bank Ltd pays 6 percent interest on its saving deposit. What is the effective interest rate if it is compounded quarterly?

Given,
Quarterly (m) = 3,3,3,3 = 4
Semi-annually (m)= 6,6 = 2
Interest Rate = i/m
No. of year = n*m
Effective annual Interest rate = (1+ i/m)^m-1
= (1 + 0.06/4)^4 – 1
= 6.14%

Descriptive Answer Questions

T.U. - 2076

Mr. Rajesh Devkota needs to accumulate Rs 1,000,000 to buy a second-hand vehicle for his personal use. He can save only Rs 125,000 annually out of his earnings, which can be deposited in a bank account at 12 percent annual compound interest rate. His last deposit will be less than Rs 125,000 if less is needed to round out to Rs 1,000,000. How many years will it take Mr. Devkota to reach his Rs 1,000,000 goal? How large will the last deposit be? (6+4)



Given,
FV_A= Rs.10,00,000
Pmt = Rs. 125,000
Interest (i) = 12%
No. of year (n) = ?
Now,
$F.V_A$ = Pmt*FVIFAi%,nyear
F.Va= 125000 (1+i)^n – 1 / I

$Pmt\left[\frac{(1+i)^n-1}{i}\right]$

$\frac{10,00,000}{125,000} = \frac{(1+0.12)^n - 1}{0.12}$

Or, 8*0.12 = (1.12)^n – 1

Or, 0.96 + 1 = (1.12)^n

Or, 1.96 = (1.12)^n

Or, Taking log on both side

Or, Log1.96 = nlog1.12

Or, $\frac{\text{Log } 1.96}{\text{Log}1.12} = n$

Or, N = 5.93year or 6 year

The number of year is 6 year

For his last deposit of less than 125000

We need a calculation for the 5 years

F.VA = Pmt*FVIFAi%, n year (i+1)

= 125000*FVIFA12%,5year (0.12+1)

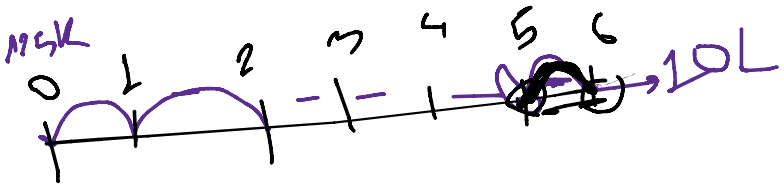
= 125000*6.3528 (1.12)

= 8,89,392

Last deposit

10,00,000 – 8,89,392

= Rs.1,10,608



FUTURE VALUE INTEREST FACTOR (PVIFA) OF AN ANNUITY THAT STARTS IN 1 PERIOD AND LASTS T PERIODS (ORDINARY ANNUITY)

Time (T)	Interest Rate (R)																			
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600	2.0700	2.0800	2.0900	2.1000	2.1100	2.1200	2.1300	2.1400	2.1500	2.1600	2.1700	2.1800	2.1900	2.2000
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2149	3.2464	3.2781	3.3100	3.3421	3.3744	3.4069	3.4396	3.4725	3.5056	3.5389	3.5724	3.6061	3.6400
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.4399	4.5061	4.5731	4.6410	4.7097	4.7793	4.8498	4.9211	4.9934	5.0665	5.1405	5.2154	5.2913	5.3680
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.7507	5.8666	5.9847	6.1051	6.2278	6.3528	6.4803	6.6101	6.7424	6.8771	7.0144	7.1542	7.2966	7.4416
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.1533	7.3359	7.5233	7.7156	7.9129	8.1152	8.3227	8.5355	8.7537	8.9775	9.2068	9.4420	9.6830	9.9299
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.6540	8.9228	9.2004	9.4872	9.7833	10.0890	10.4047	10.7305	11.0668	11.4139	11.7720	12.1415	12.5227	12.9159
8	8.2857	8.5830	8.8923	9.2142	9.5491	9.8975	10.2598	10.6366	11.0285	11.4359	11.8594	12.2997	12.7573	13.2328	13.7268	14.2401	14.7733	15.3270	15.9020	16.4991
9	9.3685	9.7546	10.1591	10.5828	11.0266	11.4913	11.9780	12.4876	13.0210	13.5795	14.1640	14.7757	15.4157	16.0853	16.7858	17.5185	18.2847	19.0859	19.9234	20.7989
10	10.4622	10.9497	11.4639	12.0061	12.5779	13.1808	13.8164	14.4866	15.1929	15.9374	16.7220	17.5487	18.4197	19.3373	20.3037	21.3215	22.3931	23.5213	24.7089	25.9587
11	11.5668	12.1687	12.8078	13.4864	14.2068	14.9716	15.7836	16.6455	17.5603	18.5312	19.5614	20.6546	21.8143	23.0445	24.3493	25.7329	27.1999	28.7551	30.4035	32.1504
12	12.6825	13.4121	14.1920	15.0258	15.9171	16.8699	17.8885	18.9771	20.1407	21.3843	22.7132	24.1331	25.6502	27.2707	29.0017	30.8502	32.8239	34.9311	37.1802	39.5805
13	13.8093	14.6803	15.6178	16.6268	17.7130	18.8821	20.1406	21.4953	22.9534	24.5227	26.2116	28.0291	29.9847	32.0887	34.3519	36.7862	39.4040	42.2187	45.2445	48.4966
14	14.9474	15.9739	17.0863	18.2919	19.5986	21.0151	22.5505	24.2149	26.0192	27.9750	30.0949	32.3926	34.8827	37.5811	40.5047	43.6720	47.1027	50.8180	54.8409	59.1959
15	16.0969	17.2934	18.5989	20.0236	21.5786	23.2760	25.1290	27.1521	29.3609	31.7725	34.4054	37.2797	40.4175	43.8424	47.5804	51.6595	56.1101	60.9653	66.2607	72.0351
16	17.2579	18.6393	20.1569	21.8245	23.6575	25.6725	27.8881	30.3243	33.0034	35.9497	39.1899	42.7533	46.6717	50.9804	55.7175	60.9250	66.6488	72.9390	79.8502	87.4421
17	18.4304	20.0121	21.7616	23.6975	25.8404	28.2129	30.8402	33.7502	36.9737	40.5447	44.5008	48.8837	53.7391	59.1176	65.0751	71.6730	78.9792	87.0680	96.0218	105.9306
18	19.6147	21.4123	23.4144	25.6454	28.1324	30.9057	33.9990	37.4502	41.3013	45.5992	50.3959	55.7497	61.7251	68.3941	75.8364	84.1407	93.4056	103.7403	115.2659	128.1167
19	20.8109	22.8406	25.1169	27.6712	30.5390	33.7600	37.3790	41.4463	46.0185	51.1591	56.9395	63.4397	70.7494	78.9692	88.2118	98.6032	110.2846	123.4135	138.1664	154.7400
20	22.0190	24.2974	26.8704	29.7781	33.0660	36.7856	40.9955	45.7620	51.1601	57.2750	64.2028	72.0524	80.9468	91.0249	102.4436	115.3797	130.0329	146.6280	165.4180	186.6880
21	23.2392	25.7833	28.6765	31.9692	35.7193	39.9927	44.8652	50.4229	56.7645	64.0025	72.2651	81.6987	92.4699	104.7684	118.8101	134.8405	153.1385	174.0210	197.8474	225.0256
22	24.4716	27.2990	30.5368	34.2480	38.5052	43.3923	49.0057	55.4568	62.8733	71.4027	81.2143	92.5026	105.4910	120.4360	137.6316	157.4150	180.1721	206.3448	236.4385	271.0307
23	25.7163	28.8450	32.4529	36.6179	41.4305	46.9958	53.4361	60.8933	69.5319	79.5430	91.1479	104.6029	120.2048	138.2970	159.2764	183.6014	211.8013	244.4868	282.3618	326.2369

