Suggested Solution

Test-6

Mission 80+ for N/D24

Case Scenario-I		
(i)	(d)	25
(ii)	(c)	₹1725
(iii)	(a)	₹937.56
(iv)	(b)	₹60
(v)	(c)	₹0.40

Hint:

(iii)

(i) Straight value of Bond

$= (85 \times 0.905) + (85 \times 0.819) + (85 \times 0.741) + (1085 \times 0.671)$

$= ₹\ 937.56$

(ii)

(ii) $\%\ \text{downside Risk} = \dfrac{\text{M.P. of bond} - \text{Straight value}}{\text{Straight value}}$

or, $0.84 = \dfrac{\text{M.P. of bond} - 937.56}{937.56}$

or $\text{M.P. of bond} = 787.5504 + 937.56$

$= 1725$

(i)

(iii) At parity,

$[\text{No. of shares on conversion} \times \text{Conversion parity price of share}] = \text{Market Price of Bond}$

or, $\text{No. of shares} = \dfrac{\text{M.P. of Bond}}{\text{Conversion parity price}}$

$= \dfrac{1725}{69} = 25$

(iv) $\%\ \text{Conversion premium} = \dfrac{\text{M.P.} - \text{Conversion value}}{\text{Conversion value}} \times 100$

or, $0.15 = \dfrac{1725 - \text{Conversion value}}{\text{Conversion value}} \times 100$

or $0.15\ \text{Conversion value} = 1725 - \text{Conversion value}$

(iv)

or Conversion Value $= \frac{1725}{1+0.15}$

$= 1500$

Now, Conversion value = Conversion ratio × M.P. of share

or, Current Market price of share $= \frac{\text{Conversion value}}{\text{conversion ratio}}$

$= \frac{1500}{25}$

$= 60$

(v)

(v) Conversion premium $= 1725 - 1500$

$= 225$

Premium payback period $= \frac{\text{Conversion premium}}{\text{Favourable income difference}}$

or, $3 = \frac{225}{\text{Favourable income difference}}$

or Favourable Income difference $= \frac{225}{3}$

$= 75$

Now,

Favourable Income difference = Interest income − dividend equivalent to 1 bond

or, $75 = (1000 \times 8.5\%) - \text{dividend per share} \times 25$

or, $75 = 85 - 25 \text{ dividend}$

dividend $= \frac{85 - 75}{25} = 0.40$

∴ Dividend per share $= ₹\ 0.40$

MCQ-2	
(a)	₹ 1054.24

Hint:

(i) Yield of Taxable Bonds:

- We know when current price and redeemable value both are face value then coupon rate itself is yield/ return of bond.
- Hence, Yield of taxable bond [pre-tax] = 10%
- Net return (post tax) = 10% × (1 - 30) = 7%

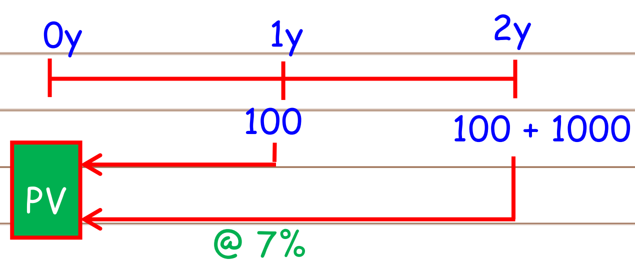
Yield of tax-free Bond:

At indifference point, tax free bond yield should be 7% (i.e., equal to net return of taxable bond)

Yield (Tax-free Bond) = 7%

(ii) Price of tax-free Bond:

Annual interest = 1000 × 10% = 100



B_0 = 100 × PVIFA (7%,2) + 1000 × PVIF (7%,2)

= 180.80 + 873.44 = 1054.24

MCQ-3	
(b)	14.40%
Hint:	(1 + ₹Return) = (1+ US$ Return) (1 + US$ Appreciation) 1 + ₹ Return = (1+ 0.10) (1 + 0.04) 1 + ₹ Return = 1.144 ₹ Return = 0.144 = 14.4%

