PART I : MCQ ANSWERS 14 MARKS

Case Study – 1

1. Option (b) : 2.0976
2. Option (d) : 11.60%
3. Option (b) : All investment in MFX

4. Option (d) : Rs 23,871
5. Option (b) : Rs 99.79 Lakh
6. Option (b) : 15% & 20%
7. Option (b) : 17.41%

PART II : DESCRIPTIVE SOLUTIONS 56 MARKS

Question : 1(a) **6 Marks**

Computation of Beta Value

Calculation of Returns

$$\text{Returns} = \frac{D1 + (P1 - P0)}{P0} \times 100$$

Year	Returns
2012-13	$\frac{22 + (253 - 245)}{245} \times 100 = 12.24\%$
2013-14	$\frac{25 + (310 - 253)}{253} \times 100 = 32.41\%$
2014-15	$\frac{30 + (330 - 310)}{310} \times 100 = 16.13\%$

Calculation of Returns from market Index

Year	% of Index Appreciation	Dividend Yield %	Total Return %
2012-13	$\frac{(2130 - 2013)}{2013} \times 100 = 5.81\%$	5%	10.81%
2013-14	$\frac{(2350 - 2130)}{2130} \times 100 = 10.33\%$	6%	16.33%
2014-15	$\frac{(2580 - 2350)}{2350} \times 100 = 9.79\%$	7%	16.79%

Computation of Beta

Year	Krishna Ltd. (X)	Market Index (Y)	XY	Y^2
2012–13	12.24%	10.81%	132.31	116.86
2013–14	32.41%	16.33%	529.25	266.67
2014–15	16.13%	16.79%	270.82	281.90
Total	**60.78%**	**43.93%**	**932.38**	**665.43**

Average Return of Krishna Ltd.

$$= \frac{60.78}{3} = 20.26\%$$

Average Market Return

$$= \frac{43.93}{3} = 14.64\%$$

Beta (β)

$$\frac{\Sigma XY - n\bar{X}\bar{Y}}{\Sigma y^2 - n(\bar{Y})^2} = \frac{932.38 - 3 \times 20.26 \times 14.64}{665.43 - 3(14.64)^2} = 1.897$$

(ii) Observation

	Expected Return (%)	Actual Return (%)	Action
2012 – 13	6%+ 1.897(10.81% - 6%) = 15.12%	12.24%	Sell
2013 – 14	6%+ 1.897(16.33% - 6%) = 25.60%	32.41%	Buy
2014 – 15	6%+ 1.897(16.79% - 6%) = 26.47%	16.13%	Sell

Question : 1(b) **4 Marks**

i. The risk free rate of interest and risk factor for each of the projects are given. The risk adjusted discount rate (RADR) for different projects can be found on the basis of CAPM as follows:

Required Rate of Return = I_{Rf} + (ko - IRF) Risk Factor

For P-I : RADR = 0.10 + (0.15 – 0.10) 1.80 = 19%

For P-II : RADR = 0.10 + (0.15 – 0.10) 1.00 = 15 %

For P-III : RADR = 0.10 + (0.15 – 0.10) 0.60 = 13 %

ii. The three projects can now be evaluated at 19%, 15% and 13% discount rate as follows:

Project P-I

Annual Inflows	₹ 6,00,000
PVAF (19 %, 4)	2.639
PV of Inflows (₹6,00,000 x 2.639)	₹ 15,83,400
Less: Cost of Investment	₹ 15,00,000
Net Present Value	**₹ 83,400**

Project P-II

Year	Cash Inflow (₹)	PVF (15%,n)	PV (₹)
1	6,00,000	0.870	5,22,000
2	4,00,000	0.756	3,02,400
3	5,00,000	0.658	3,29,000
4	2,00,000	0.572	1,14,400
Total Present Value			12,67,800
Less: Cost of Investment			11,00,000
Net Present Value			**1,67,800**

Project P-III

Year	Cash Inflow (₹)	PVF (15%,n)	PV (₹)
1	4,00,000	0.885	3,54,000
2	6,00,000	0.783	4,69,800
3	8,00,000	0.693	5,54,400
4	12,00,000	0.613	7,35,600
Total Present Value			21,13,800
Less: Cost of Investment			19,00,000
Net Present Value			**2,13,800**

Project P-III has highest NPV. So, it should be accepted by the firm

Question : 1(c) **4 Marks**

a) The Betas of two stocks:

Aggressive stock - (40% - 4%) / (25% - 7%) = 2

Defensive stock - (18% - 9%) / (25% - 7%) = 0.50

Alternatively, it can also be solved by using the Characteristic Line Relationship as follows:

$R_S = \alpha + \beta Rm$ Where,

α = Alpha β = Beta

Rm= Market Return

For Aggressive Stock

4% = α + β (7%)

40% = α + β (25%)

36% = β (18%)

β = 2

For Defensive Stock

9% = α + β (7%)

18% = α + β (25%)

9% = β (18%)