T.U. - 2075

You need to accumulate Rs 100,000. To do so, you plan to make deposits of Rs 17,500 per year, with the first payment being made a year from today, in a bank account which pays 6 percent annual interest. Your last deposit will be more than Rs 17,500 if more is needed to round out to Rs 100,000. How many years will it take you to reach your goal of Rs 100,000, and how large will the last deposit be? (6+4)

Pmt

Solution,

Given

F.V = Rs. 100,000

T.U. - 2074

The management of Vikash publication decided to buy a printing press by taking a loan of Rs 1,000,000 for 3 years from Nepal Bank Limited. The loan bears a compound annual interest rate of 10 percent and calls for equal annual installment payments at the end of each year for 3 years.

a) What is the amount of annual payments?

b) Prepare loan amortization schedule.

c) What fraction of payment made in year 2 represents the principal? (4+4+2)

Given,
PV_A =Rs.10,00,000 (Loan)
Number of years (n) = 3 years
Interest rate (I) = 10%
PVa = Pmt*PVIFAi%, nyear
10,00,000 = pmt*PVIFA10%, 3 years
Pmt = $\frac{10,00,000}{2.4869}$
Pmt = Rs.4,02,107
Annual payment Rs. 3,02,115
Calculation of loan amortization schedule:

Year	Beginning loan	Payment(pmt) 3	Interest(10%) 4	Principal (3-4=5)	Ending loan 2-5=6
1	10,00,000	4,02,107	1,00,000	3,02,107	6,97,893
2	6,97,893	4,02,107	69789.3	332377.5	3,65,575.3
3	3,65,575.3	4,02,107	36557.53	365549.47	25.83

25.83 is a calculation of rounding error. They will manage it during the settlement process.

c) Fraction of payment represents to the principle for 2 year

$$\frac{\text{Principle}}{\text{Payment}}$$

$$\frac{332377.5}{402,107}$$

82.65%

T.U. - 2073

The management of Delta Trading Company decided to buy a delivery van taking a loan of Rs 1,200,000 for 4 years from Nepal Bank. The loan bears an annual interest of 10 percent and calls for equal annual installment payments at the end of each of the 4 years.

(a) Determine amount of annual payment.

(b) Prepare loan amortization schedule. (4+6)

Sakyo sabbai?

T.U. - 2072

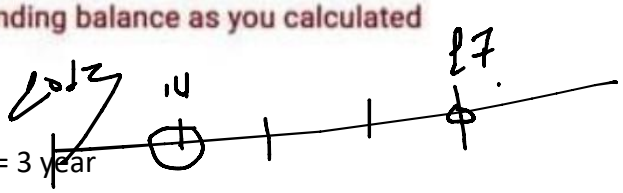
Assume that it is now January 1, 2013. On January 1, 2014, you will deposit Rs 1,000 into a savings account that pays 8 percent.

(a) If the bank compounded interest annually, how much will you have in your account on January 1, 2017?

(b) What would your January 1, 2017 balance be if the bank used quarterly compounding rather than annual compounding?

(c) Suppose you deposit the Rs 1,000 in 4 payments of Rs 250 each on January 1 of 2014, 2015, 2016 and 2017. How much would you have in your account on January 1, 2017, based on 8 percent annual compounding?

(c) Suppose you deposit 4 equal installments in your account on January 1 of 2014, 2015, 2016, and 2017. Assuming an 8 percent interest rate, how large would each of your payments have to be for you to obtain the same ending balance as you calculated in part (a)? (2.5 × 4)



Given,
P.V = Rs. 1000 Interest rate (i) = 8% Number of year (n) = 3 year
a) F.V = P.V (1+i)^n
= 1000(1+0.08)^3
=Rs. 1259.712
b) F.V = P.V(1+i/4)^n*4
1000(1+0.08/4)^4*3
= Rs.1268.24

c) Pmt = Rs.250
FVA = Pmt*FVIFAi%, n year
= 250* FVIFA8%,4year
=250*4.5061
=Rs. 1126.525

d) Given, PMT = ?
FVA = Rs. 1259.712 interest rate (i) = 8%
FVA= Pmt*FVIFAi%, n year
1259.712 = pmt*FVIFA8%,4 year
Or, $\frac{1259.712}{4.5061}$ = Pmt
:Pmt = Rs. 279.55

T.U. - 2069

Answer the following:

(a) What is the future value of 5-year annuity due that promises to pay out Rs. 400 each year? Assume all payments are reinvested at 7% a year, until year 5.

(b) You decided to buy a car, and a local bank is willing to lend you Rs 500,000 to buy a Nano car. Under the terms of the loan, it will be fully amortized over 60 months, and the nominal rate of interest will be 12 percent, with interest paid monthly. What would be the monthly payment on the loan? What is the effective rate of interest?

(c) Your client is 40 years old and wants to begin saving for retirement. You advise the client to put Rs. 6,000 a year into the stock market. You estimate that the markets return will be, on average, 12 percent a year. Assume the investment will be made the end of the year. How much will he/she have by age 70?