MCQ-4	
(c)	1.05 & 0.85
Hint:	Sharpe Ratio = reward/S.D. Or, 0.37 = Reward/11.80 Or, Reward = 0.37 × 11.80 = 4.366 Again, Treynor Ratio = reward/beta Or, 4.16 = 4.366 / beta Or, Beta = 1.05 Now, beta = $\frac{\sigma_s \times r_{S.M}}{\sigma_M}$ Or, 1.05 = $\frac{11.80 \times r_{S.M}}{9.56}$ Or, $r_{S.M}$ = 0.85%

MCQ-5	
(a)	0,1
Hint:	It is the degree to which an option price will move given a small change in the underlying stock price. For example, option price (with a delta of 0.5) will move half a rupee for every full rupee movement in the underlying stock. A deeply out-of-the-money call will have a delta very close to zero; a deeply in-the-money call will have a delta very close to 1.

MCQ-6	
(d)	Initial Investment Net of premium
Hint:	This reflects the initial cost of buying the underlying asset, minus the premium received from writing the call option. The maximum loss for a covered call writer would occur if the underlying asset's value drops to zero, resulting in a loss equal to the initial investment, offset by the premium received.

Part II (Descriptive Questions)

Question-1 Solution:

1 October — October end — November end — December end

I: 27.54 (October) | I: 41.31 (November) | I: 54.54 (December)

- 1 October:
  - 300 lakhs Units
  - NAV = ₹22.50
- October end:
  - Issue 6 lakh Unit @ 22.50 + 2% load + Div equalization
- November end:
  - Redeem 3 lakh unit @ 22.50 -2% load + Div equalization
- December end:
  - 70% Income distributed

(i) Income available for distribution: (October End)

	₹ in Lakhs
Income of October	27.54
Add: Dividend equalization collected $\left[\frac{27.54}{300 \text{ lakh}} \times 6 \text{ lakh}\right]$	0.5508
Total income at end of October (for 306 units)	28.0908
Add: Income of November	41.31
Total income of Nov end on 306 lakh units before redemption	69.4008
Less: Dividend equalization paid $\left[\frac{69.4008}{306 \text{ lakh}} \times 3 \text{ lakh}\right]$	0.6804
Total income at end of Nov after redemption	68.7204
Add: Income of Dec	54.54
Income available for distribution	123.2604

Income distributed= 123.2604 × 70% = 86.2823 lakh

Income after distribution = 36.978

(ii) Issue price at end of October:

	₹
Opening NAV	22.50
Add: Entry load@2%	0.45
Add: Dividend Equalization collected per unit (27.54/300)	0.0918
	23.0418

(iii) Redemption price at end of November:

	₹
Opening NAV	22.50
Less: Exit load@2%	0.45
Add: Dividend Equalization collected per unit $\left[\frac{69.4008 \text{ lakh}}{306 \text{ lakh}}\right]$	0.2268
	22.2768

(iv) NAV at end of December:

To calculate NAV, we have to calculate Net assets of scheme (i.e., Total assets – outside liabilities)

	₹ in lakhs
Opening net assets (300 × 22.50)	6750
Add: Income received (Oct to Dec) [27.54+41.31+54.54]	123.39
Add: portfolio value approach	510.56
Add: Amount received on issue at Oct end (6 lakh units × 23.0418)	138.2508
Less: Amount paid on redemption at Nov end (3 lakh unit × 22.2768)	66.8304
Less: Income distributed at end of Dec (70% of 123.2604)	86.2823
Net assets at end of Dec	7369.0881

No. of units at end of Dec = [300 + 6 – 3] =303 lakhs

$$NAV = \left[\frac{7369.0881}{303}\right] = 24.3204$$

Note: As monthly appreciation of portfolio value is not given, we ignored it in dividend equalization.

