FINAL EXAMINATION

GROUP III

(SYLLABUS 2012)

SUGGESTED ANSWERS TO QUESTIONS

DECEMBER 2015

Paper- 14 : ADVANCED FINANCIAL MANAGEMENT

Time Allowed : 3 Hours **Full Marks : 100**

The figures in the margin on the right side indicate full marks.
All workings must form part of your answer.
Wherever necessary, suitable assumptions may be made and
Clearly stated in the answer.

No present value table or other statistical table will be provided in addition to this question paper.

Candidates may use relevant information given at the end of the question paper for computation of answers.

This paper contains five questions. All questions are compulsory, subject to instruction provided against each question.

1. All sub-divisions are compulsory: **2×10 = 20**

(a) List two direct instruments and two indirect instruments used by RBI in the implementation of its monetary policy.

(b) Differentiate between open-end and closed-end mutual funds.

(c) Given that the strike price is ₹240, the current stock price is ₹225, and risk-free interest rate is 5% p. a., calculate the theoretical minimum price of a put option after 6 months. Which action is advantageous?

(d) An investor holds two equity shares A and B in equal proportion with the following risk and return:

$E(R_A) = 26\%$

$\sigma_A = 20\%$

$E(R_B) = 22\%$

$\sigma_B = 24\%$

The returns of these securities have a positive correlation of 0.7. Calculate the portfolio return and risk.

(e) The following information is provided:

	Investment	
	X	Y
Principal ₹	20 lacs	20 lacs
Rate of yield p.a.	12%	12%
Tenor (years)	3	3
Compounding	monthly	continuous
Compounding charges payable at the end of the period	Nil	₹ m per lac

For what minimum value of 'm' will an investor prefer X to Y?

(f) A project has an equity beta of 1.2 and is to be financed by 30% debt and 70% equity. Assume debt beta as zero, risk-free rate of return as 12% and return on market portfolio as 20%. Calculate the project beta and the return from the project.

(g) What is marginal cost of capital? When will this be equal to the average cost of capital?

(h) Securities A and B have a standard deviation of 10% and 15% respectively. The respective average returns are 12% and 20%.

Investor X has limited funds. He wants to compare A and B and choose the safer security. Advise X.

(i) The foreign exchange market prices for US dollar ($) against Indian rupees (₹) are quoted as under:

	Buying	Selling
Spot	65.30	65.50
Three months' forward	66.35	67.20

Calculate the cost of the forward cover.

(j) S invested in a mutual fund when the NAV was ₹13.50 per unit. 90 days later, the NAV was ₹12.45 per unit. During the period S got a cash dividend of ₹1.25 per unit and capital gain distribution of ₹ 0.25. Calculate the annualized return.

Answer:

1.

(a)

Direct Instruments	Indirect Instruments
Cash Reserve Ratio (CRR)	Liquidity Adjustment Facility (LAF)
Statutory Liquidity Ratio (SLR)	Repo/Reverse Repo Rate
Refinance Facilities	Open Market Operation
	Marginal Standing Facility (MSF)
	Bank Rate
	Market Stabilisation Scheme (MSS)

(b)

Aspect	Open End Funds	Closed End Funds
(i) Initial Subscription	Available throughout the year.	Fund is open only for specified period.
(ii) Maturity	No fund maturity.	Stipulated maturity period (3 to 15 Years)
(iii) Subsequent Transactions	Investors can buy and sell units at NAV related prices.	Investors can invest at the time of initial public issue and thereafter trade units in the listed stock exchanges.
(iv) Repurchase	Repurchase at any time is available.	Can be repurchased periodical as per terms of the find at NAV related price.

(c)

Exercise Price ₹ 240

Current Stock Price ₹ 225

Risk free rate of return 5% of 0.05

Time in year (t) 6/12 : 0.5

Theoretical Minimum Price

= Present Value of Exercise Price – Current Stock Price.