Given,

FVA = ? Number of year = 5 year Pmt = Rs.400 Interest rate(i) = 7%

Due = ? (1+i)

FVA = PMT*FVIFAi%,nyear (1+i)

= 400*FVIFA7%,5year(1+0.07)

= Rs. 2461.3

Given,

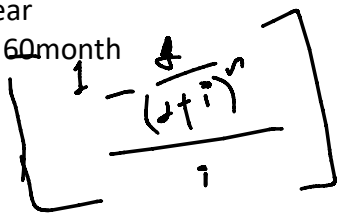
Loan (PVA) = Rs.500000

Number of year(n) = 60month = 5 year

Interest rate (i) = 12% or 12%/12 = 1%

PVA = Pmt*PVIFAi%, Nyear

500000= Pmt*PVIFA1%, 60month

500000 = pmt* 

Pmt = Rs. 11,222.23

Effective annua rate = [1+(i/m)]^n – 1

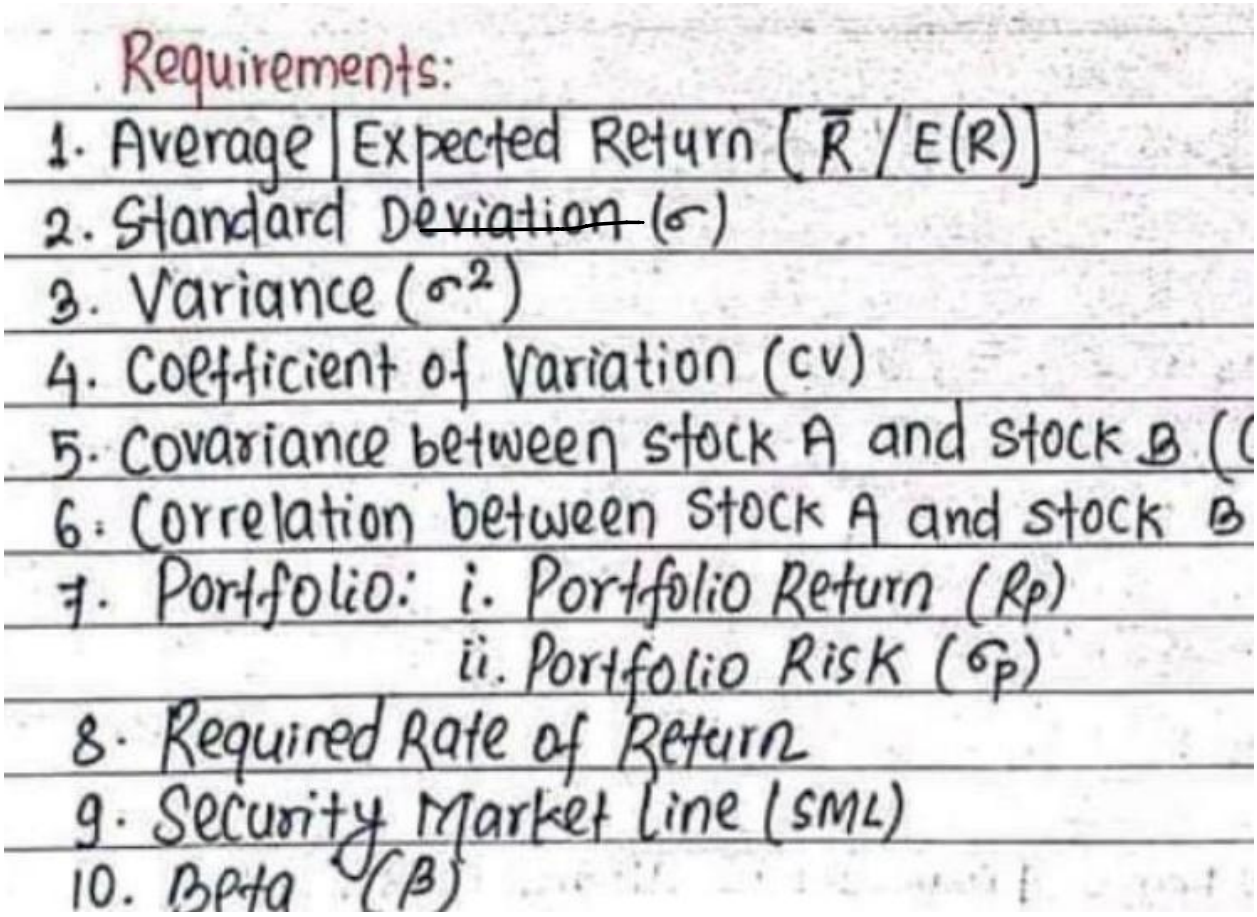
= [1+(0.12/12)]^12 – 1

= Rs.12.68%

Risk and Return Finance- 15 + 2= 17 Makrs Fixed

Formula: Session
There are mainly two types of Exam
Historical Data (Year is given)
Probability Data (% probability or decimal probability given)

Requirements:
Expected / Average return ($\sum R_A$) = $\sum RA/n$ (If There is no probabilty)
= $\sum RA*P$ (If there is probability)



1. Average Return ($\bar{R}$)

$$\bar{R}_A = \frac{\Sigma R_A}{n} =$$

$$\bar{R}_B = \frac{\Sigma R_B}{n} =$$

2. Standard Deviation (σ)

$$\sigma_A = \sqrt{\frac{\Sigma [R_A - \bar{R}_A]^2}{n-1}}$$

$$\sigma_B = \sqrt{\frac{\Sigma [R_B - \bar{R}_B]^2}{n-1}} =$$

$$COV_{AB} = \frac{[R_A - \bar{R}_A][R_B - \bar{R}_B]}{2n-1}$$

1. Rate of Return (R) $= \frac{P_1 - P_0 + D_1}{P_0}$

current yield $= \frac{D_1}{P_0}$ and capital gain yield $= \frac{P_1 - P_0}{P_0}$

Rate of Return = current yield + capital gain yield.

where,

P_1 = Ending price of investment or selling price

P_0 = beginning price of investment or purchase price

D_1 = year end income i.e. interest or dividend income

2. Expected return or Average Return ($\bar{R}_A$) $= \Sigma R_A \cdot Pr$ OR $\frac{\Sigma R_A}{N}$

3. standard deviation of stock A (σ_A) $= \sqrt{\Sigma (R_A - \bar{R}_A)^2 \cdot Pr}$ OR $\sqrt{\frac{\Sigma (R_A - \bar{R}_A)^2}{N-1}}$

4. Coefficient of variation of stock A ($C.V_A$) $= \frac{\sigma_A}{\bar{R}_A}$

5. Expected Return or Average Return on portfolio ($\bar{R}_{AB}$):

$\Sigma R_{AB} \cdot Pr$ OR, $\frac{\Sigma R_{AB}}{N}$ OR, $W_A \cdot \bar{R}_A + W_B \times \bar{R}_B$ and

$R_{AB} = W_A \cdot R_A + W_B \cdot R_B$

$$\sigma_{AB} = \sqrt{w^2_A \cdot \sigma^2_A + w^2_B \cdot \sigma^2_B + 2 \cdot w_A \cdot w_B \cdot \rho_{AB} \cdot \sigma_A \cdot \sigma_B}$$

$$\sigma_{ABC} = \sqrt{w^2_A \cdot \sigma^2_A + w^2_B \cdot \sigma^2_B + w^2_C \cdot \sigma^2_C + 2 \cdot w_A \cdot w_B \cdot \rho_{AB} \cdot \sigma_A \cdot \sigma_B + 2 \cdot w_B \cdot w_C \cdot COV_{BC} + 2 \cdot w_A \cdot w_C \cdot COV_{AC}}$$