Question-2 Solution:

Annual Interest = 1000 × 12% = 120

RV = ₹ 1000 + 5% = ₹ 1050

Duration of Bond :-

Year	Inflows	PVF @ 15%	PV	Year × PV
1	120	0.870	104.40	104.40
2	120	0.756	90.72	181.44
3	120	0.658	78.96	236.88
4	120	0.572	68.64	274.56
5	120+1050	0.497	581.49	2907.45
Total			924.21	3,704.73

(i) Market Price = Σ PV = ₹ 924.21

(ii) Bond Duration = $\frac{\Sigma(\text{Year} \times PV)}{\Sigma PV} = \frac{3,704.73}{924.21} = 4.009$

(iii) **Volatility of Bond:**

$= \frac{\text{Bond Duration}}{(1 + YTM)} = \frac{4.009}{(1+0.15)} = 3.486$ times

(iv) **Convexity of Bond**

Year	Year × PV (calculation above)	(Year × PV) × (1 + Year)
1	104.40	208.80
2	181.44	544.32
3	236.88	947.52
4	274.56	1372.80
5	2907.45	17,444.70
Σ	3704.73	20,518.14

$$\text{Bond convexity} = \frac{\Sigma(\text{year} \times PV) \times (1 + \text{year})}{(\Sigma PV) \times (1 + YTM)^2}$$

$$= \frac{20{,}518.14}{924.21 \times (1 + 0.15)^2}$$

$$= \frac{20{,}518.14}{1{,}222.268}$$

$$= 16.787$$

Alternatively, Convexity can be calculated as following (as per ICAI suggested):

Convexity of Bond:

$$C^* \times (\Delta y)^2 \times 100$$

where,

$$C^* = \frac{V_+ + V_- - 2V_0}{2V_0 (\Delta y)^2}$$

Δy = change in yield = 0.015

V_0 = Initial value of bond = ₹ 924.21

V_+ = price of bond if yield increases by Δy

V_- = price of bond if yield decreases by Δy.

Year	Cash flow	PV @ 13.5%	PV @ 16.5%
1	120	105.73	103.00
2	120	93.15	88.42
3	120	82.07	75.89
4	120	72.31	65.14
5	120 +1050	621.16	545.20
ΣPV		974.42 (V_-)	877.65 (V_+)

$$C^* = \frac{V_+ + V_- - 2V_0}{2V_0(\Delta y)^2}$$

$$= \frac{877.65 + 974.42 - (2 \times 924.21)}{2 \times 924.21 \times (0.015)^2}$$