= $240 \times e^{-rt} - 225$

$(240 \div 1.02532) - 225 = 234.07 - 225 = 9.07$

(d) **Computation of Expected Return:**

$E(R_P)$ = Proportion of A × $E(R_A)$ + Proportion of B × $E(R_B)$

= 26(.5) + 22(.5) = 13 + 11 = 24%

Computation of Portfolio Risk

$$\sigma_p = \sqrt{\left(\sigma_A^2 \times W_A^2\right) + \left(\sigma_B^2 \times W_B^2\right) + 2\left(\sigma_A \times W_A \times \sigma_B \times W_B \times \rho_{AB}\right)}$$

$$= \sqrt{\left(20^2 \times 0.50^2\right) + \left(24^2 \times 0.50^2\right) + \left(2 \times 20 \times 0.50 \times 24 \times 0.50 \times 0.70\right)}$$

$$= \sqrt{100 + 144 + 168} = \sqrt{412} = 20.30\%$$

(e) $20,00,000 \left(1 + \frac{0.12}{12}\right)^{36} > 20,00,000 \times e^{0.36} - 20m$

20,00,000 [1.43076878 – 1.4333294] > – 20m

20,00,000 [– 0.00256062] > – 20m

or m > ₹ 256.06 per lac

If the continuous compounding facility exceeds ₹ 256.00 per lac, the investor will prefer monthly compounding.

(f) Equity Beta of the Project (β*equity*) = 1.2

Risk free rate of Return (R_f) = 12%

Return on market portfolio R_M = 20%

Debt – Equity Mix = 30 : 70

$$\beta_p\left[\beta equity \times \frac{E}{D+E}\right]+\left[\beta debt \times \frac{D}{D+E}\right] = (1.2\times0.7) + (0\times0.3) = 0.84$$

Return from Project =

$$R_f + \beta_p\left(R_m - R_f\right) = 1.2 + 0.84\left(0.20 - 0.12\right) = 0.1872 \text{ or } 18.72\%$$

(g) Marginal Cost of Capital (MCC) is the cost of raising an additional rupee of capital.

When fresh capital is raised in the same proportion as the current funds with the same cost component, the marginal cost of capital will be equal to the average cost of capital.

(h) **Coefficient of variation:**

A	**B**
$\frac{10}{12} = 0.83$	$\frac{15}{20} = 0.75$

X should choose B since it has lower risk per unit of return.

(i) When customer is buying dollar under three month forward cover.

$$\frac{1.05}{66.35} \times \frac{12}{3} \times 100 = 6.33\%$$

When customer is selling dollar under three month forward cover:

$$\frac{1.70}{67.20} \times \frac{12}{3} \times 100 = 10.12\%$$

Cost of forward cover will be:

$$\frac{6.33\% + 10.12\%}{2} = 8.22\%$$

(j) Returns = 1.25 + 0.25 – 1.05

= 0.45

Return ÷ Opening NAV = $\frac{0.45}{13.50} = 0.033 = 3.33\%$

Annualised return = $\frac{3.33 \times 365}{90} = 13.51\%$ p.a.

2. Answer *any three* sub-divisions from (a) to (d): 8 × 3= 24

(a) A mutual fund made an issue of 800000 units of ₹10 each on 01.04.2014. No entry load was charged. It made the following investments after meeting its issue expenses.

	₹
40,000 Equity Shares of ₹100 @ ₹160	**64,00,000**
At par:	
8% Government Securities	**6,40,000**
9% Debentures (unlisted)	**4,00,000**
10% Debentures (listed)	**4,00,000**
	78,40,000

During the year, dividend of ₹9,60,000 was received on equity shares. Interest on all types of debt securities was received as and when due. At the end of the year on 31.03.2015, equity shares and 10% debentures were quoted at 175% and 90% of the respective par value. Other investments were at par. The operating expenses during the year amounted to ₹4,00,000.

(i) Find out the Net Assets Value (NAV) per unit at the end of the year.

