MERGERS, ACQUISITIONS & RESTRUCTURING

Q.2. XYZ Ltd., is considering merger with ABC Ltd.….
Solution:

(i) Pre-merger EPS and P/E ratios of XYZ Ltd. and ABC Ltd.

Particulars	**XYZ Ltd.**	**ABC Ltd.**
Profits after taxes	5,00,000	1,25,000
Number of shares outstanding	2,50,000	1,25,000
EPS (Earnings after tax/No. of shares)	2	1
Market price per share	20.00	10.00
P/E Ratio (times)	10.00	10.00

(ii) **Current market price of ABC Ltd., if P/E ratio is 6.4** = ₹ 1 × 6.4 = ₹ 6.4
Exchange ratio = ₹ 6.4/20 = 0.32

Post-merger EPS of XYZ Ltd. = $\frac{\text{Rs.5,00,000+Rs.1,25,000}}{2{,}50{,}000+(1{,}25{,}000 * 0.32)} = \frac{\text{Rs.6,25,000}}{2{,}90{,}000}$ = 2.16

(iii) **Calculation of Gain/ Loss from Merger**

Particulars	**Acquiror**	**Target**
Post Merger EPS / Adjusted EPS	2.16	0.6912 [2.16 * 0.32]
Less: Pre-merger EPS	2	1
Gain / (Loss) per Share	0.16	(0.3088)
No. of Shares	250000	125000
Total Gain / (Loss)	40000	(38600)

(iv) **Desired exchange ratio**
Total number of shares in post-merged company

$= \frac{\text{Post – merged earnings}}{\text{Pre – merger EPS of XYZ Ltd.}}$ = 6,25,000/2 = 3,12,500

Number of shares required to be issued = 3,12,500 – 250,000 = 62,500
Therefore, the exchange ratio is = 62,500/ 1,25,000 = 0.50

Alternatively, EPS based swapping will lead to no loss of EPS after merger.

Q.3. A Ltd. is studying the possible…..

Solution:

(i) Exchange of shares on the basis of market price

Exchange ratio is $\frac{\text{MPS of Target Firm}}{\text{MPS of Acquiring}}$ = 9/12 = 0.75.

Details	A Ltd	Z Ltd	Combined
Earnings	250,000	75,000	325,000
Shares	50,000	15,000	65,000
Earnings Per Share			5

(ii) If Z Ltd., wants to maintain earnings of its shareholder:

Pre Issue EPS

Details	A Ltd	Z Ltd	Combined
Earnings	250,000	75,000	325,000
Shares	50,000	15,000	65,000
Earnings Per Share			5

In this case, the exchange ratio should be based on EPS of respective firms

Exchange ratio is = $\frac{\text{EPS of Target Firm}}{\text{EPS of Acquiring}}$ = 3.75/5.00 = 0.75

Number of shares to be issued by A Ltd., (20,000 x 0.75) = 15,000

Post Issue EPS

Details	A Ltd	Z Ltd	Combined
Earnings	250,000	75,000	325,000
Shares	50,000	15,000	65,000
Earnings Per Share			5

Conclusion: The EPS of Z Ltd is protected. Incidentally even when the exchange ratio was based on Market Price it was protected.

Q.6. A Ltd. wants to acquire T Ltd……
Solution:

(i) The number of shares to be issued by A Ltd.:

The Exchange ratio is 0.5
So, new Shares = 1,80,000 x 0.5 = 90,000 shares.

(ii) EPS of A Ltd. After a acquisition:

Total Earnings	(₹18,00,000 + ₹3,60,000)	₹21,60,000
No. of Shares	(6,00,000 + 90,000)	6,90,000
EPS	(₹21,60,000)/6,90,000)	₹3.13

(iii) Equivalent EPS of T Ltd.:

No. of new Shares	0.5
EPS	₹3.13
Equivalent EPS (₹3.13 x 0.5)	₹1.565

(iv) New Market Price of A Ltd. (PE remains unchanged):

Present PIE Ratio of A Ltd.	10 times
Expected EPS after merger	₹3.13
Expected Market Price (₹3.13 x 10)	₹31.30

(v) Market Value of merged firm:

Total number of Shares	6,90,000
Expected Market Price	₹31.30
Total value (6,90,000 x 31.30)	₹2,15,97,000
	~ ₹2,16,00,000

Q.16. Rapid rise in the price of crude oil…..
Solution:

(a)

(i) Post Merger share price

Total M Cap = $\frac{145000 \text{ cr}}{14.5\%}$ = 10 Lakhs crore

Particulars	IGP	GRL
M. Cap	44400 cr (1000000 cr x 4.44%)	23400 cr (1000000 cr x 2.34%)
MP Per Share	1112.40	1250
Total no. of shares	39.19 cr shares (44400 / 1112.40)	18.72 cr shares (23400 / 1250)
EAT	8866125000	5250000000
(EBIT – interest)	(10639350000 - 1773225000)	(6176470588 - 926970588)
EPS	22.2253 (886612500 / 39.91 cr)	28.04 (5250000000 / 18.72 cr)
PE ratio	50.07 times (MP / EPS)	44.58 (MP / EPS)

Swap Ratio = $\frac{₹1680}{₹1112.40}$ = 1.51

Increased PER = 50.60 x 1.30 = 65.78 times

Post-merger MP = $\frac{V_{AB}}{n + \Delta n}$ $= \frac{(8866125000+5250000000) \text{ x } 65.78}{39.91 \text{ cr} + 18.72 \text{ cr x } 1.51}$

$= \frac{14116125000 \text{ x } 65.78}{68.1772 \text{ cr shares}} = \frac{918832692375}{68.1772 \text{ cr}}$

= ₹1347.70

(ii) Post merger equity ownership distribution:

Total no. of shares = 39.91 cr + 18.72 cr x 1.51

= 68.1772 cr

Acquiror = $\frac{39.91 \text{ cr}}{68.1772 \text{ cr}}$ = 58.54% target = $\frac{28.08}{68.1772 \text{ cr}}$ = 41.19%

(iii) Purchase price premium

Premium = ₹1680 - ₹1250

= ₹430

OR

Premium (in%) = $\frac{430}{1250}$ = 34.40%

Comment: Since P_{AB} (1347.7) > P_A (1112.4), therefore, Merger results into synergetic benefit to acquiror & hence it was a sound decision by IGP.

Q.19 X Ltd. wants to take over Y Ltd.…….

Solution:

(i) Net Assets Value:

Particulars	X Ltd.	Y Ltd.
Equity share capital	100000	50000
Share premium	-	2000
P & L A/C	3800	4000
Net Worth	138000	56000
÷ No. of shares	10000	5000
(SC/₹10FV)	(100000/10)	(50000/10)
Net asset value / share	13.80	11.20

$$\text{Swap ratio} = \frac{\text{NAV T}}{\text{NAV A}} = \frac{11.20}{13.80} = 0.81:1$$

(ii) Earnings Per Share:

	X ltd.	Y ltd
PAT	24000	15000
No. Of Shares	10000	5000
EPS	2.4	3

$$\text{Swap ratio} = \frac{EPS_T}{EPS_A} = \frac{3}{2.40} = 1.25:1$$

(iii) Market Price:

$$= \frac{MP_T}{MP_A} = \frac{27}{24} = 1.125:1$$

Q.22. Pragya Limited…..
Solution:

(i) Computation of theoretical post-rights price per share

Theoretical post — rights price per share = $\frac{MN-SR}{N+R}$

Where, M = Market price per share (current)
N = Number of existing shares required for a rights share
S = Subscription price of a rights share
R = Rights share offer (in number)
= [(Rs 24 x 4) + (Rs 16 x 1)]/(4 + 1) = Rs 112/5 Rs. 22.4

(ii) Computation of theoretical value of rights alone
= Rs 22.4 — Rs 16 (Cost of rights share) = Rs 6.4

(iii) Impact of rights issue on wealth of the shareholder

Existing wealth (1,000 shares x Rs 24)	Rs.24,000
Wealth after rights issue	
Value of shares (1,00 shares x Rs 22.4)	22,400
Sale proceeds of rights (1,000 x 1/4 x Rs 6.40)	1,600
	24,000

Therefore, No change in wealth.

(iv) Impact of rights issue on wealth of shareholder (when shareholder does not take any action)

Existing wealth (prior to rights issue)	Rs 24,000
Wealth after right issue (1,000 shares x Rs 22.4)	22,400
Loss of wealth	1,600

Q.33 A Ltd. plans to acquire B Ltd.

Solution:

(i) Cash deal of ₹620 lakhs:

Value of combined firm

M. Cap of A Ltd	=	3360 lakhs
M. Cap of B Ltd	=	440
PV of Synergy	=	300
Total value	=	4100 lakhs
(-) Cash paid to Shareholder	=	620
Value of combined firm	=	3480
÷ no. of shares	=	20
Post merger market price	=	₹174

Statement showing gain / (loss) to the Shareholder of both the firms:

(₹ in lakhs)

Particular	A ltd	B ltd
Post-merger MP/cash offer price	174	62 (620/10)
Pre-merger MP (M cap/no. of shares) Gain / (loss) per share	168 (3360 / 20) 6	44 (440 / 10) 18
x no. of shares	20	10
Total gain / (loss)	120	180

(ii) Swap Ratio = 2:5

Value of combined firm = 4100 lakhs

÷ no of shares = 24

$\left(20 \text{ lakhs} + \frac{10 \text{ lakhs}}{5} \text{ x } 2 = 24\right)$

Post Merger MP = 170.833

Statement showing gain / (loss) to SH of both the firms:

Particular	A ltd	B ltd
Post-merger MP/Adjusted MP	170.833	68.333
Pre-merger MP	168	44
Gain / (loss) per share	2.833	24.333
No. of shares	20	10
Total gain / (loss)	56.66	243.33

(iii) Cash offer = ₹250 lakhs + SR = 0.2

Value of combined firm:

Total Premerger M cap = 4100 lakhs

(-) cash offered to shareholder = 250

Total M cap after merger = 3850

÷ No. of shares = 22

(20 lakhs + 10 lakhs x 0.20)

Post merger MP = ₹175

Statement sharing gain / (loss) to SH of both times:

Particular	A ltd.	B ltd.
Post merger MP/Adjusted MP/ cash offer price	175	35 25
Pre merger MP	168	44
Gain / (loss) per share	7	16
x no. of shares	20	10
Total gain/ (loss)	140	160

Q.36 ABC Company is taking over XYZ company.

Solution:

(i) Post merger EPS $= \frac{EPSa + EATx}{n + \Delta n}$

$= \frac{58+12}{12+3 \times .80}$

= 4.86

(ii) Post merger market value per share:

PAT of ABC Co.	=	58 cr.
PAT of XYZ Co.	=	12 cr.
Total earning	=	70 cr.
x PER	=	6.21
Post Merger market value	=	434.70
÷ no. of shares (12 + 3 x .80)	=	14.40 cr
TPMP	=	30.18

(iii) No. of shares

Swap ratio	= 0.80:1
No. of shares of ABC Co.	= 12 crore
No. of Shares issued to XYZ Co. (3 crore x .80)	= 2.4 crore
Total no. of share	= 14.40 crore

(iv) Market Cap:

Post Merger market value = 434.70 crore

(v) Amount of premium:

Adjusted MP	=	24.144	(30.18 x .80)
(-) pre merger MP	=	20.000	
Premium per shares	=	4.144 or	20.72%
X no. of Shares	=	3 crore	
Total premium	=	12.432 crores	

SECURITY VALUATION & CORPORATE VALUATION

Q.7. Cost of equity of Reliance Communications Ltd….
Solution:
(i) Current Market Price:

$$Po = \frac{D_1}{Ke - g}$$

$$Po = \frac{2 \text{ x } 1.05}{0.155 - 0.05}$$

Po = ₹20

(ii)

(a) $$Po = \frac{D_1}{Ke - g}$$

$$Po = \frac{2 \text{ x } 1.08}{0.155 - 0.08}$$

Po = ₹28.80

(b) $$Po = \frac{2 \text{ x } 1.03}{0.155 - 0.03}$$

Po = ₹16.48

Observation: There is a direct relationship between growth rate & market price of share as growth rate increases, prices of shares increases & vice versa.