7. Coefficient of variation $(C.V_{AB}) = \dfrac{\sigma_{AB}}{\bar{R}_{AB}}$

8. Co-variance between Return on stock A and stock B (COV_{AB})

$$COV_{AB} = \Sigma (R_A - \bar{R}_A)(R_B - \bar{R}_B) \times pr \quad \text{or,} \quad \frac{\Sigma (R_A - \bar{R}_A)(R_B - \bar{R}_B)}{N-1} \quad \text{or,} \quad \rho_{AB} \cdot \sigma_A \cdot \sigma_B$$

9. Correlation between Return on stock A and stock B

$$\rho_{AB} = \frac{COV_{AB}}{\sigma_A \cdot \sigma_B}$$

10. Capital Assets pricing model (CAPM)

Required Rate of Return $(R_A) = [R_f + (R_m - R_f) \times \beta_A]$

Market return premium $(R_m - R_f)$

11. Beta coefficient of stock A $(\beta_A) = \dfrac{COV_{AM}}{\sigma^2_M}$

12. Beta portfolio $= w_A \cdot \beta_A + w_B \cdot \beta_B + w_C \times \beta_C + \cdots + w_n \times \beta_n$

13. Slope of SML $= \dfrac{R_m - R_f}{\beta_m}$

Unit 4: Fundamentals of Risk and Return

Theoretical Questions

Brief Answer Questions

1. 2080 Q.No. 3
   What is beta coefficient and what objective does it serve?
2. 2078 Q.No. 3
   Define the term risk. How is it measured?
3. 2077 Q.No. 3
   Define the term portfolio.

Descriptive Answer Questions

4. 2074 Q.No. 10a
   Write notes on portfolio opportunity set.
5. 2072 Q.No. 10b
   Write short note on efficient sets.
6. 2057
   Explain the concept of portfolio risk and the capital assets pricing model.

Numerical Problems

1. 2079 Q.No. 9
   Stock Y has a beta of 1.45 and expected return of 17 percent. If the risk free rate is 6 percent and market risk premium is 7.5 percent. Is the stock correctly priced? [2]
   Ans: 16.87%

2. 2077 Q.No. 7 2073 Q. No. 7
   Assume that the risk-free rate is 6 percent and the market risk premium is 8 percent. Beta of Stock J is 1.5. Calculate required rate of return on Stock J. [2]
   Ans: 18%

3. 2076 Q.No. 4
   Suppose you invested Rs 35,000 in Stock A that has a beta coefficient of 0.8 and Rs 40,000 in stock B that has a beta coefficient of 1.4. What is your portfolio's beta? [2]
   Ans: 1.12

4. 2075 Q.No. 7
   Assume that the risk-free rate is 8 percent and the market risk premium is 6 percent. Beta of Stock J is 2. Average rate of return on Stock J is 18 percent. Is Stock J correctly priced? [2]
   Ans: E(R$_j$) 20%

5. 2074 Q.No. 4
   A portfolio consists of Stock A and Stock B with beta 0.9 and 1.6, respectively. If Stock A consists of 80 percent investment in the portfolio, what will be the portfolio beta? [2]
   Ans: 1.04

Given, Beta of stock Y = 1.45

Expected return = 17%

ate = 6%

k premium (Rm-Rf) = 7.5%

3) Stock A = 35000 , Stock B = 4
Total stock = 75,000
Weight of stock A (Wa) = 35,000
Weight of stock B (Wb) = 40,000
Beta coff. Stock A (0.8 or
Portfolio beta = Wa*Ba+Wb*Bb
= 0.47*0.8+0.53*
= 1.118

6. 2077 Q.No. 7 2073 Q. No. 7
   Assume that the risk-free rate is 6 percent and the market risk premium is 8 percent. Beta of Stock J is 1.5. Calculate required rate of return on Stock J. [2]
   Ans: 18%

7. 2076 Q.No. 4
   Suppose you invested Rs 35,000 in Stock A that has a beta coefficient of 0.8 and Rs 40,000 in stock B that has a beta coefficient of 1.4. What is your portfolio's beta? [2]
   Ans: 1.12

8. 2075 Q.No. 7
   Assume that the risk-free rate is 8 percent and the market risk premium is 6 percent. Beta of Stock J is 2. Average rate of return on Stock J is 18 percent. Is Stock J correctly priced? [2]
   Ans: E(R$_j$) 20%

9. 2074 Q.No. 4
   A portfolio consists of Stock A and Stock B with beta 0.9 and 1.6, respectively. If Stock A consists of 80 percent investment in the portfolio, what will be the portfolio beta? [2]
   Ans: 1.04

Risk-free rate (Rf) = 6%
Market risk premium (Rf-Rm) = 8%
Beta stock j (β) = 1.5
Rate of return =Rf+ (Rf-Rm)* β
= 6% + (8%*1.5)
= 18%

7. 2076 Q.No. 4

Suppose you invested Rs 35,000 in Stock A that has a beta coefficient of 0.8 and Rs 40,000 in stock B that has a beta coefficient of 1.4. What is your portfolio's beta? [2]

Ans: 1.12

Given .
Stock A = Rs.35,000
Stock B = Rs. 40,000
Total Stock = 75,000
Weight of stock A (Wa) = $\frac{35,000}{75,000}$ = 46.67
Weight of stock B (Wb) = $\frac{40,000}{75,000}$ = 53.33
Beta coefficient of stock (A) = 0.8

2074 Q.No. 4

Consider the following information:

State of Economy	Probability	Rate of return	
		Stock A	Stock B
Recession	0.20	6%	(20%)
Normal	0.60	7	13
Boom	0.20	11	33

Calculate: (a) Expected return of both stocks, (b) Standard deviation of both stocks, and (c) Covariance between return of both stocks. [3+3+4]

Ans: (a) 7.6% and 10.4% (b) 1.74% and 17.06 (c) 24.16

2077 Q.No. 12

Consider the following information associated with Stock A and Stock B given in the following table.

	Stock A	Stock B
Average rate of return	12%	18%
Standard deviation of returns	6%	8%
Covariance of stock returns	−38.4	
Coefficient of correlation of stock returns	−0.8	

a. Which one stock is more risky? Which one stock would you prefer? [2]
b. If you form a portfolio of Stock A and Stock B comprising 60 percent wealth in Stock A and the rest in Stock B, calculate the risk and return of your portfolio. [4]
c. Assume risk-free rate and market return are 8% and 15% respectively. Covariance between Stock A and market return is 54 and variance of market return is 36, calculate beta of Stock A. what is the required rate of return on Stock A? [4]

Ans: (a) 0.5; 0.4444; Stock B; (b) E (R_P) 14.4%; σ_P 2.18%; (c) β_A 1.5; E(R_A) 18.5%

cost of capital:
→ cost of debt
→ cost of preferred stock
→ cost of common stock
→ cost of retain earning

Debt

10 marks
Fixed

→ cost of debt after tax (K_{dt})

$K_{dt} = K_d(1-t)$

where, K_d = cost of debt before tax
t = tax.

i. $K_d = \frac{I}{NP}$ If no maturity period

K_d = cost of debt
I = interest
NP = Net proceed (Actual received share or price)

ii. If maturity period given.

$$K_d = \frac{I + \frac{M - NP}{n}}{\frac{M + 2NP}{3}}$$

where, M = Face value, par value, maturity value
n = no. of years.