(ii) Find out the NAV if the Mutual Fund had distributed a dividend of ₹0.90 per unit during the year to the unit holders. 8

Answer:

2. (a) Computation of closing net asset value

Given the total initial investment ₹ 78,40,000 out of issue proceeds of ₹ 80,00,000 therefore balance of ₹ 1,60,000 is considered as issue expenses.

Particulars	Opening value of investment	Capital Appreciation	Closing value of investment	Income
40000 Equity of ₹100 each at ₹ 160	64,00,000	6,00,000	70,00,000	9,60,000
8% Government securities	6,40,000	Nil	6,40,000	51,200
9% Debentures (Unlisted)	4,00,000	Nil	4,00,000	36,000
10% Debentures (Listed)	4,00,000	- 40,000	3,60,000	40,000
Total	78,40,000	5,60,000	84,00,000	10,87,200

Total Income	=	₹ 10,87,200
Less: Opening Expenses during the period	=	₹ 4,00,000
Net Income		₹ 6,87,200
Net Fund Balance 84,00,000 + 6,87,200	=	₹ 90,87,200
Less: Dividend = 7,20,000 (8,00,000 × 0.90)	=	₹ 7,20,000
Net Fund balance (after dividend)	=	₹ 83,67,200
Net Asset Value (before considering dividend)	=	₹ 90,87,200
Net Asset Value(before considering dividend) [₹90,87,200 ÷ 800000]	=	₹ 11.36
Net Asset Value (After dividend) [₹ 83,67,200 ÷ 800000]	=	₹ 10.46

Note: Closing market price of the investment have been quoted at a percentage of the face value (Assumption)

(b) (I) The data pertaining to 5 mutual funds is given below:

Fund	Return	Standard deviation (σ)	Beta (β)
J	13	6	1.50
K	9	2	0.90
L	11	3	1.20
M	15	5	0.80
N	12	4	1.10

Compute the reward- to- variability/volatility ratios and rank the funds, if the risk-free rate is 6%. 5

(II) What is the principal business of the following entities? 3

(i) Asset Financial Company (AFC)

(ii) Investment Company (IC)

(iii) Infrastructure Debt Fund – NBFC (IDF – NBFC)

Answer:

2. (b) (I) For computing reward to variability/volatility ratio is

- Sharpe's Ratio = $\left[\left(R_P - R_F\right) \div \sigma_P\right]$
- Treynor's Ratio = $\left[\left(R_P - R_F\right) \div \beta_P\right]$

Ranking based on Sharpe's Ratio and Treynor Ratio method.

Fund	Under sharpe's mothod $\left[\left(R_P - R_F\right) \div \sigma_P\right]$	Ranking	Under Treynor method $\left[\left(R_P - R_F\right) \div \beta_P\right]$	
J	[(13 – 6) ÷ 6] = 1.17	4	[(13 – 6) ÷ 1.50] = 4.67	3
K	[(9 – 6) ÷ 2] = 1.50	3	[(9 – 6) ÷ 0.90] = 3.33	5
L	[(11 – 6) ÷ 3] = 1.67	2	[(11 – 6) ÷ 1.20] = 4.17	4
M	[(15 – 6) ÷ 5] = 1.80	1	[(15 – 6) ÷ 0.80] = 11.25	1
N	[(12 – 6) ÷ 4] = 1.50	3	[(12 – 6) ÷ 1.10] = 5.45	2

(II)

Company	Principal Business
(i) AFC	Financing of physical assets supporting productive/economic activity.
(ii) IC	Acquisition of securities
(iii) IDF-NBFC	Raising of long term debt to finance infrastructure projects

(c) The current price (in Dec 2015) of sugar is ₹40 per kg. Sugar Mill SM expects to produce 200 MT of sugar in February 2016. February futures contract due on 20th February is trading at ₹ 45 per kg. SM wants to hedge itself against a price decline to below ₹45 kg in February. 100% cover is required and each contract is for 10 MT.