(iii)

$$Po = \frac{2 \text{ x } 1.20}{0.155 - 0.20}$$

Po = - ₹53.33

Comment: Negative share prices are not possible according to Gordon's Model Ke must be greater then g (Ke > g) which is practically true assumption because no company can grow at such higher pace for infinite years although high growth is possible but only for some limited no. of years.

(iv)

$$Ke = \frac{D_1}{Po} + g$$

$$Ke = \frac{2 \text{ x } 1.05}{30} + 0.05$$

Ke = 12%

Q.13. The dividend of Nelson Company….
Solution:
We will use IRR technique to find Ke

Calculation of Ke

Year	CF	PV @ 10%	PV @ 12%
1	2.5 (2 x 1.25)	2.27	2.23
2	3.125 (2.5 x 1.25)	2.58	2.49
2	$P_2 = \frac{3.125 \times 1.05}{Ke - 0.05}$	54.23	37.37
	PV I	59.09	42.09
	PV 0	(42.06)	(42.06)
	NPV	17.03	0.03

IRR or Ke = 12%
(There is no need to apply interpolation since NPV @ 12% is very close to '0'.

Q.14 K Ltd., is foreseeing a dividend growth rate…………
Solution:
Calculation of Value of share:

Year	CF	PV @ 16%
1	1.50 x 1.12 = 1.68	1.44
2	1.68 x 1.12 = 1.88	1.40
3	1.88 x 1.10 = 2.07	1.33
4	2.07 x 1.10 = 2.28	1.26
4	$P_4 = \frac{2.28 \times 1.08}{0.16 - 0.08} = 30.79$	16.98
		P_0 = ₹22.43

Q.18. Investor's expectations from a company….
Solution:

$$Po = \frac{D_1}{Ke - g} = \frac{3 \text{ x } (1 - 0.05)}{0.15 - (-0.05)} = ₹14.25$$

Q.20. In December 2011, AB Co's share…

Solution:

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

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

Where,

K_e = Cost of equity share capital

D_1 = Expected dividend at the end of year 1

P_0 = Current market price of the share.

g = Expected growth rate of dividend.

Therefore, $K_e = \frac{3.36}{146} + 7.5\%$

= 0.0230 + 0.075 = 0.098

Or, K_e = 9.80%

(ii) With rate of return on retained earnings (r) 10% and retention ratio (b) 60%, new growth rate will be as follows:

G = br i.e.

= 0.10 x 0.60 = 0.06

Accordingly, dividend will also get changed and to calculate this, first we shall calculate previous retention ratio (b_1) and then EPS assuming that rate of return or retained earnings (r) is same.

With previous Growth Rate of 7.5% and r =10% the retention ratio comes out to be:

0.075 = b_1 x 0.10

b_1 = 0.75 and payout ratio = 0.25

With 0.25 payout ratio the EPS will be as follows:

$$\frac{3.36}{0.25} = 13.44$$

With new 0.40 (1 - 0.60) payout ratio the new dividend will be

D_1 = 13.44 x 0.40 = 5.376

Accordingly new K_e will be

$$K_e = \frac{5.376}{146} + 0.06$$

or, Ke = 9.68%

Q.22. X Ltd., just declared a dividend…..

Solution

(i) Expected dividend for next 3 years.

Year 1 (D_1) ₹14.00 (1.09) = ₹15.26

Year 2 (D_2) ₹14.00 $(1.09)^2$ = ₹16.63

Year 3 (D_3) ₹14.00 $(1.09)^3$ = ₹18.13

Required rate of return = 13% (Ke)

Market price of share after 3 years = (P_3) = ₹360

The present value of share

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

$$P_0 = \frac{15.26}{(1+0.13)} + \frac{16.63}{(1+0.13)^2} + \frac{18.13}{(1+0.13)^3} + \frac{360}{(1+0.13)^3}$$

P_0 = 15.26(0.885) + 16.63(0.783) +18.13(0.693) +360(0.693)

P_0 = 13.50 + 13.02 + 12.56 + 249.48

P_0 = ₹288.56

(ii) If growth rate 9% is achieved for indefinite period, then maximum price of share should Mr. A willing be to pay is

$$P_0 = \frac{D_1}{(ke-g)} = \frac{₹15.26}{0.13-0.09} = \frac{₹15.26}{0.04} = ₹381.50$$

(iii) Assuming that conditions mentioned above remain same, the price expected after 3 years will be:

$$P_3 = \frac{D_4}{k_e-g} = \frac{18.13 \text{ x } 1.09}{0.04} = \frac{19.76}{0.04} = ₹494$$

Q.31. Calculate the market price….

Solution:

(i) Walter's formula

$$P_0 = \frac{D + \frac{r}{K}(E - D)}{Ke}$$

$$= \frac{3 + \frac{.20\,(5-3)}{.16}}{.16}$$

P_0 = ₹34.375

(ii) Dividend growth model

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

g = RR x ROE

= .40 x .20

= 8%

$P_0 = \frac{3 \text{ x } 1.08}{.16-.08}$

P_0 = ₹40.50

Q.32. Goldilocks Ltd. was started……

Solution:

(i) Walter's model is given by

$$P = \frac{D+(E-D)(r/K_e)}{k_e}$$

Where,

P = Market price per share.

E = Earnings per share = ₹10

D = Dividend per share = ₹8

r = Return earned on investment = 10%

K_e = Cost of equity capital = 1 / 12.5 = 8%

$$Po = \frac{8+(10-8)\text{x}\frac{0.10}{0.08}}{0.08} = \frac{8+2\text{ x}\frac{0.10}{0.08}}{0.08}$$

= ₹131.25

(ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil.

So, at a pay-out ratio of zero, the market value of the company's share will be:

$$= \frac{0+(10-0)\text{x}\frac{0.10}{0.08}}{0.08} = ₹156.25$$

Q.37. A Ltd. is considering the acquisition…..

Solution:

(i) Calculation of free cash flows:

Rs. in lakhs

	Year 1	Year 2	Year 3	Year 4	Year 5
PBIDT	150	180	220	250	270
Less: Depreciation	30	32	34	36	38
Interest	30	28	26	24	22
PBT	90	120	160	190	210
Less: Tax	27	36	48	57	63
PAT	63	84	112	133	147
Add: Depreciation	30	32	34	36	38
Cash flow	93	116	146	169	185
Less: Capex	20	20	20	20	20
W.Cap. Inc.	30	30	30	30	30
Free Cash Flow	43	66	96	119	135

(ii) **Terminal Value** = Last year earnings × P/E

= 135 × 12 = Rs. 1,620 lakhs

(iii) **Present Value of free cash flow:**

Year	Free CF	PVF	PV
1	43	0.909	39.09
2	66	0.826	54.52
3	96	0.751	72.10
4	119	0.683	81.28
5	135	0.621	83.84
			330.83
PV of terminal value 1,620 x 0.62			1,006.02
Total Value			1,336.85

Q.39. Following information are available in respect of XYZ Ltd……
Solution:

High growth phase:

K_e = 0.10 + 1.15 x 0.06 = 0.169 or 16.9%.

K_d = 0.13 x (1-0.3) = 0.091 or 9.1%.

Cost of capital = 0.5 x 0.169 + 0.5 x 0.091 = 0.13 or 13%.

Stable growth phase:

K_e = 0.09 + 1.0 x 0.05 = 0.14 or 14%.

K_d = 0.1286 x (1 - 0.3) = 0.09 or 9%.

Cost of capital = 0.6 x 0.14 + 0.4 x 0.09 = 0.12 or 12%.

Determination of forecasted Free Cash Flow of the Firm (FCFF)

					(₹ in crores)
	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Terminal Year
Revenue	2,400	2,880	3,456	4,147.20	4,561.92
EBIT	360	432	518.40	622.08	684.29
EAT	252	302.40	362.88	435.46	479.00
Capital Expenditure					-
Less: Depreciation	96	115.20	138.24	165.89	
Working Capital	100.00	120.00	144.00	172.80	103.68
Cash Flow (FCF)	56.00	67.20	80.64	96.77	375.32

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	PVF @ 13%	PV ₹ in crores
56.00	0.885	49.56
67.20	0.753	52.62
80.64	0.693	55.88
96.77	0.613	59.32
		217.38

PV of the terminal, value is:

$\frac{375.32}{0.12-0.09}$ x $\frac{1}{(1.13)^4}$ = ₹12,510.67 Crores x 0.613318 = ₹7,673.02 Crores

The value of the firm is: ₹217.38 Crores + ₹7,673.02 Crores = ₹7,890.40 Crores

Q.42. Helium Ltd evolved a new sales…..

Solution:

Solution if candidates have assumed that if the Current Assets amount is 5000 instead of 6000. OR if candidates have assumed Current Liabilities = 1000, hence Net Current Assets (i.e. Net Working Capital) = ₹ 6000 – 1000 = ₹ 5000.

Note: Below Solution is done assuming Gross Margin will remain same @ 30%

Projected Balance Sheet

					(In ₹ Thousands)
Year	1	2	3	4	5
Fixed Assets (25% of sales)	13000.00	16900.00	21970.00	28561.00	28561.00
Current Assets (12.5% of sales)	6500.00	8450.00	10985.00	14280.50	14280.50
Total Assets	19500.00	25350.00	32955.00	42841.50	42841.50
Equity and Reserves	19500.00	25350.00	32955.00	42841.50	42841.50

Projected Cash Flows

					(In ₹ Thousands)
Sales (30% yoy)	52000.00	67600.00	87880.00	114244.00	114244.00
Gross Margin					
PBT 15%	7800.00	10140.00	13182.00	17136.60	17136.60
PAT 70%	5460.00	7098.00	9227.40	11995.62	11995.62
Depreciation 15%	1500.00	1950.00	2535.00	3295.50	4284.15
Addition to Fixed Assets	4500.00	5850.00	7605.00	9886.50	4284.15
Increase in Current Assets	1500.00	1950.00	2535.00	3295.50	0
Operating Cash Flow	960.00	1248.00	1622.40	2109.12	11995.62
Present value factor @ 14%	0.877	0.769	0.675	0.592	
Present value of cash flows @ 14%	841.92	959.71	1095.12	1248.60	

	(in ₹ Thousands)
Total for first 4 years (A)	4145.35
Residual value (11995.62 / 0.14)	85683
Present value of Residual value $(85683/(1.14)^{4}]$ (B)	50731.21
Total Shareholders value (C) = (A) + (B)	54876.56
Pre strategy value (4200/0.14) (D)	30000.00
Value of strategy (C) - (D)	24876.56

Conclusion: The strategy is financially viable

Q.47. Eagle Ltd. reported….
Solution:

(i) Computation of Business Value

			(₹ Lakhs)
Profit before tax $\frac{77}{1-0.30}$			110
Less: Extraordinary income			(8)
Add: Extraordinary losses			10
			112
Profit from new product	(₹ Lakhs)		
Sales		70	
Less: Material costs	20		
Labour costs	12		
Fixed costs	10	(42)	28
			140.00
Less: Taxes @30%			42.00
Future Maintainable Profit after taxes			98.00
Relevant Capitalisation Factor			0.14
Value of Business (₹98/0.14)			700

(ii) Determination of Market Price of Equity Share

Future maintainable profits (After Tax)
₹98,00,000
Less Preference share dividends 1,00,000 shares of ₹100 P. 13%
₹13,00,000
Earnings available for Equity Shareholders
₹85,00,000
No. of Equity Shares
50,00,000
Earnings per share = $\frac{₹85,00,000}{50,00,000}$ =
₹1.70
PE ratio 10
Market price per share ₹17

Q.48. The following is the balance sheet of A Ltd….
Solution:

Cost of acquisition of A Ltd. under Break-up value method to A Ltd.