$K_{dt} = K_d(1-t)$

022

$K_{dt} = K_d(1-t)$

Preference stock

$K_{ps} = \frac{D_{ps}}{NP}$ Dividend

$K_{ps} = \frac{D_{ps} + \frac{M - NP}{n}}{\frac{M + 2NP}{3}}$

cost of equity

→ Internal (Retained earning) $(K_s) = \frac{D_1}{P_0} + g$

→ External $(K_e) = \frac{D_1}{NP} + g$

D_1 = Expected Dividend (Next year Dividend)

P_0 = stock current price

g = Growth rate

$D_1 = D_0(1+g)$

D_0 = Last Year Dividend, just paid Dividend

CAPM

cost of equity

$K_s = R_f + (R_m - R_f) * \beta$

where,

R_f = Risk free rate

$R_m - R_f$ = market risk premium

β = Beta

Weighted Average cost of capital (WACC)

$$WACC = K_{dt} \times w_d + k_{ps} \times w_{ps} + k_s \times w_s + k_e \times w_e$$

2080 Q.No. 16

Sahara Company has the following capital structure, which it considers to be optimal:

Debt	40%
Preferred stock	10
Common equity	50
	100%

Sahara's current dividend per share is Rs 30. Investors expect future earnings and dividends to grow at a constant rate of 5 percent per year forever. The company's stock currently sells for Rs 280 per share. New common stock can be sold for Rs 250 per share. Preferred stock can be sold with a dividend of Rs 14 to the public at a price of Rs 95 per share. Debt can be sold at an interest rate of 10 percent. Assume the applicable tax rate is 30 percent.

a. Calculate the cost of each capital component.
b. Calculate the weighted average cost of capital (WACC) assuming equity requirement is fulfilled from external equity only.
c. What are the uses of cost of capital? [6+3+1]

Ans: (a) k_{dT} = 17.6%; k_{ps} = 14.74%; k_s = 16.25%; k_e = 17.6% (b) 12.399%

Given,
Weight of Debt(Wd) = 40% = 0.40
Weight of preferred stock (Wp) = 10% = 0.10
Weight of common equity (Ks) = 50% = 0.50
Current dividend (D0) = Rs.30
Growth rate (g) = 5% = 0.05
Current selling price (P0)= rs.280 per share
New common stock (P1) = Rs.250 per share
Dividend (DPS)= Rs.14
Price (NP) = Rs. 95 per share
Interest rate (Kd) = 10%
Tax rate (T) = 30% = 0.30

a) Cost of Debt after tax (Kdt) = kd(1-T)
= 10%(1-0.30)
= 7%

b) Cost of preferred stock (Kps) = DpS / NP

= 14/ 95

= 14.73%

c) Cost of Capital (Ks) = D1/p0 + g

= D0(1+g)/280 + 0.05

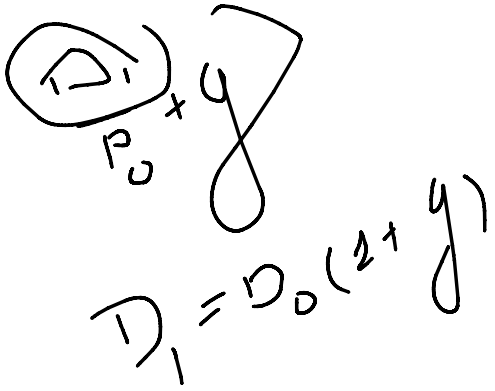
= 30(1.05)/280+0.05

= 16.25%

d) Cost of equity (Ke) = D1/Np +g

= 31.5/250 + 0.05

= 17.6%



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B) WACC = Wd*kdt+Wp*Kps+Ws*Ke

=0.40*17.6% + 0.10*14.73%+0.50*17.6%

=

2079 Q.No. 15 2064 Q.No. 8 2062 Q.No 3

The small tool company was recently formed to manufacture a new product. The company has the following capital structure in the beginning of the year 2021.

13% Debenture of 2030	Rs. 6 million
8% Preference stock	Rs. 2 million
Common stock (80,000 shares of Rs. 100)	Rs. 8 million
Total	**Rs. 16 million**

The common stock sells for Rs. 200 a share on this data. Last year company paid dividend of Rs. 20 per share and expected to grow at the rate of 10 percent. The company has a marginal tax rate of 40 percent.

a. Compute the firm's weighted average cost of capital.

b. Is the figure computed in (a) is an appropriate acceptance criteria for evaluating new investment proposal? [8+2]

Ans: (a) 14.425% (b) Yes

Given,

Weight of debenture (Wd) = 6/16 = 0.375

Weight of preference stock (Wp) = 2/16 = 0.125

Weight of common stock (Ks) = 8/16 = 0.5

Selling price for common stock (P0) = Rs.200

Last year dividend (D0) = Rs.20 per share

Growth rate (g) = 10%

Tax Rate (T) = 40% = 0.40
Interest rate (kd) = 13%

a) Requirement :

WACC = Wd*Kdt+Wp*Kps+Ws*Ks
= 0.375*7.8%+0.125*8%+0.5*21%
= 14.425%

i) Cost of debt (Kdt) = Kd(1-T)
= 13% (1-0.40)
= 7.8%

ii) Cost of preferred stock (Kps) = 8%

iii) Cost of common stock (Ks) = D1/P0 + g
=D0(1+g)/P0 +g
=20(1+0.10)/200 + 0.10
= 0.21 or 21%

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

B) yes it is an appropriate and acceptable criteria for evaluating new investment proposal because it has higher cost of common stock for return.