(i) Explain SM's appropriate hedging measure showing cash flows for full value if the price falls to ₹42 per kg in February 2016.

(ii) What is the position of SM in the futures and in the spot market? (6+2) =8

(1 MT = 1000 kg.)

Answer:

2. (c) Quantity to be hedged = $\frac{200\ MT}{10}$ = 20 futures

Hedging Strategy:

Sell 20 futures in Dec 15 : 20×10×45×1000	₹90,00,000
Buy futures in Feb 16 : 20×10×42×1000	₹84,00,000
Gain in Future Market (A)	₹6,00,000
Price in Spot Market : 20×10×42×1000 (B)	₹84,00,000
Effective price realized [A+B]	₹90,00,000

SM's position in futures market is short and since SM holds the underlying asset, it is long in the spot market.

(d) Explain four measures taken by the Central Government in the field of infrastructure financing. 8

Answer:

2. (d) Measures taken by the central govt. in the field of infrastructure financing:

(i) **Public-Private partnership projects (PPP projects).** Private sector is allowed to invest in infrastructure projects. PPP mechanism provides for built-in credit enhancement, buy back guarantee, escrow arrangements, and substitution rights for lenders.

Documents and process for award of PPP projects have been standardized resulting in greater transparency.

(ii) **Setting up of committees to simplify procedures.** Many committees have been set up to facilitate private funding.

Committee on Infrastructure, Cabinet Committee on Infrastructure, PPP Appraisal Committee and Empowered Committee are some of them.

(iii) **Viability gap funding.**

Upto 20% of capital costs is funded by the Govt. for commercially unviable projects. The level of grant is the NPV of the gap between project cost and estimated revenue based on the pre-determined fee over the concession period.

(iv) **Foreign Direct Investment (FDI):**

100% financing through automatic route is allowed in certain sectors. (eg. construction projects, civil aviation).

Government approval route with limits in certain sectors (eg. airports, telecom, etc) is also permitted.

(v) **Setting up of India Infrastructure Finance Company Ltd (IIFCL):**

Long term loans are provided directly to projects or refinanced to banks and other financial institutions.
Upto 20% of project cost is funded of cheaper rates. Relaxation of the take-out timings has also been made.

(vi) **Setting up of Infrastructure Debt Funds (IDF):**

Long term funding through Mutual Funds or NBFCs is being provided.
Overseas inflow of funds through these is being promoted by a lower withholding tax rate.

(vii) **Tapping retail investor base through Infrastructure Bonds:**

IFCI, IDFC, LIC, etc have been permitted to issue infrastructure bonds with benefits of tax exemption upto ₹ 20,000 NHAI, Railway Finance Corpn. And HIDCO have been raising funds.

(viii) **Major steps taken by the Reserve Bank:** The Reserve Bank has initiated a number of regulatory measures/concessions for facilitating increased flow of credit to infrastructure projects.

(ix) **Introduction of Credit Default Swaps:** The introduction of Credit Default Swaps (CDS) would help banks to manage exposures while increasing credit penetration, and lending to infrastructure and large firms without being constrained by the extant regulatory.

(x) **Securitisation** is to facilitate healthy securitisation of loans, the Reserve Bank issued guidelines on Securitisation of Standard Assets which are applicable to all categories of loans including infrastructure loans. The circular contained various guidelines on true sale criteria, credit enhancement, Policy on provision of credit enhancement facilities, provision of liquidity facilities, provision of underwriting facilities, provision of services, prudential norms for investment in securities issued by SPVs, accounting treatment of the securitisation transactions, disclosures to be made, among others. It is expected that introduction of these norms would result in development of an orderly and healthy securitisation market.