Sale proceeds of assets :	
Investments	1,25,000
Debtors	3,50,000
Inventories	4,25,000
	9,00,000
Add: Cash at bank of A Ltd.	1,00,000
	10,00,000
Proposed Payments:	
Dissolution Expenses	30,000
Current Liabilities	1,90,000
13% Debentures	3,30,000
12% Convertible pref. shares	1,00,000
Equity share capital (15×1,50,000)	22,50,000
II	29,00,000
Net cost of acquisition (II - I)	19,00,000

NPV after merger :

Year	Cash flow after tax Rs.	Discount factor @ 15%	PV Rs.
1	7,00,000	0.870	6,09,000
2	7,00,000	0.756	5,29,200
3	7,00,000	0.658	4,60,600
4	7,00,000	0.572	4,00,400
5	7,00,000	0.496	3,47,200
6	7,00,000	0.432	3,02,400
6	3,00,000	0.432	1,29,600
			27,78,400
Less: Net Cost of acquisition			19,00,000
NPV after Merger			8,78,400

As the NPV is positive after merger, the proposal may be accepted.

Q.49. The balance sheet of XYZ Ltd…

Solution

Step – 1: Calculation of Outflow use: (purchase consideration)

	Debenture at premium	=	110000	
	Sundry Creditors	=	30000	
	Cash payment	=	140000	(14 x 10000 Shares)
	Equity shares	=	160000	(16 x 10000 Shares)
	Cost of dissolution	=	10000	
Less:	Current Assets realised:			
	Inventories	=	(100000)	
	Debtors	=	(20000)	
	Bank Balance	=	(10000)	
	Net Purchase Consideration	=	820000	

Step – 2 expected cash Flows

1 – 5 yrs	150000	514962

Step – 3 NPV:

NPV = PV of inflows – PV of Outflows

= 514962 – 320000

= ₹194962 ~ 1.95 Lakhs

Comment: As the NPV of project is positive, merger would result in soundful decision. Hence ABC Ltd should also acquire XYZ Ltd.

Q.50. A Ltd. decides to take over….

Solution

Step – 1: Purchase Consideration

	Inventories	=	₹70000
	Debtors	=	₹35000
	Bank	=	₹15000
	Land & Building	=	₹500000
	Plant & Machinery	=	₹500000
	Goodwill	=	₹50000
	Dissolution Expense	=	₹10000
Less:	Expected realisation	=	(₹90000) + (₹15000)
	Bank balance purchase consideration	=	1075000

Step – 2: Expected Cashflows:

Year	CF		PV
1	200000		173913
2	300000		226843
3	260000		170954
4	200000		114351
5	100000		449718
5	640000		318193
		Total	1053972

Step – 3: NPV: = PV of Inflow – PV of outflows

= 1053972 – 1075000

NPV = - 21028

Comment: As the NPV of project is -21028 hence, A Ltd. should not acquire T Ltd.

Q.53. Calculate the value of equity share….

Solution:

Value of the share = EPS X P /E Ratio

	₹
EBIT	25,00,000
Less- Interest on 15% Secured loans	3,75,000
Less- Interest on 12.5% Unsecured loans	1,25,000
PBT	20,00,000
Less- Tax @ 50%	10,00,000
PAT	10,00,000

No. of equity shares 50,00,000 / 20 = 250,000

EPS = ₹10,00,000 / 2,50,000 = ₹4.00

P/E =12.5

Therefore, value of share = ₹4 × 12.5 = ₹50.

Q.56. Cool-cool Ltd. makes thermal clothing…
Solution:

(a) $K_{SS} = K_{RF} + (K_M - K_{RF})\ ß_{SS}$
$= 5\% + (9\% - 5\%)\ 2.0$
$= 13\%$

(b)

Cash Flow:	(Rs.000)
EAT	1,300
Depreciation	600
Operating cash flow	1,900
Savings on factory operation after tax	600
Less: Reinvested cash	(100)
	2,400

(c) Value of Sking Shell Acquisition
Planning Horizon

(Rs.000)

	5 yrs	10 yrs	15 yrs
Yearly cash flow	Rs.2,400	Rs.2,400	Rs.2,400
× $PVFA_{13,n}$	3.5172	5.4262	6.4624
Value of acquisition	Rs.8,441	Rs.13,023	Rs,15,510

(d)

Divide by # shares	250,000	250,000	250,000
Offer price	Rs.33.6	Rs.52.09	Rs.62.40

(e) Rs.24,00,000/0.13 = Rs.1,84,62,000
Rs.1,84,62,000/2,50,000 = Rs.73.85

Q.61. Consider the following information of M/s Lakadawala & Co…..
Solution:

Calculation of Book Value of M/S Lakadwala & Co:

Short term assets	=	₹30 lakhs
Add: Long term assets	=	₹120
Add: Goodwill	=	₹20
Less: Outside liabilities		
Short term liabilities	=	(₹20)
Long term liabilities	=	(₹45)
Net book value	=	₹105 lakhs
÷ No. of shares outstanding	=	5.10
BVPS	=	₹20.59

Market value of share	=	BVPS x 4 times
	=	₹20.59 x 4 times
	=	₹82.36

Q.65. The Sick Company Ltd….
Solution:

(in ₹ lakhs)

Calculation of NPV of Likely Benefit

Year	CF's	PV @ 15%
1	20 x 35% = 7 (tax benefit of 20 lakhs)	6.09
2	5L x 35% = 1.75 (tax benefit of 5 lakhs)	1.32
	NPV	7.41

Q.67. The current price of a share of Kaykay Pharmaceuticals……….
Solution:

Let the Rights offer subscription price be X

$$\text{Ex rights price per share} = \frac{\text{Po x n+Right Offer Price x } \Delta n}{n + \Delta n}$$

$$52 = \frac{55 \text{ x } 4 + X \text{ x } 1}{4 + 1}$$

$$52 = \frac{220 + x}{5}$$

$$260 = 220 + x$$

$$X = 40$$

Q.70. The stock of X Ltd. is presently trading at…………
Solution

$$Po = \frac{D1+P1}{1+Ke} = \frac{18+800}{1.16} = ₹\ 705$$

Since fair value > Actual price, therefore, stock may be purchased

Q.76. X Ltd earns ₹ 6 per share having a capitalization
Solution

Walter Model is as follows: -

$$V_e = \frac{D + \frac{R_a}{R_c}(E - D)}{R_c}$$

V_e = Market value of the share
R_a = Return on retained earnings
R_e = Capitalisation rate
E = Earnings per share
D = Dividend per share

Hence, if Walter modal is applied-

Market value of the share V_c = $$\frac{₹1.50 + \frac{0.20}{0.10}(₹6.00 - ₹1.50)}{0.10}$$

Or

$$V_c = \frac{₹1.50 + \frac{0.20}{0.10}(₹4.50)}{0.10}$$

Or

$$V_c = \frac{₹1.50 + ₹9.00}{0.10} = \frac{₹10.50}{0.10} = ₹105$$

This is not the optimum payout ratio because Ra > Ke and therefore Vc can further go up if payout ratio is reduced.

Q.84. Balance Sheet of XYZ Limited as on March 31 (current year) is follows:
Solution:

Financial analysis of merger decision

(i) Cost of acquisition (t = 0)
(₹ lakh)

Equity share capital (10 lakh shares x ₹16)	₹160
Cash payment to shareholders (10 lakh shares x ₹14)	140
Redemption of 13% Debentures at 10% Premium	110
Payment required for creditors and other liabilities	30
Cost of dissolution	10
	450

(ii) PV of FCFF (years 1 — 5)
(₹ lakh)

Year-end	FCFF	PV factor (0.14)	Total PV
1	₹100	0.877	₹87.70
2	135	0.769	103.81
3	175	0.675	118.12
4	200	0.592	118.40
5	80	0.519	41.52
			469.55

(iii) Present value of terminal sum related to FCFF after the forecast period

TV5 = FCFF5/k_0
= ₹80 lakh/0.14 = ₹571.429 lakh
PV of TV = ₹571.429 lakh x 0.519 = ₹296.57 lakh

(iv) Determination of net present value

(₹ lakh)

PV of FCFF (years 1 — 5)	₹469.55
PV of FCFF (after year 5)	296.57
Total PV of FCFF	766.12
Less: Cost of acquisition	450.00
Net present value	316.12

Recommendation As the NPV is positive, acquisition of the target firm XYZ Limited is financially viable.

Q.87. Consider the following date for the year just ended-

Solution

FCFFo = (Revenue – Operating expenses) (1 - t) – (Capital spending Net of depn) – Inv in working capital

= (7500 - 4500) (1 – 0.30) – 600 -1200

= 300 crores

Value of firm = $\frac{\text{FCFF1}}{\text{Kc}-\text{g}} = \frac{300 \text{ x } 1.12}{0.15-0.12}$ = 11200 crores

Value of equity = 11200 – 7000 = 4200 crores or ₹ 16.8 per share

PORTFOLIO MANAGEMENT

UNIT I – RISK AND RETURNS

Q.7. Abhishek seeks your advice….

Solution:

Calculation of Return & Risks:

Reliance Ltd.

Return (%)	$d_x = (x - \bar{X})$	$d_x{}^2$
25%	13.75%	189.06
-5%	-16.25%	264.06
10%	-1.25%	1.56
15%	3.75%	14.06
$\sum x = 45\%$		$\sum d_x{}^2 = 468.75$

$\bar{X} = \frac{\sum x}{n}$

$\bar{X} = 11.25\%$

Variance $= \frac{\sum dx^2}{n}$

$= \frac{468.75}{4}$

$= 117.19$

$\sigma = \sqrt{\text{Variance}}$

$= \sqrt{117.19}$

$= 10.83$

Bharti Ltd.

Return (%)	$d_x\ (x - \bar{X})$	$d_x{}^2$
14%	2.75%	7.5625
8.5%	-2.75%	7.5625
5.5%	-5.75%	33.0625
17%	5.75%	33.0625
$\sum x = 48\%$		$\sum dx^2 = 81.25$

$\bar{X} = 11.25\%$ Var = 20.3125

$\sigma = 4.51\%$

$CV_{Reliance} = \frac{\sigma}{\bar{x}}$

$= \frac{10.83}{11.25}$

$= 0.96$

$CV_{Bharti} = \frac{\sigma}{x}$

$= \frac{4.51}{11.25}$

$= .40$

Decision : Abhishek should invest in the share of Bharti Ltd. because for the same level of return, it has lower risk.