4. 2078 Q.No. 15

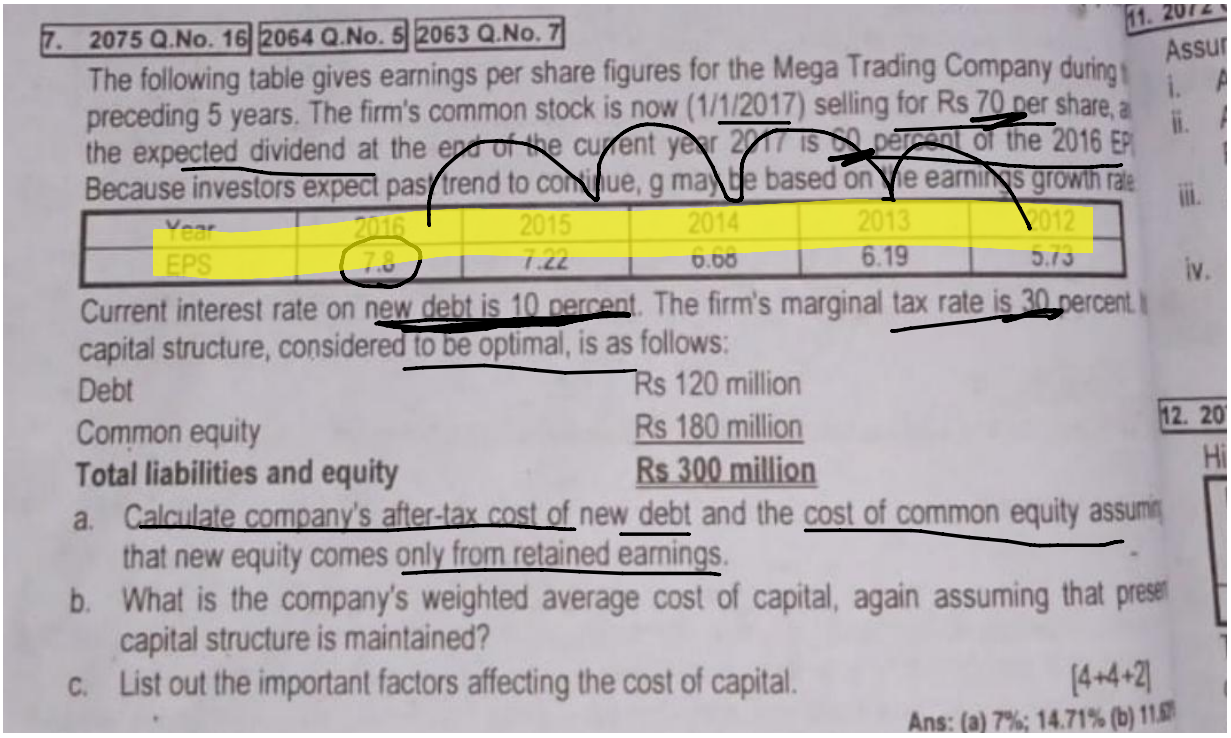
Mega Company has the following capital structure, which it considers to be optimal:

Debt	30%
Preferred stock	20
Common equity	50
	100%

Mega's current dividend per share is Rs 15. Investors expect future earnings and dividends to grow at a constant rate of 6 percent per year forever. The company's stock currently sells for Rs 180 per share. New common stock can be sold for Rs 150 per share. Preferred stock can be sold with a dividend of Rs 12 to the public at a price of Rs 90 per share. Debt can be sold at an interest rate of 10 percent. Assume the applicable tax rate is 40 percent.

a. Calculate the cost of each capital component.
b. Calculate the weighted average cost of capital (WACC) assuming equity requirement is fulfilled from retained earning only. [6+4]

Ans: k_{dT} = 6%; k_s = 14.83%; k_e = 16.6%; k_{ps} = 13.33% (b) 11.881%



7. 2075 Q.No. 16 | 2064 Q.No. 5 | 2063 Q.No. 7

The following table gives earnings per share figures for the Mega Trading Company during the preceding 5 years. The firm's common stock is now (1/1/2017) selling for Rs 70 per share, and the expected dividend at the end of the current year 2017 is 60 percent of the 2016 EPS. Because investors expect past trend to continue, g may be based on the earnings growth rate.

Year	2016	2015	2014	2013	2012
EPS	7.8	7.22	6.68	6.19	5.73

Current interest rate on new debt is 10 percent. The firm's marginal tax rate is 30 percent. The capital structure, considered to be optimal, is as follows:

Debt	Rs 120 million
Common equity	Rs 180 million
Total liabilities and equity	**Rs 300 million**

a. Calculate company's after-tax cost of new debt and the cost of common equity assuming that new equity comes only from retained earnings.

b. What is the company's weighted average cost of capital, again assuming that present capital structure is maintained?

c. List out the important factors affecting the cost of capital. [4+4+2]

Ans: (a) 7%; 14.71% (b) 11.6

Given,

Selling price of common stock (P0) = Rs.70 per share

Expected dividend (D1) = 60% of 7.8
= Rs.4.68

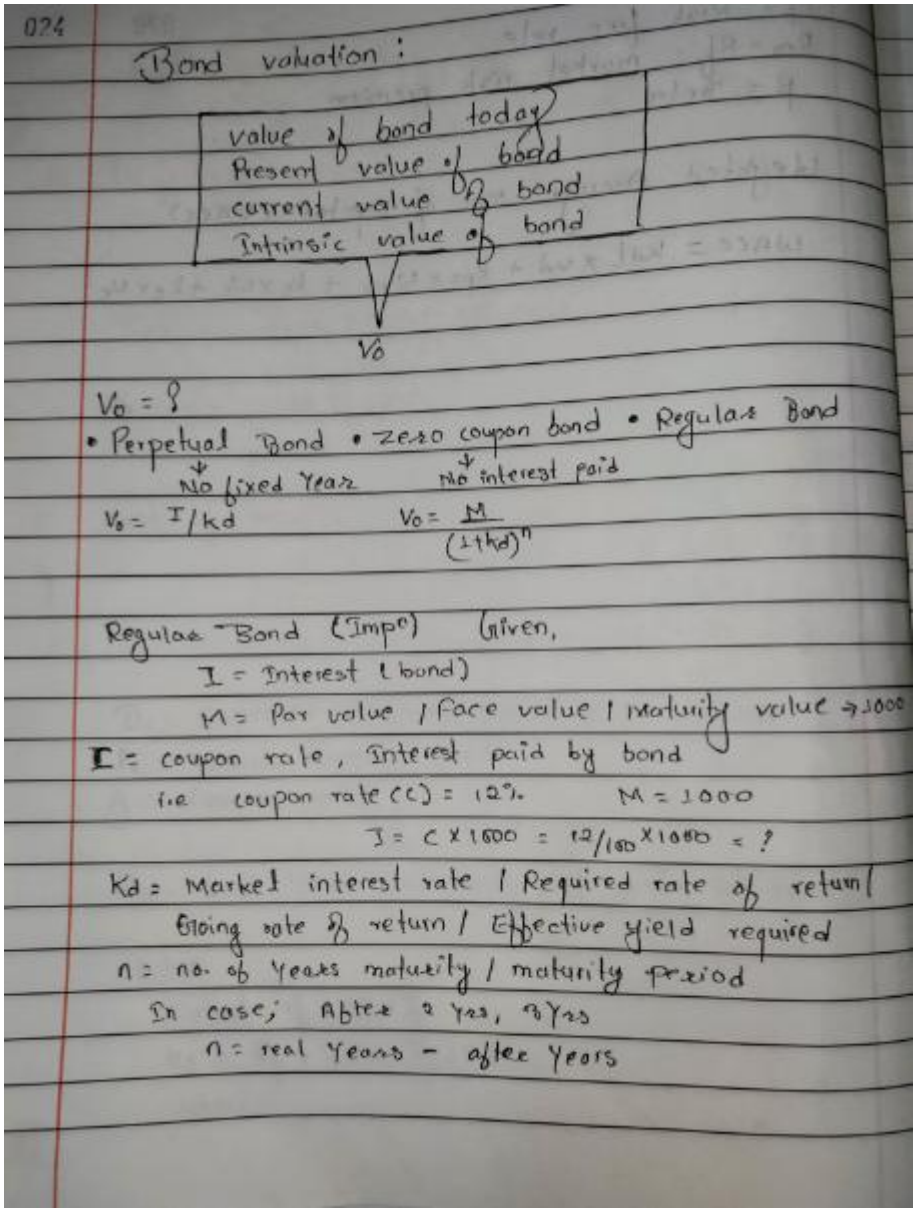
EPS 2016 = EPS 2012 (1+g)^4
7.8 = 5.73 (1+g)^4
Or, 7.8/5.73 =(1+g)^4
Or, 1.36 = (1+g)^4
Or, 1.3613^1/4 = (1+g)^4*1/4
Or, 1.0802 = 1+g
Or, g =0.0802 or 8.0161%
Kd= 10%
Cost of debt (Kdt) = kd(1-T)
= 10%(1-.30)
= 7%
Cost of equity (Ks) = D1/P0 +g
=4.68 / 70 + 0.0802
= 0.1471 or 14.70%