$$= \frac{877.65 + 974.42 - 1848.42}{2 \times 924.21 \times 0.000225}$$

$$= \frac{3.65}{0.415895}$$

$$= 8.7763$$

Convexity $= C^* \times (\Delta y)^2 \times 100$

$= 8.7763 \times (0.015)^2 \times 100$

$= 0.1975\%$

(v) **Expected price of bond if YTM increase by 150 basis point:**

YTM increase = 1%

Expected Market price if YTM increased by 1.5%,

Increase in YTM = 1.5%

Decrease in Bond price (as per bond volatility) = 1.5% × 3.486

= 5.229% = 0.05229

Decrease in Bond price after adjustment of convexity

$$= 0.05229 + \left[(\Delta YTM)^2 \times \frac{\text{Convexity}}{2}\right]$$

$$= 0.05229 + \left[(0.015)^2 \times \frac{16.787}{2}\right]$$

$= 0.05229 + 0.00189$

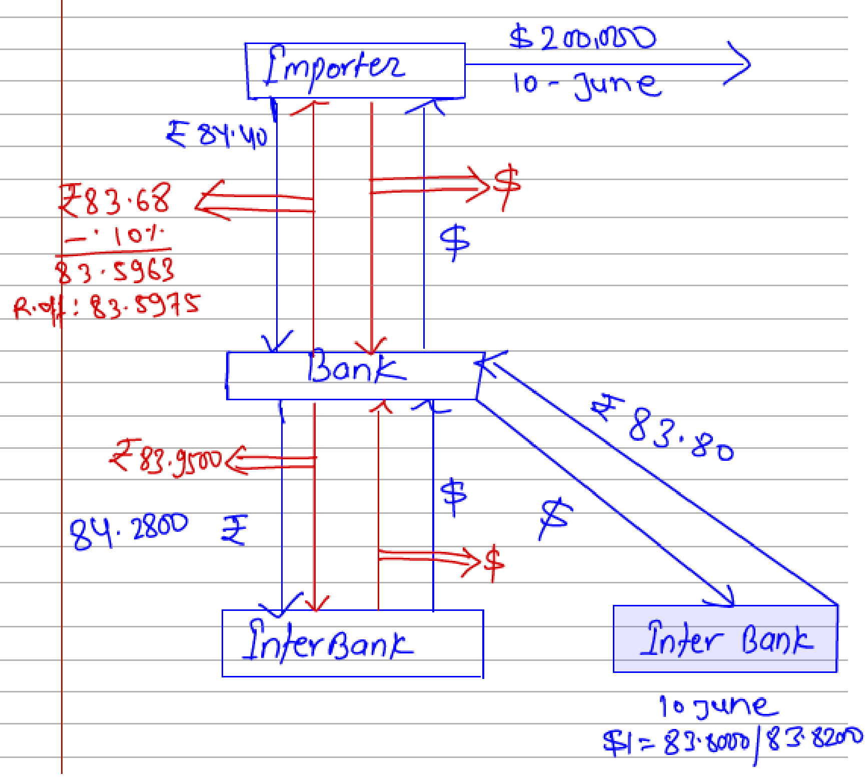
$= 0.0542 = 5.42\%$

New Bond price = 924.21 − 5.42%

= ₹ 874.12

Question -3 Solution:

Interpretation of question



(i) Cancelation Rate

SR on 13th June : $1 = ₹ 83.6800 (Bid rate
less margin @ .10%   - . 10%
                                 83.5963

Rounding off :- **83.5975**

(ii) Amount payable on $ 200,000

= ₹ 200,000 (84.4000 - 83.5975)

= ₹ 160500

(iii) Swap loss

= (83.9500 - 83.8000) X 200000

= ₹30000

(iv) Interest on outlay of fund

$= 200{,}000 (84.2800 - 83.8000) \times 12\% \times \frac{3}{365}$

$= 94.68$

(v) New contract cost

FR for Aug \$1 = ₹ 84.1800 / 84.2500

Ask rate is relevant in the given case.

∴ New Rate = ₹ 84.2500
+ margin + .10 %
84.3343

Rounding off Rate : ₹ 84.3350.

(vi) Total cost.

cancellation Loss	₹ 160500
swap loss	₹ 30000
Interest	94.68
	190594.68

QUESTION – 4 Solution:

(i) Variance of MFX = 5.760

Variance of MFY = 5.100

Variance of Market = 3.720

These values are already given in Matrix.
Covariance between same security is nothing but variance.
Covariance (X, X) = Variance of X

(ii) Portfolio return, Beta, Variance and SD:

- Portfolio of Mr. Abhishek is third alternative (i.e., 3,00,000 in X & 2,00,000 in Y)

(a) $R_{Portfolio} = R_X \times W_X + R_Y \times W_Y$

$= \left[20 \times \frac{300{,}000}{500{,}000}\right] + \left[18 \times \frac{200{,}000}{500{,}000}\right]$

= 19.20%

(b) $\beta_{Portfolio} = \beta_X \times W_X + \beta_Y \times W_Y$

Where,

$\beta_X = \frac{\text{Covariance (X,M)}}{\sigma^2_M} = \frac{4.050}{3.720} = 1.089$

$\beta_Y = \frac{3.360}{3.720} = 0.903$

$\beta_{Portfolio} = \left[1.089 \times \frac{300{,}000}{500{,}000}\right] + \left[0.903 \times \frac{200{,}000}{500{,}000}\right]$

= 1.0146

(c) $\sigma^2_{Portfolio} = (\sigma_X W_X)^2 + (\sigma_Y W_Y)^2 + 2W_X W_Y \text{Covariance}(X, Y)$

$= [5.76 \times (0.60)^2] + [5.1 \times (0.40)^2] + 2 \times .60 \times .40 \times 5.16 = 5.3664$