Q.9. You have estimated the following probability ….
Solution:

a. Expected Return

Stock X			**Stock Y**		
Prob (P)	Return % (X)	PxX	Prob (P)	Return % (Y)	PxY
0.10	-10%	-1%	0.20	2%	0.4%
0.20	10%	2%	0.20	7%	1.4%
0.40	15%	6%	0.30	12%	3.6%
0.20	20%	4%	0.20	15%	3%
0.10	40%	4%	0.10	16%	1.6%
		$\bar{X}$ = 15%			$\bar{Y}$ = 10%

b. Standard Deviation

Stock X : $\bar{X}$ = 15%

dx = x – $\bar{X}$	dx^2	pdx^2
-25%	625	62.5
-5%	25	5
0%	0	0
5%	25	5
25%	625	62.5

Variance = 135

$\sigma = \sqrt{\text{Variance}}$

$= \sqrt{135}$

$=$ 11.62%

Stock Y: $\bar{Y}$ = 10%

dy = Y - $\bar{Y}$	dy2	pdy2
-8%	64	12.80
-3%	9	1.80
2%	4	1.20
5%	25	5
6%	36	3.6
	Variance	24.40

$\sigma = \sqrt{24.40}$

$=$ 4.94%

$CV_X = \frac{\sigma}{\bar{X}} = \frac{11.62}{15} = 0.77$

$CV_Y = \frac{\sigma}{\bar{Y}} = \frac{4.94}{10} = 0.49$

Standard derivation being a measure of risk is high for security X and hence security X has higher risk.

However, Security X provides higher return therefore, we should look at risk in terms of relation to the return using coefficient of variation since CV for security X is high therefore it's more risky.

Q.13. You are given the following information, about a portfolio consisting….

Solution:

Assumption: It has been assumed that one share of every security is purchased

Calculation of return:

Return % = $\frac{D1+P1-P0}{P0}$ x 100

A = $\frac{4+60-80}{30}$ x 100 = 113.33%

B = $\frac{5+70-40}{40}$ = 87.5%

C = $\frac{6+150-50}{50}$ = 212%

D = $\frac{150+1050-1000}{1000}$ = 20%

Calculation of Return on Portfolio

	Return	Weights	R x W
A	113.33%	30/1120	3.04%
B	87.5%	40/1120	3.125%
C	212%	50/1120	9.46%
D	20%	1000/1120	17.86%
		Return on portfolio	33.48%

Q.14. From the following data, compute the covariance….

Solution:

Calculation of Co-variance

Prob (P)	Return on Sec A (X)	Return on Sec B (Y)	P x X	P x Y	dx	dy	pdxdy
0.15	30	10	4.5	1.5	10	-10	-15
0.70	20	20	14	14	0	0	0
0.15	10	30	1.5	4.5	-10	10	-15
			X = 20%	Y = 20%			
						∑pdxdy	-30

Covariance b/w securities A & B = -30

Q.15. Consider the data given in above question, and ……
Solution

Calculation of correlative coefficient:

Pdx^2	Pdy^2
15%	15%
0%	0%
15%	15%
30%	30%

$\sigma A = \sqrt{30\%}$, $\sigma B = \sqrt{30\%}$,

$$\text{Correlation}_{AB} = \frac{\text{Covariance}}{\sigma A \ \sigma B}$$

$$= \frac{-30}{\sqrt{30} \times \sqrt{30}} = \frac{-30}{5.48 \times 5.48} = -1$$

$Corr_{AB} = -1$

Comment: Correlation of – 1 indicates that the two securities have Perfect negative correlation meaning the 2 securities will always move in the exact opposite direction by the same number of Standard deviations.

Q.21. Security A and B have standard deviation of 6% and 8%......
Solution:

(i) Correlation = +1

$$\sigma P = \sqrt{(\sigma AwA)^2 + (\sigma BwB)^2 + 2\sigma AwA\ \sigma BwB\ \text{Corr AB}}$$

$$= \sqrt{(6 \times .40)^2 + (8 \times .60)^2 + 2 \times 6 \times .40 \times 8 \times .60 \times 1}$$

= 7.2%

(ii) Correlation = -1

$$\sigma P = \sqrt{(6 \times .40)^2 + (8 \times .60)^2 + 2 \times 6 \times .40 \times 8 \times .60 \times (-1)}$$

= 2.40%

(iii) Correlation = 0.40

$$\sigma P = \sqrt{(6 \times .40)^2 + (8 \times .60)^2 + 2 \times 6 \times .40 \times 8 \times .60 \times .40}$$

= 6.17%

(iv) Correlation = 0

$$\sigma P = \sqrt{(6 \times .40)^2 + (8 \times .60)^2 + 2 \times 6 \times .40 \times 8 \times .60 \times 0}$$

= 5.37%

Comment: Higher correlation tends to higher risk as it results into no diversification. Lower/negative correlation tends to lower risks as there are diversification benefits.
It can be concluded that an investor has to invest in securities having lower/ negative correlation.

Q.22. Suppose that economy A is growing rapidly……

Solution:

(a) Let the weight of stocks of Economy A is expressed as w, then

(1- w) x 10.0 + w x 15.0 = 10.5

i.e. w = 0.1 or 10%.

(b) Variance of portfolio shall be:

$(0.9)^2 (0.16)^2 + (0 .1)^2 (0.30)^2 + 2(0.9) (0.1) (0.16) (0.30) (0.30) = 0.02423$

Standard deviation is $(0.02423)^{1/2} = 0.15565$ or 15.6%.

(c) The Sharpe ratio will improve by approximately 0.04, as shown below:

$$\text{Sharpe Ratio} = \frac{\text{Expected Return Risk Free Rate of Return}}{\text{Standard Deviation}}$$

Investment only in developed countries: $= \frac{10-3}{16} = 0.437$

With inclusion of stocks of Economy A: $= \frac{10.5-3}{15.6} = 0.481$

Q.25. T Ltd. and A Ltd., have low positive correlation….

Solution:

Calculation of Proportion

$$W_T = \frac{Var_A - Cov_{AT}}{Var_A + Var_T - 2\,Cov_{AT}}$$

$Variance_A = (SD_A)^2 = (10)^2 = 100$

$Variance_T = (SD_T)^2 = (15)^2 = 225$

$Cov_{AT} = Corr_{AT} \times \sigma_A \times \sigma_T = 0.50 \times 10 \times 15 = 75$

$$W_T = \frac{100-75}{100+225-150} = 0.14$$

$$W_A = \frac{225-75}{100+225-150} = 0.86$$

Q.26. Securities A, B, and C have the following characteristics…..

Solution:

Expected return:

Return		Weight (w)	Rxw
A	0.05	1/3	.0167
B	0.15	1/3	.05
C	0.12	1/3	.04
		Expected return:	10.66% or 10.667%

Standard Deviation σ_P =

$$\sqrt{(\sigma A\ WB)^2 + (\sigma B\ WB)^2 + (\sigma C\ WC)^2 + 2\sigma AWA\ \sigma BWB\ Corr\ AB + 2\sigma\ WB\ \sigma CWC\ CorrBC + 2\sigma BWB\ \sigma CWC\ CorrBC + 2\sigma\ CWC\ \sigma A\ WA\ Corr\ AC}$$

=

$$\sqrt{\left(.02 \text{ x} \frac{1}{3}\right) + \left(.16 \text{ x} \frac{1}{3}\right) + \left(.08 \text{ x} \frac{1}{3}\right) + 2 \text{ x } .02 \text{ x } \frac{1}{3} \text{ x } .16 \text{ x} \frac{1}{3} + 2 \text{ x } .16 \text{ x} \frac{1}{3} \text{ x } .08 \text{ x} \frac{1}{3} \text{ x } .8 + 2 \text{ x } .08 \text{ x} \frac{1}{3} \text{ x } .02 \text{ x} \frac{1}{3} \text{ x } .6}$$

σ_P = 7.9833%

Q.27. An investor has formed a portfolio with three securities…..

Solution:

		30/100	30/100	40/100
		A	B	C
30/100	A	38.20	6.87	4
30/100	B	6.87	6.39	7.20
40/100	C	4	7.20	8.45

$$\sigma_P = \sqrt{\sum_{i=1}^{n} \sum_{i=1}^{n} w_i\ w_j\ cov_{ij}}$$

$$= \sqrt{(38.20 \text{ x } .30 \text{ x } .30) + (6.87 \text{ x } .30 \text{ x } .30) + (4 \text{ x } .30 \text{ x } .40) + (6.87 \text{ x } .30 \text{ x } .30) + (6.39 \text{ x } .30 \text{ x } .30) + (7.20 \text{ x } .30 \text{ x } .40) + (4 \text{ x } .40 \text{ x } .30) + (7.20 \text{ x } .40 \text{ x } .30) + (8.45 \text{ x } .40 \text{ x } .40)}$$

σ_P = 3.05%

Q.33. From the data regarding six securities,…..

Solution:

Between A & B: Security A is dominating over B because for the same level of returns it has lower risk **(A > B)**

Between A & D: Security A is dominating over D because it has booth higher returns & lower risk **(A > D).**

Between C & E: Security E is dominating over C because for the same level of risk it has higher retunes **(E > C)**

Between A & F: Security F is dominating over A because for the same level of returns it has lower risk. **(F > A)**

Answer: Security E & F dominates the other security in portfolio.