Weight of debt (Wd) = 120/300 = 0.4
Weight of common stock (Ws) = 180/300 = 0.6

b) WACC = Wd*Kdt + Ws*Ks
=0.4*7%+0.6*14.70%
= 11.625%
Yes because it is higher than rate of return

c) Important

Bond valuation



Regular Bond:

$V_0 = I \times PVIFA_{Kd\%, n\,Yrs} + M \times PVIF_{Kd\%, n\,Yrs}$

I = ब्याज M = मूलधन

$$I \times \left[\frac{1 - \frac{1}{(1+K_d)^n}}{K_d}\right] + M \times \frac{1}{(1+K_d)^n}$$

If semi-Annually

n = Years × 2 , Interest rate = $I/2$, $K_d = K_d/2$

current yield = I / V_0

capital train(loss) Yield = YTM − current yield

Yeild to Maturity (YTM)

YTM

step-1 | step-2 | step-3

Calulate Approximate YTM	Try at lower & Higher rate (LR, HR	Interpolation

Approximate YTM = $\dfrac{I + \frac{M - V_0}{n}}{\frac{M + 2V_0}{3}}$

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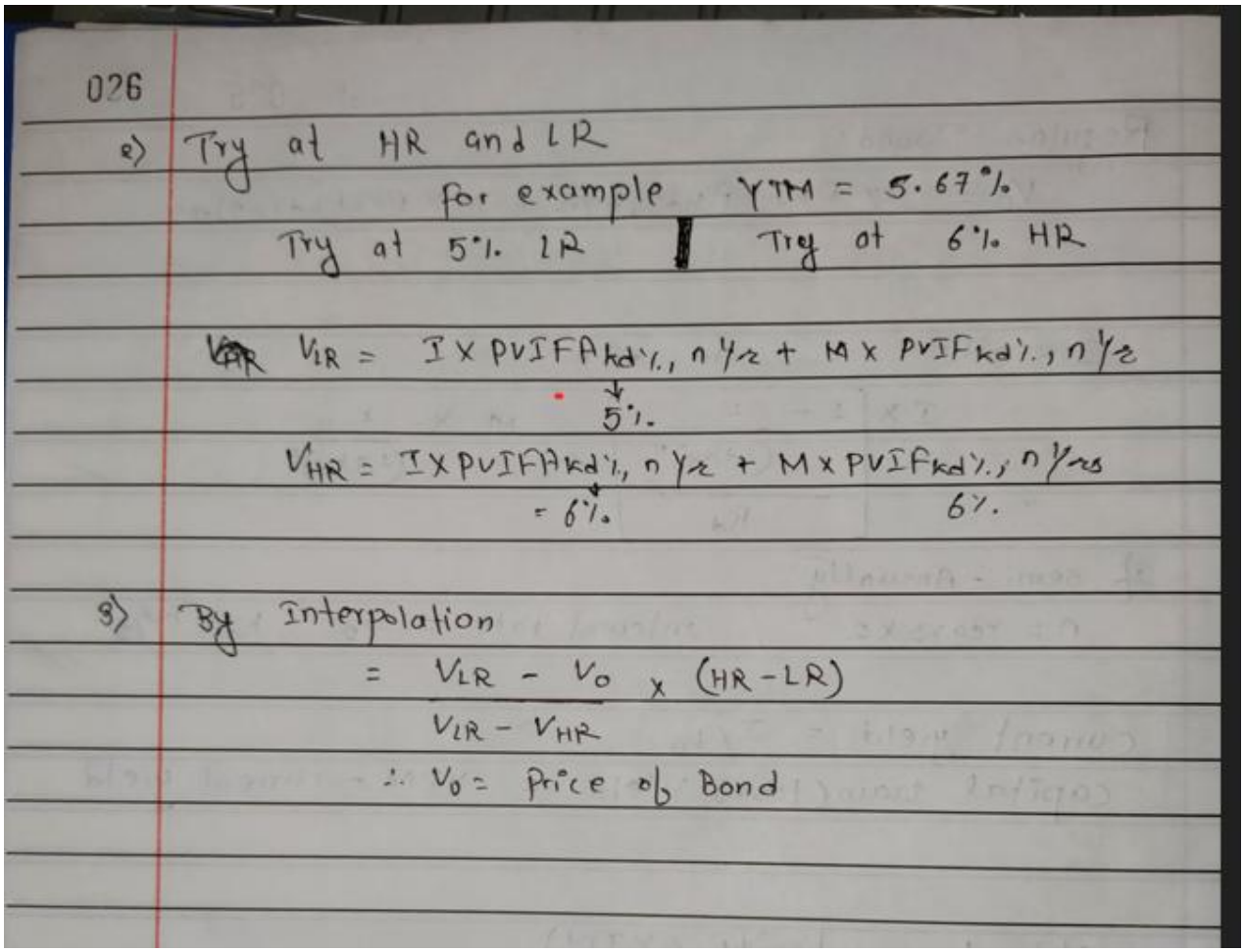

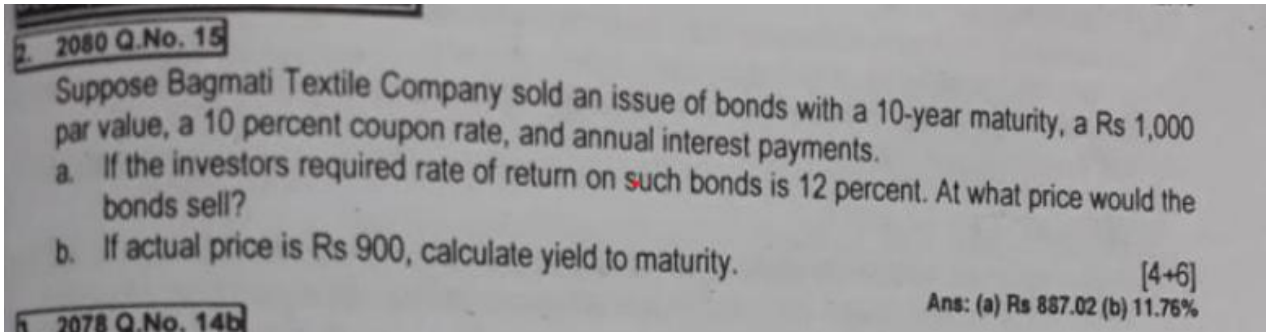
2. 2080 Q.No. 15

Suppose Bagmati Textile Company sold an issue of bonds with a 10-year maturity, a Rs 1,000 par value, a 10 percent coupon rate, and annual interest payments.

a. If the investors required rate of return on such bonds is 12 percent. At what price would the bonds sell?

b. If actual price is Rs 900, calculate yield to maturity. [4+6]

Ans: (a) Rs 887.02 (b) 11.76%

5. 2078 Q.No. 14b

Given.