(xi) **Corporate Bond Market** Reserve Bank has issued guidelines on repo in corporate bonds to make the market more active. Entities regulated by Reserve Bank of India are reporting corporate trades on FIMMDA developed platform, enabling greater transparency and thereby facilitating better price discovery. To ensure smooth settlement in the secondary market, RBI has permitted clearing houses of the exchanges. Primary dealers have been permitted higher exposure limits for corporates to enable better market making. Other measures, including permitting banks to classify investments in non-SLR bonds issued by companies engaged in infrastructure activities and having a minimum residual maturity of seven years and investment in non-SLR debt securities are there.

(xii) **Liberalisation & Rationalization of ECB policies** Corporates implementing infrastructure projects were eligible to avail of ECB up to USD 500 million in a financial year under the automatic route. This limit has been raised to USD 750 million. Infrastructure Finance Companies (IFCs) i.e., Non Banking Financial Companies (NBFCs) categorized as IFCs by the Reserve Bank, are permitted to avail of ECBs, including the outstanding ECBs, up to 50 per cent of their owned funds, for on-lending to the infrastructure sector as defined under the ECB policy, subject to their complying with

certain conditions. The Reserve Bank has further liberalized the ECB policy relating to the infrastructure sector in September 2011. Under this dispensation, the direct foreign equity holder (holding minimum 25 per cent of the paid-up capital) and indirect foreign equity holder holding at least 51 per cent of the paid-up capital will be permitted to provide credit enhancement for the domestic debt raised by Indian companies engaged exclusively in the development of infrastructure and infrastructure finance companies without prior approval from the Reserve Bank. Further, the existing ECB policy has been reviewed to allow Indian companies to import capital goods by availing of short-term.

(xiii) **Making the Infrastructure Project Commercially viable** is the first and foremost thing we should do for financing infrastructure in a sustainable manner. As mentioned earlier infrastructure projects involve huge financing requirements, most of which are met by banks and other financial institutions directly and indirectly. Thus, it is very important to make the project commercially viable to ensure regular servicing of the loan.

(xiv) **Greater Participation of State Governments** in a federal country like India, participation and support of the State governments is essential for developing high quality infrastructure. The State governments' support in maintenance of law and order, land acquisition, rehabilitation and settlement of displaced persons, shifting of utilities, and obtaining environmental clearances are necessary for the projects undertaken by the Central Government or the private sector.

(xv) **Improving efficiency of the Corporate Bond Market**

As has been noted, vibrant corporate bond market will reduce the dependence on the banking sector for funds. Further, coordinated regulatory initiatives could be considered in the areas involving standardization of stamp duties on corporate bonds across the states, encouraging public issuance and bringing in institutional investors in a big way.

(xvi) **Credit Enhancement** one of the major obstacles in attracting foreign debt capital for infrastructure is the sovereign credit rating ceiling. Domestic investors are also inhibited due to high level of credit risk perception, particularly in the absence of sound bankruptcy framework. A credit enhancement mechanism can possibly bridge the rating cap between the investment norms, risk perceptions and actual ratings.

(xvii) **Simplification of Procedures- Enabling Single Window Clearance**

It is well recognized that while funding is the major problem for infrastructure financing, there are other issues which aggravate the problems of raising funds. These include legal disputes regarding land acquisition, delay in getting other clearances and linkages among others. It is felt that in respect of mega-projects, beyond certain cut-off point, single window clearance approach could cut down the implementation period. **[Write any four points]**

3. Answer *any two* sub-divisions from (a) to (c): 10 × 2= 20

(a) Compute the theoretical price of the following securities for 6 months:

Securities of	A Ltd	B Ltd.	C Ltd.
Spot Price	₹5,450	₹450	₹1,050
Dividend Expected	₹60	₹25	₹60
Dividend Receivable in	2 months	3 months	4 months
6 month's futures contract rate	₹5,510	₹490	₹1,070

You may assume a risk-free interest rate of 9% p. a.

(i) What action do you recommend to benefit from futures contract?