Q.43. Given below is the distribution of conditional
Solution

(i) Sontex Stock

$R_{(S)}$	P_i	$R_S P_i$	$(R_S - E_{(S)})$	$P_i [R_S - E_{(S)}]^2$
60%	0.10	6	20	40
50%	0.20	10	10	20
40%	0.40	16	0	0
30%	0.20	6	-10	20
20%	0.10	2	-20	40
		40		**120**

$\sum P_i R_S$ = 40%
$\sum P_i[(R_S - E_S)]^2$ = 120%
Expected Return of Sontex: $E_{(S)}$ = 40%
Standard deviation of Returns of Sontex = $\sigma_S = \sqrt{120}$ = 10.95%

Dentex Stock

$R_{(DE)}$	P_i	$R_{(DE)} P_i$	$(R_{(DE)} - E_{(DE)})$	$P_i (R_{DE} - E_{DE})^2$
5%	0.10	0.50	20.50	42.025
15%	0.20	3.00	- 10.50	22.050
25%	0.40	10.0	- 0.50	0.100
35%	0.20	7.00	9.50	18.050
50%	0.10	5.00	24.50	60.025
		25.50		**142.25**

$\sum P_i R_{(DE)}$ = 25.25%
$\sum P_i (R_{DE} - E_{DE})^2$ = 142.25%
Expected Return of Dentex: $E_{(DE)}$ = 25.5%
Standard deviation of Returns of Dentex $[\sigma_{DE}] = \sqrt{142.25\%}$
= 11.93%

Covariance between Sontex and Dentex Stocks

Pi	**$(R_S - E_S)$**	**$(R_{DE} - E_{DE})$**	**$P_i (R_S - E_S) \times (R_{DE} - E_{DE})$**
0.10	20	- 20.50	- 41
0.20	10	- 10.50	-21
0.40	0	- 0.50	0
0.20	- 10	9.50	- 19.0
0.10	- 20	24.50	- 49

$\sum P_i (R_S - E_S) \times (R_{DE} - E_{DE})$
$COV_{(S\&DE)}$ = - 130
Correlation coefficient between Sontex and Dentex Stocks =

$$\frac{COV_{SDE}}{\sigma_S \, \sigma_{DE}} = \frac{-130}{10.95 \times 11.93} = -1$$

(ii) **Since the Correlation Coefficient between two stocks (Sontex & Dentex) is -1, a Zero-Risk Portfolio can be constructed using these Stocks.**

If W_1 and W_2 is proportion of investment in Sontex and Dentex Stocks. The portfolio risk will be

σ^2_p = $W_1^2 \sigma^2_1 + W^2_2 \sigma^2_2 + 2\rho_{12} \sigma_1 \sigma_2 W_1 W_2$

σ^2_P = $W_1^2 \sigma_1^2 + W_2^2 \sigma_2^2 + 2(-1) \sigma_1 \sigma_2 W_1 W_2$

σ^2_P = $(W_1 \sigma_1 - W_2 \sigma_2)^2$

σ_P = $W_1 \sigma_1 - W_2 \sigma_2$

0 = $W_1 \sigma_1 - W_2 \sigma_2$

$W_1\sigma_1$ = $W_2 \sigma_2$ (i)

Again $W_1 + W_2 = 1$

Or $W_2 = 1 - W_1$ (ii)

Putting the value of W_2 in equation (i)

$W_1 \sigma_1 = (1 - W_1) \sigma_2$

$W_1 \sigma_S = (1 - W_1) \sigma_{DE}$

$10.95 W_1 = (1 - W_1) 11.93$

$(10.95 + 11.93) W_1 = 11.93$

$W_1 = \frac{11.93}{(10.95 \text{ x } 11.93)} = 52.14\%$

W_2 = 1 - 0.5214 = 0.4786 = 47.86%

Expected return of risk - free portfolio

= 0.5214 x 40 + 0.4786 x 25.5

= 33.06%

Alternative Solution:

An alternative solution is provided without rounding off the figure and considering the exact decimal figure.

Correlation coefficient between Sontex and Dentex Stocks

$= \frac{-130}{10.95 \text{ x } 11.93}$

$= \frac{-130}{130.6335}$

= 0.995 (considering upto three decimals)

The risk and return of Portfolio of two stocks (Sontex and Dentex)

σP^2 = $(0.5)^2$ x 120 + $(0.5)^2$ x 142.25 + [2 x - 0.995 x 10.95 x 11.93 x 0.5 x 0.5]

= 30 + 35.56 - 64.99 = 0.57

Risk (σ p) = $\sqrt{0.57}$ = 0.75%

Alternative solution to part (iii)

Proportion of Investment in Sontex

$$W_S = \frac{\sigma^2 DE - CoV_{(S \,\&\, DE)}}{\sigma^2 S + \sigma^2 DE - 2CoV_{(S \,\&\, DE)}}$$

$$= \frac{(11.93)^2 - (-130)}{(10.95)^2 + (11.93)^2 - 2\,(-130)}$$

$$= \frac{272.32}{119.90 + 142.32 + 260}$$

$= \frac{272.32}{552.22}$

= 0.52146

Proportion of investment in Dentex

$W_{DE} = 1 - W_S$

= 1 – 0.5214

$W_{DE} = 0.4786$

Q.45. A conservative investor is analysing

Solution:

The current price of PSEL is Rs. 1,180. The EPS is Rs. 40.

Hence, the P/E ratio is $\frac{1180}{40}$ = 29.5

The various EPS and P/E ratios are given below:

(1) EPS	(2) P/E Ratio	(3) Probability	(4) Expected Price	(5) Expected Return	(6) Expected Return (%)
50	20	0.20	1000	- 180	(15.25)
50	30	0.35	1500	320	27.12
60	20	0.30	1200	20	1.69
60	30	0.15	1800	620	52.54

The expected return will be

E (P) = (-15.25 x 0.2) + (27.12 x 0.35) + (1.69 x 0.30) + (52.54 x 0.15)

= -3.05 + 9.49 + 0.507 + 7.88

= 14.827 or 14.83%

The risk of the stock is found below:

X	$X - \bar{X}$	$(X - \bar{X})^2$	Prob.	$(X - \bar{X})^2$ x Prob.
(15.25)	(30.08)	904.81	0.20	180.96
27.12	12.29	151.04	0.35	52.86
1.69	(13.14)	172.66	0.30	51.80
52.54	37.71	1422.04	0.15	213.31
				498.93

$\sigma^2_{(P)}$ = 498.93(%)^2

S. D. = $(498.93)^{1/2}$= 22.34%

Q.47. An investor has two portfolios known

Solution

(i) Investment committed to each security would be:-

	A (₹)	B (₹)	C (₹)	Total (₹)
Portfolio X	1,500	2,000	1,500	5,000
Portfolio Y	600	1,500	900	3,000
Combined Portfolio	2,100	3,500	2,400	8,000
Stock weights	0.26	0.44	0.30	

(ii) The equation of critical line takes the following form:-

$W_B = a + bW_A$

Substituting the values of W_A & W_B from portfolio X and Y in above equation, we get

0.40 = a + 0.30b, and

0.50 = a + 0.20b

Solving above equation we obtain the slope and intercept, a = 070 and b = -1 and thus, the critical line is

$W_B = 0.70 – W_A$

If half of the funds is invested in security A then,

$W_B = 0.70 – 0.50 \ = 0.20$

Since $W_A + W_B + W_C$ = 1

$W_C = 1 – 0.50 – 0.20$ =0.30

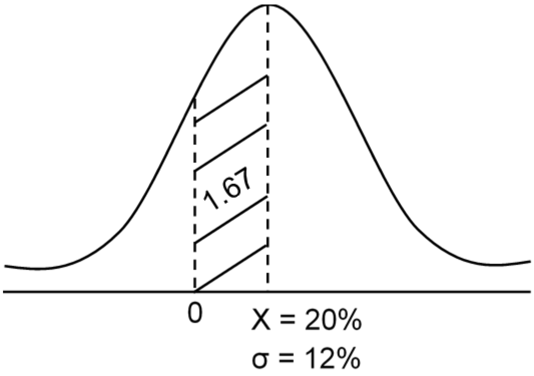
Allocation of funds to security B	= 0.20 x 8,000	= ₹1,600, and
Security C	= 0.30 x 8,000	= ₹2,400

UNIT II – USING Z VALUES

Q.1. The expected return and standard deviation of returns…..

Solution:

(a)

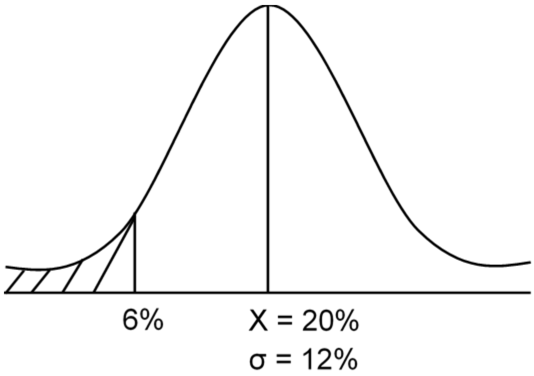


$Z = \frac{X-\bar{X}}{\sigma} \quad = \frac{0-20\%}{12\%}$

= 1.67

At z = 1.67, area is 0.4525. Therefore, chances / probability of incurring a loss is 0.5 – 0.4525 = 0.0475 or 4.75%.

(b)



$Z = \frac{X-\bar{X}}{\sigma} \quad = \frac{6\%-20\%}{12\%}$

Z = - 1.17

At Z = 1.17, area is 0.3790, therefore, probability of earning a return less than 6% is 0.50 – 0.3790 = 0.121 or 12.18%

Q.5. International Dreams, Inc.'s common stock……

Solution:

Calculation of Expected return:

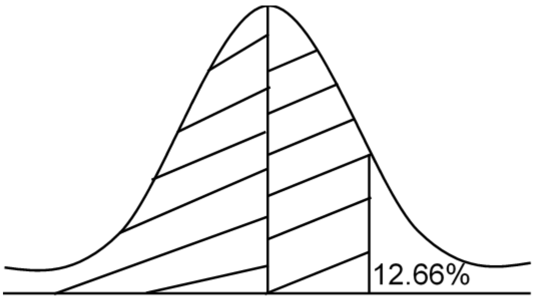
(using CAGR) –

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

$25 = 15(1+r)^5$

$\sqrt[5]{1.67} = 1 + r$

$r = 10.76\%$



Calculation of Expected return: (using CAPM):

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

$= 6\% + 0.90(7.4\%)$

$R_j = 12.66\%$

$Z = \frac{X - \bar{X}}{\sigma}$

$= \frac{12.60\% - 10.76\%}{2\%}$

$Z = 0.95$

At Z = 0.95, area is 0.3289

Therefore, probability of stock being overvalued is 0.3289 + 0.50 = .8289 or 82.89%

UNIT III – TYPES OF RISKS

Q.1. Annual rates of return of ABC Ltd……

Solution:

Calculation of β co-efficient:

Formula 1

$$\beta = \frac{Cov_{jm}}{Var_m}$$

ABC (y)	Market (x)	dx	dy	dxdy	dx^2	dy^2
-8	-10	-22	-18	396	484	324
15	18	6	5	30	36	25
12	14	2	2	4	4	4
13	16	4	3	12	16	9
18	22	10	8	80	100	64
$\sum y = 50$	$\sum x = 60$			$\sum dxdy = 522$	$\sum dx^2 = 640$	$\sum dy^2 = 426$

$$Y = \frac{\sum Y}{n} \qquad X = \frac{\sum x}{n} \qquad COV_{xy} = \frac{\sum dxdy}{n} \qquad VAR_x = \frac{\sum dx^2}{n}$$

$$Y = \frac{50}{5} \qquad X = \frac{60}{5} \qquad = \frac{522}{5} \qquad = \frac{640}{5}$$

Y = 10 X = 12

$COV_{xy} = 104.40$ $VAR_x = 128$

$$\beta = \frac{Cov_{xy}}{Var_x}$$

$$= \frac{104.40}{128}$$

β = 0.815

Formula 2

$$\beta = \frac{Corr_{xy}\ \sigma_y}{\sigma_x}$$

$$Var_y = \frac{\sum dy^2}{n}$$

= 426/5

Var = 85.20

$\sigma_y = \sqrt{85.20}$

σ_y = 9.23%

$\sigma_x = \sqrt{128}$

σ_x = 11.31%

$$Corr_{xy} = \frac{Cov_{xy}}{\sigma_x\ \sigma_y}$$

$$= \frac{104.40}{11.31 \times 9.23}$$

$Corr_{xy}$ = 1

$$\beta = \frac{1 \times 9.23}{11.31}$$

β = 0.816

Formula 3

$$\beta = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2}$$

X	Y	XY	X^2
-10	-8	80	100
18	15	270	324
14	12	168	196
16	13	208	256
22	18	396	484
		$\sum xy$ = 1122	$\sum x^2$ = 1360

$$\beta = \frac{1122 - 5\,(12)(10)}{1360 - (5)(12)^2}$$

$$= \frac{522}{640}$$

β = 0.815

Conclusion: β of 0.815 is a low β & hence stock is a defensive stock such stock are preferred in bearish market i.e. when market is expected to fall.