Number of maturity (n) = 10 years
Par value (M) = Rs.1000
Counpon interest © = 10%
Annual interest (I) = C*M or 10%*1000 = Rs.100
Require rate of return (KD) = 12%
V0?
V0 = I*PVIFAkd%,nyear+M*PVIFkd%,n year
= 100*PVIFA12%,10years + 1000*PVIF12%,10 years
= 100*5.6503+ 1000*0.3220
= Rs.887.02
B: Given,
Price (P0) = Rs.900
Yield to maturity?
1st step:
Appropriate YTM = $I + \frac{M - V_0}{n}$ / $\frac{M + 2V_0}{3}$

$100 + \frac{1000 - 887.02}{10}$

$\frac{1000 + 2 \times 887.02}{3}$

$\frac{111.298}{1258.0133}$

3. **2078 Q.No. 14b** [4+6]

Ans: (a) Rs 887.02 (b) 11.75%

Suppose City Bank sold an issue of bonds with a 10-year maturity, a Rs 1,000 par value, a 12 percent coupon rate, and semi-annual interest payments. Market interest rate is 10 percent. Calculate value of bond at present. Would you purchase the bond if it is trading at Rs 1,050?

4. **2077 Q.No. 13**

Ans: Rs. 1,124.63

Mega Bank has just issued bonds with an annual coupon rate of 8 percent, 7 years maturity and Rs 1,000 par value.

a. If an investor required rate of return is 10 percent, how much can he/she pay for the bond at present? If bond is trading at Rs 900, would you suggest the investor to purchase the bond?

b. How does value of the bond change with the change in market interest rate? [7+3]

Ans: Rs 902.67

5. **2076 Q.No. 14a**

A company has Rs 1,000 par value, 14% coupon payment bond outstanding that has 15 years remaining until maturity. If investor's required rate of return is 12% what should be the price of bond today? [5]

Ans: Rs 1,136.23

6. **2075 Q.No. 14**

Suppose High-Tech Manufacturing Company sold an issue of bonds with a 10-year maturity, Rs 1,000 par value, a 10 percent coupon rate, and annual interest payments.

a. Two years after the bonds were issued, the going rate of interest on bonds such as these fell to 8 percent. At what price would the bonds sell?

b. Suppose that, 2 years after the initial offering, the going interest rate had risen to 12 percent. At what price would the bonds sell?

c. Suppose that the conditions in part (a) existed that is, interest rates fall to 8 percent 2 years after the issue date. Suppose further that the interest rate remained at 8 percent for the next 10 years. Describe what would happen to the price of the company's bonds over time. [4+4+2]

Ans: (a) Rs 1,114.96 (b) Rs 900.66

New Chapter Stock valuation – 12 marks

Formula:

Financial Assets valuation

(11) Stock valuation:

(*) calculation of value of stock at present under:

1. zero growth model

$$P_0 = \frac{D_0}{K_s}$$

2. constant growth model

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

3. supernormal growth model

$$P_0 = \frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{D_3}{(1+K_s)^3} + \cdots + \frac{D_n}{(1+K_s)^n} + \frac{P_n}{(1+K_s)^n}$$

$D_1 = D_0(1+g)$

$D_2 = D_1(1+g)$

$D_3 = D_2(1+g)$

$D_4 = D_3(1+g)$

$D_5 = D_4(1+g)$

$D_6 = D_5(1+g)$

$$P_1 = \frac{D_2}{(1+K_s)^1} + \frac{D_3}{(1+K_s)^2} + \frac{D_4}{(1+K_s)^3} + \frac{D_5}{(1+K_s)^4} + \frac{D_6}{(1+K_s)^5} + \frac{P_6}{(1+K_s)^5}$$

$$P_2 = \frac{D_3}{(1+K_s)^1} + \frac{D_4}{(1+K_s)^2} + \frac{D_5}{(1+K_s)^3} + \frac{D_6}{(1+K_s)^4} + \frac{P_6}{(1+K_s)^6}$$

$$P_3 = \frac{D_4}{(1+K_s)^1} + \frac{D_5}{(1+K_s)^2} + \frac{D_6}{(1+K_s)^3} + \frac{P_6}{(1+K_s)^3}$$

$$P_4 = \frac{D_5}{(1+K_s)^1} + \frac{D_6}{(1+K_s)^2} + \frac{P_6}{(1+K_s)^2}$$

Descriptive Answer Questions

2080 Q.No. 14

Janakpur Sweets Company is experiencing a period of rapid growth. Earnings and dividends are expected to grow at a rate of 10 percent during the next 2 years, at 8 percent in the third year, and at 5 percent constant rate thereafter. Company's last dividend was Rs 20 and the required rate of return on the stock is 15 percent.

a. Calculate the value of the stock today.
b. Calculate value of stock at the end of year 1, (P1).
c. Calculate the dividend yield and capital gain yield for the first year. [4+3+3]

Ans: (a) Rs 274.428 (b) Rs 248.31 (c) 5.64%

2079 Q.No. 14

Everest Company's current stock price is Rs. 360 and its last dividend was Rs. 24. In view of company's strong financial position and its consequent low risk, its required rate of return is only 12 percent. If dividends are expected to grow at a constant rate in the future, and if required rate of return on stock is expected to remain 12 percent, what is company's expected stock price 5 years from now? [10]

Ans: g = 5%; Rs 459.46

$$P_0 = \frac{D_1}{(1+K_s)^1} + \frac{D_2}{(1+K_s)^2} + \frac{D_3}{(1+K_s)^3} + \frac{P_3}{(1+K_s)^3}$$

$g_{1-2} =$

$g_3 =$

D1= D0(1+g)
=20(1+.10) = 22
D2 = D1(1+g)
=22(1+.10) = 24.20
D3 = D2(1+g)
= 24.20(1+0.08) = 26.14
D4 = D3(1+g)
= 26.14(1+0.05) = 27.45
P3 = D4

Chapter 9: Working Capital Management 2 marks