(d) SD of Portfolio $= \sqrt{5.3664} = 2.316\%$

(iii) Expected return, systematic risk, and Unsystematic risk:

(a) <u>Expected return (CAPM):</u>

ER (X) $= R_f + \beta_X (R_m - R_f)$

$= 10 + 1.089 \times (15 - 10) = 15.445$

ER (Y) $= 10 + 0.903 \times (15 - 10) = 14.515$

ER (Port) $= [\,ER(X)\,W_X] + [\,ER(Y)\,W_Y]$

$= (15.445 \times 0.60) + (14.515 \times 0.40) = 15.073\%$

(b) Systematic Risk:

Sys(X) $= \sigma^2_m \times \beta^2_X = 3.72 \times (1.089)^2 = 4.412$

Sys(Y) $= \sigma^2_m \times \beta^2_Y = 3.72 \times (0.903)^2 = 3.033$

Sys (Port) $= \sigma^2_m \times \beta^2_{Port} = 3.72 \times (1.0146)^2 = 3.829$

(c) Unsystematic Risk:

$\sigma^2_{e\,(X)} = \sigma^2_X - Sys(X) = 5.760 - 4.412 = 1.348$

$\sigma^2_{e\,(Y)} = \sigma^2_Y - Sys(Y) = 5.100 - 3.033 = 2.067$

$\sigma^2_{e\,(Port)} = (\sigma^2_{e\,(X)} W^2_X) + (\sigma^2_{e\,(Y)} W^2_Y)$

$= [1.348 \times (0.60)^2] + [2.067 \times (0.40)^2] = 0.816$

QUESTION – 5 Solution:

(i) Beta of Portfolio:

Security	Market Price	No. of shares	Market Value	weight	beta	Beta × weight
A	48.50	673	32640.50	0.1061	0.74	0.0785
K	332.68	480	159686.40	0.5197	1.28	0.6652
S	13.99	721	10086.79	0.0328	0.54	0.0177
P	292.82	358	104829.50	0.3414	0.46	0.1570
			307,243.25			0.9184

$\beta_{portfolio}$ 0.9184 Or, 0.92 (approx.)

(ii) Theoretical value of NIFTY Future:

Interest rate / cost of capital =16% p.a. compounded continuously.

Spot price of NIFTY = 9820

Future price $= SP \times e^{rt}$

$= 9380 \times e^{0.16\times7/12}$

$= 9380 \times e^{0.093}$

$= 9380 \times 1.0975 = 10{,}294.55$

(iii) Value of 1 contract = Actual future price for October x contract size
= 9820 × 25 = 2,45,500

Value of future contract to be sold for complete hedge
= value of portfolio × $\beta_{portfolio}$
= 307,243.25 × 0.92 = 2,82,663.79

No. of contract = $\frac{2,82,663.79}{2,45,500}$ = 1.15 contract

(Either 1 or 2 contracts)

Question No. 6 Solution:

Annual interest = 1000 × 9% = ₹ 90

Interest net of tax = 90 – (90 × 0.30) = 63

Issue Price = 1000 – 10% Discount = ₹900

Redeemable value = 1000 +5% premium = ₹1050

Capital gain = 1050 – 900 = 150

Tax on CG = 150 × 10% = 15

Redeemable value net of capital gain tax = 1050 – 15 = 1035

0Y	1	2	3	4	5y
(900	63	63	63	63	63 + 1035

Approx. post-tax YTM (i.e., Avg return) $= \frac{63 + \left(\frac{1035 - 900}{5}\right)}{\left(\frac{1035 + 900}{2}\right)} \times 100$

= 9.30%

Accurate YTM should be slightly higher than 9.30%.

Assume, Discount rate = 9.50% (Do roughly calculation on calculator)

PV of inflows = 63 × PVIFA (9.5%, 5) + 1035 × PVIF (9.5%, 5)
= (63 × 3.840) + (1035 × 0.635) = 899.1 (i.e., 900)
(Equal to initial investment)

Hence, post-tax YTM = 9.50%