Q4. The rates of return on the security of Company X…..
Solution:
(i)

Period	R_X	R_M	$R_X - \overline{R_X}$	$R_M - \overline{R_M}$	$(R_X - \overline{Rx})(R_M - \overline{Rm})$	$(R_M - \overline{Rm})^2$
1	20	22	5	10	50	100
2	22	20	7	8	56	64
3	25	18	10	6	60	36
4	21	16	6	4	24	16
5	18	20	3	8	24	64
6	-5	8	-20	-4	80	16
7	17	-6	2	-18	-36	324
8	19	5	4	-7	-28	49
9	-7	6	-22	-6	132	36
10	20	11	5	-1	-5	1
	150	**120**			**357**	**706**
	ΣR_X	ΣR_M			$\Sigma(R_X - \overline{Rx})(R_M - \overline{Rm})$	$\Sigma(R_M - \overline{Rm})^2$

$\overline{Rx}$ = 15% $\overline{Rm}$ = 12%

$\sigma^2{}_M = \frac{\Sigma(R_M - \overline{R_M})^2}{n} = \frac{706}{10} = 70.60$

$Cov_{XM} = \frac{\Sigma(R_X - \overline{R_X})(R_M - \overline{R_M})}{n} = \frac{357}{10} = 35.70$

$Beta_X \frac{Cov_{XM}}{\sigma^2 M} = \frac{35.70}{70.60} = 0.505$

Alternative solution

Period	X	Y	Y^2	XY
1	20	22	484	440
2	22	20	400	440
3	25	18	324	450
4	21	16	256	336
5	18	20	400	360
6	-5	8	64	-40
7	17	-6	36	-102
8	19	5	25	95
9	-7	6	36	-42
10	20	11	121	220
	150	**120**	**2146**	**2157**
	$\overline{X}$ = 15	$\overline{Y}$ = 12		

$= \frac{\Sigma XY - n\overline{XY}}{\Sigma X^2 - n(\overline{x})^2}$

$= \frac{2157 - 10 \times 15 \times 12}{2146 - 10 \times 12 \times 12} = \frac{357}{706} = 0.506$

(ii) $\overline{Rx}$ = 15% $\overline{Rm}$ = 12%

$\overline{Y} = \alpha + \beta\overline{X}$

15% = α + 0.505 x 12%

Alpha (α) = 15% – (0.505 x 12%) = 8.94%

Characteristic line for security X = α +β x R_M

Where,

R_M = Expected return on market Index

Characteristic line for security X = 8.94% + 0.505 R_M

Q.5. The returns on stock A and market portfolio……

Solution:

Characteristic line is given by

$Y = \alpha + \beta\ Rm$

$\beta i = \frac{\Sigma xy - n\overline{xy}}{\Sigma x^2 - n(\overline{x})^2}$

$\alpha_i = \overline{y} - \beta\overline{x}$

Return on A (Y)	Return on market (X)	XY	X^2	$(x - \overline{x})$	$(x - \overline{x})^2$	$(y - \overline{y})$	$(y - \overline{y})^2$
12	8	96	64	2.25	5.06	5.67	32.15
15	12	180	144	6.25	39.06	8.67	75.17
11	11	121	121	5.25	27.56	4.67	21.81
2	-4	-8	16	-9.75	95.06	-4.33	18.75
10	9.5	95	90.25	3.75	14.06	3.67	13.47
-12	-2	24	4	-7.75	60.06	-18.33	335.99
38	**34.5**	**508**	**439.25**		**240.86**		**497.34**

$\overline{Y} = 38/6 = 6.33$

$\overline{X} = 34.5/6 = 5.57$

$\beta_i = \frac{\Sigma xy - n\overline{xy}}{\Sigma x^2 - n(\overline{x})^2} = \frac{508 - 6\ (5.75)\ (6.33)}{439.25 - 6\ (5.75)^2} = \frac{508 - 218.385}{439.25 - 198.375}$

$= \frac{289.615}{240.875} = 1.202$

$\alpha_i = \overline{y} - \beta\overline{x}$

$= 6.33 - 1.202\ (5.75)$

$= -0.58$

Hence the characteristic line is $-0.58 + 1.202\ (R_m)$

Total Risk of Market = $\sigma_m^2 = \frac{\Sigma\ (x - \overline{x})^2}{n} = \frac{240.86}{6} = 40.14(\%)$

Total Risk of Stock = $\frac{497.34}{6} = 82.89\ (\%)$

Systematic Risk = $\beta i^2\ \sigma_2 = (1.202)^2 \times 40.14 = 57.99(\%)$

Unsystematic Risk is = Total Risk - Systematic Risk

= 82.89 - 57.99 = 24.90(%)

Q.7. A has portfolio having following features…….

Solution:

As per ICAI Suggested Answer, two alternative solutions are possible

$\beta_P = \sum_{i=1}^{4} X_i \, \beta_i$

= 1.60 x 0.25 + 1.15 x 0.30 + 1.40 x 0.25 + 1.00 x 0.20

= 0.4 + 0.345 + 0.35 + 0.20 = 1.295

The Standard Deviation (Risk) of the portfolio is

$= [(1.295)^2(18)^2+(0.25)^2(7)^2+(0.30)^2(11)^2+(0.25)^2(3)^2+(0.20)^2(9)^2)]$

$= [543.36 + 3.0625 + 10.89 + 0.5625 + 3.24] = [561.115]^{1/2} = 23.69\%$

Alternative Answer

The variance of Security's Return

$\sigma^2 = \beta^2_i \sigma^2_M + \sigma 2_{\epsilon i}$ I

Accordingly, variance of various securities

		σ^2	Weight (w)	σ^2 x w
L	$(1.60)^2 (18)^2 + 7^2$ =	878.44	0.25	219.61
M	$(1.15)^2 (18)^2 + 11^2$ =	549.49	0.30	164.85
N	$(1.40)^2 (18)^2 + 3^2$ =	644.04	0.25	161.01
K	$(1.00)^2 (18)^2 + 9^2$ =	405.00	0.20	81
		Variance		626.47

SD $= \sqrt{626.47} = 25.03$

Q.10. From the following information, calculate the expected rate….
Solution:

Calculation of Expected Rate of Return of a Portfolio:

Expected Rate of Return of a portfolio can be worked by using following formula:

$R_e = R_f + \beta_j (R_m - R_f)$……. (1)

Where

R_e = expected rate of return of a portfolio

R_f = Risk free rate of interest or return

R_m = Expected return of market portfolio

β_j = Beta co-efficient of Security j

Since in the question, information on β is not given, it is essential to find it. The formula to calculate β_j is:

$$\beta_j = \frac{r_{sm} \times \sigma_s}{\sigma_m}$$

Where r_{sm} stands for correlation co-efficient of portfolio with market

σ_s Standard deviation of an asset

σ_m Market standard deviation

By substituting the available information in above formula, (2) we may get:

β = (0.70 x 0.25) ÷ 0.22

= 0.7955

Now we may get expected rate of return by substituting available information in equation
(1)

R_e = 13 + 0.7955 (19 - 13)

= 17.77%

Q.16. Consider the following date for two companies and the market……
Solution:

a) (i) $$\beta_{zee} = \frac{\text{Cov (Zee,M)}}{\text{Var (M)}} = \frac{0.0205}{(0.15)^2} = \frac{0.0205}{0.0225} = 0.91$$

(ii) Cov (Pad, M) = β_{Pad} x Var (M) = 1.2 x 0.0225

= 0.027 i.e. 270 $(\%)^2$

b) (i) $$\rho_{zee,M} = \frac{\text{Cov (Zee,M)}}{\sigma_{Zee} \times \sigma_M} = \frac{0.0205}{0.45 \times 0.15} = 0.304$$

(ii) $$\rho_{Pad,M} = \frac{\text{Cov (Pad,M)}}{\sigma_{Pad} \times \sigma_M} = \frac{0.027}{0.45 \times 0.15} = 0.45$$

c) Var (Portfolio) = $W^2_{Zee} \, \sigma^2_{Zee} + W^2_{Pad} \, \sigma^2_{Pad} + 2 \times W_{Zee}, W_{Pad} \, Cov_{(Zee, Pad)}$

$W_{Zee} = \frac{2}{3}$; $\sigma_{Zee} = 0.45$

$W_{Pad} = \frac{1}{3}$; $\sigma_{Pad} = 0.40$

From the assumptions of characteristic (Regression) line we get

$Cov_{(Zee, Pad)} = \beta_{zee} \times \beta_{Pod} \times Var_{(M)}$

= 0.91 x 1.2 x 0.0225 = 0.02457 i.e. 245.7 $(\%)^2$

Variance (portfolio)

$= \left(\frac{2}{3}\right)^2$ x $(0.45)^2$ + $\left(\frac{1}{3}\right)^2$ x $(0.40)^2$ + 2 x $\frac{2}{3}$ x $\frac{1}{3}$ x 0.02457

= 0.09 + 0.0178 + 0.01092 = 0.1187 or 1187 $(\%)^2$

d) Unsystematic Risk of Zee Ltd.

$= (1 - \rho^2_{Zee', M})\ \sigma^2_{Zee}$

$= [1 - (0.304)^2] \times (0.45)^2 = 0.1838$ i.e. 1838 $(\%)^2$

Unsystematic Risk of Padmalay Ltd.

$= (1 - \rho^2_{Pad, M})\ \sigma^2_{Pad}$

$= [1 - (0.45)^2] \times (0.40)^2 = 0.1276$ i.e. 1276 $(\%)^2$

$\beta_{Portfolio} = \frac{2}{3}\beta_{Zee} + \frac{1}{3}\beta_{Pad}$

$= \frac{2}{3} \times 0.91 + \frac{1}{3} \times 1.2 = 1.007$

$= \rho_{Port, M} = \frac{Cov_{(Part,M)}}{\sigma_{Part} \times \sigma_M}$

$= \rho_{Port,} \times \frac{\sigma_M}{\sigma_{Part}}$

$= 1.007 \times \sqrt{\frac{0.0225}{0.1187}} = 0.438\ 0.$

Unsystematic Risk of Portfolio:

$= (1 - \rho^2_{Portfolio, M})\ \sigma^2$ Portfolio

$= [1 - (0.438)^2] \times 0.1187 = 0.09593$ ie 959.3 $(\%)^2$

Therefore, we find that unsystematic Risk of the Portfolio is less than that of individual Stocks. From the result it can be implied that because of constitution of Portfolio unsystematic return reduces.

UNIT IV – OPPORTUNITY BASED INVESTMENT

Q.3. A Portfolio Management Service manages a stock fund…..