β = 0.50

b) Expected returns of the two stocks: -

Aggressive stock - 0.5 x 4% + 0.5 x 40% = 22%

Defensive stock - 0.5 x 9% + 0.5 x 18% = 13.5%

c) Expected return of market portfolio

= 0.5 x 7% + 0.5% x 25% = 16%

∴ Market risk premium = 16% - 7.5% = 8.5%

∴ SML is, required return = 7.5% + βi 8.5%

d) Rs = α + βRm

For Aggressive Stock

22% = αA + 2(16%)

αA = -10%

For Defensive Stock

13.5% = αD + 0.50(16%)

αD = 5.5%

Question : 2(a) **5 Marks**

i. Inflation adjusted Revenues

Year	Revenues (₹)	Revenues (Inflation Adjusted) (₹)
1	10,00,000	10,00,000(1.09) = 10,90,000
2	13,00,000	13,00,000(1.09) (1.08) = 15,30,360

3	14,00,000	14,00,000(1.09) (1.08)(1.06) = 17,46,965

ii. Inflation adjusted Costs

Year	Costs (₹)	Revenues (Inflation Adjusted) (₹)
1	5,00,000	5,00,000(1.10) = 5,50,000
2	6,00,000	6,00,000(1.10)(1.09) = 7,19,400
3	6,50,000	6,50,000(1.10)(1.09)(1.07) = 8,33,905

iii. Tax Benefit on Depreciation = ₹ 5,00,000 x 0.35 = ₹1,75,000

iv. Net Profit after Tax

Year	Revenues (Inflation Adjusted) (₹)	Costs (Inflation Adjusted) (₹)	Net Profit (₹)	Tax (₹)	Profit after Tax (₹)
	(1)	(2)	(3) = (1) – (2)	(4) = 35% of (3)	(3) – (4)
1	10,90,000	5,50,000	5,40,000	1,89,000	3,51,000
2	15,30,360	7,19,400	8,10,960	2,83,836	5,27,124
3	17,46,965	8,33,905	9,13,060	3,19,571	5,93,489

v. Present Value of Cash Inflows

Year	Net Profit after tax (₹)	Tax Benefit on Depreciation (₹)	Cash Inflow (₹)	PVF@ 14%	PV (₹)
1	3,51,000	1,75,000	5,26,000	0.877	4,61,302
2	5,27,124	1,75,000	7,02,124	0.769	5,39,933
3	5,93,489	1,75,000	7,68,489	0.675	5,18,730
					15,19,965

NPV = ₹ 15,19,965 – ₹ 15,00,000 = ₹ 19,965

Question : 2(b) **5 Marks**

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

(1- w) ×10.0 + w ×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)½ = 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 : $\frac{10.5 - 3}{15.6} = 0.481$

Question : 2(c) **4 Marks**

In this question the effect of increasing running cost and decreasing resale value have to be weighted upto against the purchase cost of bike. For this purpose, we shall compute Equivalent Annual cost (EAC) of replacement in different years shall be computed and compared.

Year	Road Taxes	Petrol etc.	Total	PVF @10%	PV	Cumulative PV	PV of Resale Price	Net Outflow
	₹	₹	₹	₹	₹	₹	₹	₹
1	3,000	30,000	33,000	0.909	29,997	29,997	31,815	(1,818)
2	3,000	35,000	38,000	0.826	31,388	61,385	17,346	44,039
3	3,000	43,000	46,000	0.751	34,546	95,931	6,759	89,172

Computation of EACs

Year*	Purchase Price of Bike (₹)	Net Outflow (₹)	Total Outflow (₹)	PVAF @ 10%	EAC (₹)*
1	55,000	(1,818)	53,182	0.909	58,506
2	55,000	44,039	99,039	1.735	57,083
3	55,000	89,172	1,44,172	2.486	57,993

Thus, from above table it is clear that EAC is least in case of 2 years, hence bike should be replaced every two years.

Question : 3 (a) **7 Marks**

Question : 3 (b) **7 Marks**

1. Calculation of Net Cash Inflow per year

	Particulars	Amount (₹)
A	Selling price per unit	100
B	Variable cost per unit	50
C	Contribution per unit (A - B)	50
D	Number of units sold per year	5 Cr.
E	Total Contribution (C × D)	₹ 250 Cr.
F	Fixed cost per year	₹ 50 Cr.
G	Net cash inflow per year (E - F)	₹ 200 Cr.

Calculation of Net Present Value (NPV) of the Project

Year	Year Cash Flow (₹ in Cr.)	PV factor @ 6%	Present Value (PV) (₹ in Cr.)
0	(400.00)	1.000	(400.00)
1	200.00	0.943	188.60
2	200.00	0.890	178.00
3	200.00	0.840	168.00
Net Present Value			134.60

Here, NPV represent the most likely outcomes and not the actual outcomes. The actual outcome can be lower or higher than the expected outcome.