Solution:

Stock	E (r)	R_j= Rf + β(Rm-Rf)	Market Value	Weights	R_j x W	Valuation Status
P	15%	15.6%	200000	0.2	3.12	Overvalued
Q	14%	13.5%	100000	0.10	1.35	Undervalued
R	15%	14.4%	150000	0.15	2.16	Undervalued
S	16%	16.2%	250000	0.25	4.05	Overvalued
T	17%	17.4%	300000	0.3	5.22	Overvalued
			1000000		15.9%	Overvalued

E(r) of Portfolio as per CAPM is 15.9%

Q.6. An investor holds two stocks A and B…..
Solution:

Expected Return on Market index A = E (A) = $\sum_{i=G,S,R} P_i \, A_i$

(G, S & R, denoted Growth, Stagnation and Recession)

(0.40) (25) + 0.30 (10) + 0.30 (-5) = 11.5%

Expected Return on 'B'

(0.40 x 20) + (0.30 x 15) + 0.30 x (-8) = 10.1%

Expected Return on Market index

(0.40 x 18) + (0.30 x 13) + 0.30 x (-3) =10.2%

Variance of Market index

$(18 - 10.2)^2 (0.40) + (13 - 10.2)^2 (0.30) + (-3 - 10.2)^2 (0.30)$

= 24.34 + 2.35 + 52.27 = 78.96%

Covariance of stock A and Market Index M

Cov. (AM) = $\sum_{i = G,S,R}$ ([A_i -E(A)1] [M_i - E(M)] P

(25 -11.5) (18 - 10.2) (0.40) + (10 - 11.5) (13 - 10.2) (0.30) + (-5-11.5) (-3-10.2) (0.30)

= 42.12 + (-1.26) + 65.34=106.20

Covariance of stock B and Market index M

(20-10.1) (18-10.2) (0.40) + (15-10.1) (13-10.2) (0.30) + (-8-10.1) (-3-10.2) (0.30) = 30.89 + 4.12 + 71.67=106.68

Beta for stock A $= \frac{\text{CoV(AM)}}{\text{VAR (M)}} = \frac{106.20}{78.96} = 1.345$

Beta for Stock B $= \frac{\text{CoV(BM)}}{\text{varM}} = \frac{106.68}{78.96} = 1.351$

Required Return for A
$R(A) = R_f + \beta (M - R_f)$
11% + 1.345 (10.2 - 11) % = 9.924%

Required Return for B
11% + 1.351 (10.2 - 11) % = 9.92%

Alpha for Stock A
E (A) - R (A) i.e. 11.5 % - 9.924% = 1.576%

Alpha for Stock B
E (B) - R (B) i.e. 10.1% - 9.92% = 0.18%

Since stock A and B both have positive Alpha, therefore, they are UNDERPRICED. The investor should make fresh investment in them.

Q.16. Zebra Ltd. has a beta of 1.15……
Solution:

(i) E(r) as per CAPM $= R_f + \beta (R_M - R_f)$

$= 5 + 1.15 (14-5)$
$= 15.35\%$

(ii) E(r) of 15.35% implies that an investor should require on an average 15.35% returns based on the risk he is taking in the stock. Returns must average 15.35% over period of time, though in a particular year return may not precisely be 15.35%.

(iii)

Year	Actual Returns	E(r) as per CAPM	α = Actual Returns - E(r)as per CAPM
1	18.83%	15.35%	3.48%
2	12.65%	15.35%	- 2.7%
3	15.35%	15.35%	0%
4	16.57%	15.35%	1.22%
		Total α	**2%**

$$\text{avg } \alpha = \frac{2}{4}$$

Average α = 0.5% p.a.

Q.18. Average market risk premium reflecting return……
Solution:

E(r) as per factor model $=\lambda_0 + \beta_{forex}\lambda_{forex} + \beta_{Interest}\lambda_{Interest} + \beta_{gnp}\lambda_{gnp}$

ABC = 6% + 1.50 x 3% + [1.25 x (-1%)] + 3 x 4.50%
= 22.75%

DEF = 6% + 0.80 x 3% + [-2 x (-1%)] + 1 x 4.50%
= 14.9%

LKG = 6% + 0.40 x 3% + 0.50 x (-1%) + 1 x 4.50%
= 11.2%

$E(r)_p = 22.75\% \times \frac{1}{3} + 14.9\% \times \frac{1}{3} + 11.2\% \times \frac{1}{3}$

$E(r)_p$ = 16.28%

Q.27. A company's β is 1.40. The market

Solution:

(i) Computation of expected return based on CAPM
$R_j = R_j + \beta\,(R_m - R_f)$ = 10% + 1.40 (14% - 10%) = 10% + 5.6%= 15.6%

(ii) Computation of risk premium if the market goes up by 2.5 points
The return from the market goes up by 2.5 i.e. 14% + 2.5% = 16.5%
Expected Return based on CAPM is given by
R_j = 10% + 1.40 (16.5% - 10%) = 10% + 1.40 x 6.5%
= 10% + 9.1% = 19.1%

Q.31. Price of 91 days money market interest Treasury Bill….

[Hint:Rf= $\frac{100 - 98.20}{98.20} \times \frac{365}{91}$ =7.35%; Answer: Rj =14.55%,10.95%, 21.75%, 15.15%;
Accordingly, on comparison of E(r) vs Rj, All the Stocks are Undervalued]

UNIT V – PORTFOLIO & MUTUAL FUNDS PERFORMANCE EVALUATION

Q.4. Based on the below mentioned data

Solution:

Particulars	Sharpe Ratio	Treynor Ratio	Jensen Alpha
Portfolio	$\frac{R_p - R_f}{\sigma_p}$	$\frac{R_p - R_f}{\beta_p}$	Actual return – R_j as per CAPM
	$\frac{35-6}{42}$	$\frac{35-6}{1.2}$	35 – (6% + 1.2 (28 - 6%))
	= 0.69	= 24.167	= 2.6
Market	$\frac{R_m - R_f}{\sigma_m}$	$\frac{R_m - R_f}{\beta_m}$	
	$= \frac{28-6}{30}$	$= \frac{28-6}{1}$	
	0.73	22	0
Comment	Portfolio has Underperformed the market	Portfolio has Outperformed the market	Portfolio has Outperformed the market

Q.6. The following information is available on the performance…..
Solution:

(a)

Particulars	**Sharpe Ratio** $\frac{R_p - R_f}{\sigma_p}$	**Ranking**	**Treynor Ratio** $\frac{R_p - R_f}{\beta_p}$	**Ranking**
1	$\frac{15.6-6}{27} = 0.36$	IV	$\frac{15.6-6}{1.82} = 5.27\%$	V
2	$\frac{11.8-6}{18} = 0.32$	V	$\frac{11.8-6}{.825} = 7.03\%$	IV
3	$\frac{8.3-6}{15.2} = 0.15$	VI	$\frac{8.3-6}{0.481} = 4.78\%$	VI
4	$\frac{19-6}{21.2} = 0.61$	III	$\frac{19-6}{1.325} = 9.81\%$	II
5	$\frac{-6-6}{4} = -3$	VII	$\frac{-6-6}{0.15} = -80\%$	VII
6	$\frac{23.5-6}{19.3} = 0.91$	I	$\frac{23.5-6}{1.013} = -17.28\%$	I
7	$\frac{12.5-6}{8.2} = 0.79$	II	$\frac{12.5-6}{0.67} = 9.70\%$	II

Space for point (b) & (c) – Done in Class room

Q.7. Consider the key statistical results on the following……
Solution:

WN-1: Calculation of Return on Portfolio:

Funds	Characteristic Line $=\alpha + \beta R_M$	R_p
A	3.72 + 0.99 x 13.5	17.085%
B	0.60 + 1.27 x 13.5	17.745%
C	0.41 + 0.96 x 13.5	13.37%
D	(0.22) + 1.21 x 13.5	16.115%
E	0.45 + 0.75 x 13.5	10.575%

WN-2 Calculation of σ_p:

Funds	Unsystematic Variance	Systematic Variance $(\beta_p \times \sigma_m)^2$	Total Variance [Unsystematic Variance + Systematic Variance]	Standard Deviation
A	9.35	$(0.99^2 \times 25) = 24.50$	33.85	5.82
B	5.92	$(1.27^2 \times 25) = 40.32$	46.24	6.8
C	9.79	$(0.96^2 \times 25) = 23.04$	32.83	5.73
D	5.36	$(1.21^2 \times 25) = 36.60$	41.96	6.48
E	4.52	$(0.75^2 \times 25) = 14.06$	18.58	4.31

	Sharpe's ratio = $\frac{R_p - R_f}{\sigma_p}$		Ranking
A	$\frac{17.085-7}{5.82}$	1.73	I
B	$\frac{17.745-7}{6.80}$	1.58	II
C	$\frac{13.37-7}{5.73}$	1.11	IV
D	$\frac{16.115-7}{6.48}$	1.41	III
E	$\frac{10.575-7}{4.31}$	0.83	V

UNIT VI – CORPORATE FINANCE

Q.4. Reliance Capital's market value of debt…..

Solution:

(a) Required return on Equity Shares

R_j using CAPM $= R_f + \beta_e (R_m - R_f)$

$= 6\% + 1.40\ (6\%)$

$= 14.4\%$

(b) β of Assets

β_A = Overall β of levered firm

Overall β of levered firm $= \beta_E \times \frac{E}{E+D} + \beta_D \times \frac{D}{E+D}$

$= 1.40 \times \frac{400}{400+300} + 0 \times \frac{300}{300+400}$

Overall β of levered firm = 0.8

Therefore, β of asset = 0.8

(c) Cost of capital:

$K_O = K_e \times W_e + K_d \times W_d$

$K_O = [R_f + \beta_e (R_m - R_f)] \times W_e + [R_f + \beta_D (R_m - R_f)] \times W_d$

$K_O = [6\% + 1.4\ (6\%)] \times \frac{400}{700} + [6\% + 0\ (6\%)] \times \frac{300}{700}$

$= 14.4\% \times \frac{400}{700} + 6\% \times \frac{300}{700}$

$K_O = 10.80\%$

(d) $K_O = K_e \times W_e + K_d \times W_d$

$= 14.4\% \times \frac{400}{700} + 6\% \times \frac{300}{700}$

$K_O = 10.80\%$

(e) Expected Return on new venture using CAPM:

$= R_e + \beta_e (R_m - R_f)$

$= 6\% + 1.5\ (6\%)$

$= 15\%$

Q.5. The total market value of the equity share of O.R.E……

Solution

(i) Beta of existing portfolio of assets (β_A) Value of equity (β_e)

$\left(\text{Beta of equity } (\beta e) \times \frac{\text{Value of equity (Ve)}}{\text{Total value of firm (Vo)}}\right) +$

$\left(\text{Beta of debt } (\beta_d) \times \frac{\text{Value of equity (Vd)}}{\text{Total value of firm (Vo)}}\right)$

β_A = 1.5 x (Rs 60 lakh / Rs 100 lakh i.e., Rs 60 lakh + Rs 40 lakh) = 0.9

Note: In absence of β_d, it is assumed to be zero.

(ii) **Cost of capital**

Ke = Risk free rate of return + (Risk premium x β_A) = 8% + (10% x 0.9) = 17%

17% discount rate should be used to evaluate company's investments in expansion business.

Q.7. Alpha Ltd., and Gamma Ltd., are identical……

Solution:

Step 1: Compute β_u firm from the D/E of Alpha

$$\beta_u = \beta_{ge} \times \frac{E}{E+D\ (1-t)}$$

$$= 1.30 \times \frac{4}{4+1\ (1-0.4)}$$

$$= 1.13$$

Step 2: Compute beta of equity of Gamma from βu

$$\beta_u = \beta_{ge} \times \frac{E}{E+D\ (1-t)}$$

$$\beta_{ge} = \beta_u \times \frac{E+D\ (1-t)}{E}$$

$$= 1.13 \times \frac{3+2\ (1-0.4)}{3}$$

$$\beta_{ge} = 1.582$$

Q.8. L&T Ltd. wants to diversify into fertilizers

Solution:

Step 1: Compute β_u firm from the D/E of Alpha

$$\beta_u = \beta_{ge} \times \frac{E}{E+D\ (1-t)}$$

$$= 1.35 \times \frac{0.28}{0.28+0.72\ (1-0.35)}$$

$$= 0.51$$

Step 2: Compute beta of equity of Gamma from βu

$$\beta_u = \beta_{ge} \times \frac{E}{E+D\ (1-t)}$$

$$\beta_{ge} = \beta_u \times \frac{E+D\ (1-t)}{E}$$

$$= 0.51 \times \frac{0.5+0.5\ (1-0.35)}{0.5}$$

$$\beta_{ge} = 0.84$$

Q.12. A Ltd., pays no taxes and is entirely financed by

Solution:

(i) Beta of equity shares after buy-back:

Before buy-back Protect Ltd. is all equity financed and the equity beta is 0.60.

Expected return on Equity is 20%

Thus, the Company's beta is 0.6 and the Cost of Capital is 20%.

The Company value will not change after the buy-back and the debt is risk free.

$\beta_A = \frac{D}{D+E}(\beta_D) + \frac{E}{D+E}(\beta_E)$

$0.6 = 0.5 \times 0 + 0.5 \times \beta_E$ or, $\beta_E = 0.6 \div 0.5 = 1.20$

(ii) Required return and Risk Premium:

Particulars	Before Buy-back	After buy-back
Return on Equity	20% (given)	$R_A = \frac{D}{D+E}(R_D) + \frac{E}{D+E} \times R_E$ $0.20 = 0.5 \times 0.10 + 0.05 \times R_E$ $0.20 = 0.05 + 0.5$ RE $R_E = (0.20 – 0.50) \div 0.5$ = 30%
Risk-free Rate	10%	10%
Risk Premium	$R_A = R_F + (R_M - R_F) \times \beta$ $20\% = 10 + (R_M - 10) \text{ X } 0.6$ $10 = (R_M - 10) \times 0.6$ $R_M – 10 = 10 \div 0.6$ Risk Premium = 16.67%	$R_A = R_F + (R_M - R_F) \times \beta$ $30 = 10 + (R_M - 10) \times 1.20$ $(R_M - 10) = 20 \div 1.20$ Risk Premium = 16.67%
Required Return	$R_M = 10 + 16.67 = 26.67\%$	$R_M = 10 + 16.67 = 26.67\%$

(iii) The expected rate of Return on Debt is 10% i.e. Risk-free rate.

(iv) The percentage increase in EPS:

	Before Buy-back	**After buy-back**
Equity	100	50
Debt @ 10%	NIL	50
Total	100	100
EBIT @ 20%	20	20
Less: Interest	NIL	5
Earnings	20	15
No. of shares	100	50
Earnings per share	0.20	0.30
P/E Ratio	5	3.33
Return on Equity	200%	30%

The percentage increase in EPS is 50% i.e. (0.30 - 0.20) ÷ 0.20x100 = 50%

The New Price Earnings Multiple is **3.33**.

Q.14. The XYZ Ltd. In the manufacturing business is planning to set up…..

[Ans: Avg Beta = 0.82; Equity beta of XYZ = 0.96, Ke = 17.76%; Ko = 15.91%]

MUTUAL FUNDS

Q.4. Mr. A can earn a return of 16% by……

Solution:

Personal earnings of Mr. A = R1

Mutual Fund earnings = R2

R2 = $\frac{1}{1-\text{Initial expenses (\%)}}$ R1 + Recurring expenses (%)

= $\frac{1}{1-0.055}$ x 16% + 1.5%

= 18.43%

Mutual Fund earnings = 18.43%

Q.17. A Mutual Fund's Opening NAV is ₹ 20………..

Solution:

Expense Ratio = (Expense incurred per unit / Average NAV)

= 0.50 / (20+24) / 2

= 2.27%

BONDS VALUATION

Q.1. A ₹ 100 par value bond, bearing a coupon rate of 11 percent…..

Solution: Value of Bond = 11 (PVIFA 15%, 5) + 100 (PVIF 15%, 5)

Value of Bond = 11 (3.3522) + 100 (0.4972)

= 86.59

Q.16. The market value of 100 par value bond……

Solution: **YTM Using Shortcut**

$$YTM\ \% = \frac{I + \frac{RP-PP}{n}}{\frac{RP+PP}{2}}$$

$$= \frac{14 + \frac{100-80}{10}}{\frac{100+80}{2}}$$

= 17.78%

YTM using IRR

Year	CF	PV@18%	PV@20%
1-10	14	62.92	58.69
10	100	19.11	16.15
	PV_I	82.03	74.84
	PV_O	(80)	(80)
		2.03	(5.16)

$$IRR = LR + \frac{NPV_{LR}}{NPV_{LR}-NPV_{HR}} \times (HR - LR)$$

$$= 18\% + \frac{2.03}{2.03-(-5.16)} \times (20 - 18)$$

= 18.56%

Q.18. There is a 9% 5-year bond issue……

Solution:

Calculation of yield to Maturity (YTM)

$$YTM = \frac{\text{Coupon}+\text{Pro-rated discount}}{(\text{Redemption price}+\text{Purchase Price})/2}$$

After tax coupon = 9 x (1 - .30) = 6.3%

After tax redemption price = 105 - (15 x .10) or ₹103.5

After tax capital gain = 103.50 - 90 = ₹13.50

$$YTM = \frac{6.3+(13.5/5)}{(103.5+9)/2} \text{ or } \frac{9.00}{96.75} = 9.30\%$$

Q.21. The market value of a ₹ 1,000 par value bond…..

Solution:

The YTM is the value of r in the following equality:

$$1{,}050 = \sum_{t=1}^{5} \frac{140}{(1+r)^t} + \frac{1{,}000}{(1+r)^5}$$

$$= 140\,(PVIFA_{r,5\ yrs}) + 1{,}000\,(PVIF_{r,\ 5\ yrs})$$

Let us try a value of 13 percent for r. The right hand side of the above expression becomes:

$$= 140\,(PVIFA_{13\%,\ 5\ yrs}) + 1{,}000\,(PVIF_{13\%,\ 5\ yrs})$$
$$= 140\,(3.517) + 1{,}000\,(0.543)$$
$$= 492.4 + 543.0 = \text{Rs. } 1035.4$$

Since this is less than Rs.1,050, we try a lower value for r. Let us try r = 12 percent.

This makes the right-hand side equal to:

$$= 140\,(PVIFA_{12\%,\ 5\ yrs}) + 1{,}000\,(PVIF_{12\%.5\ vrs})$$
$$= 140\,(3.605) + 1{,}000\,(0.567)$$
$$= 504.7 + 567.0 = \text{Rs. } 1071.7$$

Thus, r lies between 12 percent and 13 percent. Using a linear interpolation in this range, we find that r is equal to:

$$12\% + (13\% - 12\%) = \frac{1071.7-1050.0}{1071.7-1035.4} = 12.60 \text{ percent}$$

(b) The approximate YTM works out to:

$$YTM = \frac{140+(1{,}000-1{,}050)/5}{0.40 \times 1000+0.6 \times 1050} = 12.62 \text{ percent}$$

(c) The realised yield to maturity may be calculated as follows:

Future value of interest and principal repayment

$$= 140\,(1.06)^4 + 140\,(1.06)^3 + 140\,(1.06)^2 + 140\,(1.06)^1 + 140 + 1000$$
$$= \text{Rs. } 1789.2$$

Present market price $(1+r^*)^5$ = Rs.1789.2

Rs.1050 x $(1+r^*)^5$ = Rs.1789.2

$(1+r^*)^5 = 1.70399$

$r^* = 1.70399^{1/5} - 1$

$= 1.112489 - 1 = 11.2489$ percent ~ 11.25%

Q.23 It is now January 1, 2009, and Mr. X is….

Solution:

M = ₹ 1,000 INT = 0.095 (₹ 1,000) = ₹ 95N = 28 years in 2037

Vd = ₹ 1,165.75

Use Equation to find the approximate yield to maturity:

$$(\text{Approximate Yield to Maturity}) = \frac{\text{Interest}+\left(\frac{M-V_d}{N}\right)}{\left[\frac{V_d+M}{2}\right]}$$

$$= \frac{₹\,95+\left(\frac{₹\,1{,}000\,-\,₹\,1{,}165.75}{28}\right)}{\left[\frac{₹\,1{,}165.75+₹\,1{,}000}{2}\right]}$$

$$= \frac{₹\,89.08}{₹\,1{,}082.875} = 0.0822 = 8.22\%$$

Note: Above Question may also be solved using IRR Technique

Q.50. Suppose a 8% ₹1000 bond had 5 years

Solution: The only way the holder of an 8% bond can find a buyer is to sell the bond at a discount, so that its yield to maturity is the same as the coupon rate on new issues. Let's say interest rates increase from 8% to 10%. With 15 years to maturity, an 8% bond has to be priced so that the discount, when amortized over 15 years has a yield to maturity of 10%. That discount is a little under ₹200:

$$\text{YTM} = \frac{\text{Coupon Rate+Prorated Discount}}{(\text{Face value+Purchase Price})/2} = \frac{₹80+(₹200/15\text{ years})}{(₹1{,}000+₹800)/2} = \frac{₹93.33}{₹900} = 10.4\%$$

The 8% bond with 15 years to maturity must sell at a little over ₹800 to compete with 10% bonds. The possibility that interest rates will cause outstanding bond issues to lose value is called "Interest rate risk." Yet there is an upside to this risk. If interest rates decline during the five years that the 8% bond is outstanding, the holder could sell it for enough of a premium to make its YTM rate equal to the lower yields of recent issues. For instance, should Interest rates decline to 7%, the price of the 8% bond with 15 years to maturity will increase by about ₹100.

Q.52. A bond has an 8% coupon rate (semi-annual-interest),

Solution: Calculating bond price @ YTM of 5%

Bond Price = Coupon x PVIFA ((2.5)%, 2n) + RV x PVIF ((2.5)%, 2n)

= 40 x PVIFA (2.5%, 10) + 1000 x PVIF (2.5%, 10)

= 1131.28

Similarly calculating bond price @ YTM of 3%

Bond Price = 1230.55

Using interpolation YTM

$$= \text{Low YTM\%} + \frac{\text{PV @ Lower - Actual Desired}}{\text{PV @ Lower - PV @ Higher}} \times (\text{High \% - Low \%})$$

$$= 3\% + \frac{1230.55 - 1200}{1230.55 - 1131.28} * (5\% - 3\%)$$

= 3.6155%

Q.53. Consider a bond with the following features:

Solution:

Step1: Calculate clean price on next coupon date i.e on 31/Dec/2009

Bond Price = Coupon x PVIFA (k%, n) + Maturity Value x PVIF (k%,n)

Clean Price = 12,000*PVIFA (15%,6) + 1,00,000*PVIF (15%,6)

Clean Price = 88,646.55

Step2: Calculate Dirty Price on i.e on 31/Dec/2009

Dirty Price = Clean Price + Coupon

= 88,646.55 + 12,000

= 1,00,646.55