2. Sensitivity Analysis considering 2.5 % Adverse Variance in each variable

	Particulars	Base	Initial capital cost increased to ₹410 crore	Selling Price per Unit Reduced to ₹97.5	Variable Cost Per Unit increased to ₹51.25	Fixed Cost Per Unit increased to ₹ 51.25	Units sold per year reduced to 4.875 crore
		(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
A	Selling price per unit	100	100	97.5	100	100	100
B	Variable cost per unit	50	50	50	51.25	50	50
C	Contribution per unit (A - B)	50	50	47.5	48.75	50	50
		(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)
D	Number of units sold per year (units in Crores)	5	5	5	5	5	4.875
E	Total Contribution (C × D)	250	250	237.5	243.75	250	243.75
F	Fixed cost per year	50	50	50	50	51.25	50
G	Net Cash Inflow per year (E - F)	200	200	187.5	193.75	198.75	193.75
H	PV of Net cash Inflow	534.60	534.60	501.19	517.89	531.26	517.89

	per year (G × 2.673)						
I	Initial capital cost	400	410	400	400	400	400
J	NPV (H - I)	134.60	124.60	101.19	117.89	131.26	117.89
K	Percentage Change in NPV	-	-7.43%	-24.82%	-12.41%	-2.48%	-12.41%

The above table shows that by changing one variable at a time by 2.5% (adverse) while keeping the others constant, the impact in percentage terms on the NPV of the project can be calculated. Thus, the change in selling price has the maximum effect on the NPV by 24.82%.

Question : 4 (a) **7 Marks**

(i) Portfolio Beta

0.20 x 0.40 + 0.50 x 0.50 + 0.30 x 1.10 = 0.66

(ii) Residual Variance

To determine Residual Variance first of all we shall compute the Systematic Risk as follows:

βA 2 × σM 2 = (0.40)2 (0.01) = 0.0016

βB 2 × σM 2 = (0.50)2 (0.01) = 0.0025

βC 2 × σM 2 = (1.10)2 (0.01) = 0.0121

Residual Variance

A 0.015 – 0.0016 = 0.0134

B 0.025 – 0.0025 = 0.0225

C 0.100 – 0.0121 = 0.0879

(iii) Portfolio variance using Sharpe Index Model

Systematic Variance of Portfolio = (0.10)2 x (0.66)2 = 0.004356

Unsystematic Variance of Portfolio = 0.0134 x (0.20)2 + 0.0225 x (0.50)2 + 0.0879 x (0.30)2 = 0.014072

Total Variance = 0.004356 + 0.014072 = 0.018428

(iv) Portfolio variance on the basis of Markowitz Theory

= (wA x wA x σ2A) + (wA x wB x CovAB) + (w A x wC x CovAC) + (w B x wA x CovAB) + (wB x wB xσ2B) + (wB x wC x CovBC) + (wC x wA x CovCA) + (wC x wB x CovCB) + (wC x wCx σ2C)

= (0.20 x 0.20 x 0.015) + (0.20 x 0.50 x 0.030) + (0.20 x 0.30 x 0.020) + (0.20 x 0.50 x 0.030) + (0.50 x 0.50 x 0.025) + (0.50 x 0.30 x 0.040) + (0.30 x 0.20 x 0.020) + (0.30 x

0.50 x 0.040) + (0.30 x 0.30 x 0.10)

= 0.0006 + 0.0030 + 0.0012 + 0.0030 + 0.00625 + 0.0060 + 0.0012 + 0.0060 + 0.0090

= 0.0363

Question : 4 (b) **7 Marks**

(i). Initial Investment

IRR = 16% (Given)

At IRR, NPV shall be zero, therefore

Initial Cost of Investment = PVAF (16%,5) x Cash Flow (Annual)

= 3.274 x ₹ 57,500

= ₹ 1,88,255

(ii). Net Present Value (NPV)

Let Cost of Capital be X, then 16−X = 60% ; X = 10%

Thus NPV of the project

= Annual Cash Flow x PVAF (10%, 5) – Initial Investment

= ₹ 57,500 x 3.791 – ₹ 1,88,255

= ₹ 2,17,982.50 – ₹ 1,88,255 = ₹ 29,727.50

(iii). Annual Fixed Cost

Let change in the Fixed Cost which makes NPV zero is X. Then,

₹ 29,727.50 – 3.791X = 0 Thus X = ₹ 7,841.60

Let original Fixed Cost be Y then, Y × 7.8416% = ₹ 7,841.60

Y = ₹ 1,00,000

Thus Fixed Cost is equal to ₹ 1,00,000

(iv). Estimated Annual Units of Sales

Selling price per unit $= \frac{₹\ 60}{100\% - 70\%} = ₹\ 200$

$$\frac{\text{Actual cash flow + Fixed cost}}{\text{P/V Ratio}} = \text{Sales value}$$

$$\frac{57,500 + 1,00,000}{0.70} = ₹\ 2,25,000$$

Sales in unit $= \frac{2,25,000}{200} = 1125$ units

(v). Break Even Units

$$\frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{1,00,000}{140} = 714.285 \text{ units}$$

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