(ii) What will be the impact on the theoretical forward prices if the risk-free interest rate is taken lower than 9%? 8+2=10

Answer:

3. (a)

Securities of	A Ltd.	BLtd.	CLtd.
Spot Price (S_x)	₹ 5450	₹ 450	₹ 1050
Dividend Expected (D_F)	₹ 60	₹ 25	₹ 60
Dividend Receivable in (t)	2 months or 0.1667	3 months or 0.25	4 months or 0.333
Risk free interest rate (r)	9% or 0.09	9% or 0.09	9% or 0.09
Present value of Dividend (D_P)	DF×e^{-rt} or DF ÷ e^{rt} ₹ 60 ÷ $e^{0.09\times0.1667}$ = ₹ 60 + $e^{0.015}$ = 60 ÷ 1.01511 = ₹ 59.107	DF×e^{-rt} or DF ÷ e^{rt} ₹ 25 ÷ $e^{0.09\times0.25}$ = ₹ 25 + $e^{0.0225}$ = 25 ÷ 1.022755 = ₹ 24.444	DF×e^{-rt} or DF ÷ e^{rt} ₹ 60 ÷ $e^{0.09\times0.333}$ = ₹ 60 + $e^{0.03}$ = 60 ÷ 1.030455 = ₹ 58.227
Adjusted Spot price = S_X - D_P	5450 – 59.107 = ₹ 5390.893	₹ 450 – ₹ 24.444 = ₹ 425.556	₹ 1050 – ₹ 58.227 = ₹ 991.773
Theoretical Forward Price (TFP_X)	5390.893×$e^{0.09\times0.50}$ 5390.893×$e^{0.045}$ 5390.893×1.04603 = ₹ 5639.036	425.556×$e^{0.09\times0.50}$ 425.556×$e^{0.045}$ 425.556×1.04603 = ₹ 445.144	991.773×$e^{0.09\times0.50}$ 991.773×$e^{0.045}$ 991.773×1.04603 = ₹ 1037.424
6 months futures contract Rate (AFP_X)	₹ 5510	₹ 490	₹ 1070
TFP_xVs.AFP_x	*AFP_x is lower*	*AFP_x is higher*	*AFP_x is higher*
Valuation in futures market	Under valued	Overvalued	Overvalued
Recommended Action	Sale Spot, buy future	Buy spot, sell future	Buy spot, sell futur

A lower risk-free rate would mean a lower theoretical forward price and a lower adjusted spot price.

(b) Nihar, a foreign exchange dealer, is actively engaged in simultaneously buying and selling same foreign currencies to make guaranteed profit.
The rates prevailing in the market are as follows:

Spot rate : ₹65.80/$
3 months forward rate : ₹66.40/$
3 months interest rates : ₹ : 7% p. a.
$: 11% p. a.

Discuss the possibility of a net gain in arbitrage if Nihar's borrowing potential is limited to ₹100 million. 10

Answer:

3. (b) 3 month forward rate of dollar is higher (at ₹ 66.40) than the spot rate (₹ 65.80). It implies that the dollar is at premium.

Premium (%) $= \frac{₹66.40 - ₹65.80}{65.80} \times \frac{12}{3} \times 100 = 3.647$ or 3.65% P.a

Interest rate differential = 11% – 7% = 4% p.a.

Since the interest rate differential (4%) and premium (3.65%) do not match, there are arbitrage gain possibilities. An arbitrageur (Nihar) can take the following steps in this regard:

(i) Nihar (arbitrageur) borrows, say ₹ 100 million at 7% for 3 months (as ₹ carries lower interest rate)

(ii) He then converts ₹ 100 mollion in US $ at the spot rate of ₹ 65.80 in the spot market. He gets an amount of US $ 1519757 (i.e. 100,000,000/65.80 = 1519756.839 or 1519757)

(iii) He invests US $ 1519757 in the US money market at 11% interest p.a. for 3 months and he obtains interest of US $ 41793 ($ $1519757 \times \frac{3}{12} \times \frac{11}{100}$)

(iv) Total sum available with arbitrageur, 3 months from now is (US $1519757 + $41793) = US $1561550.

(v) Since he would get US $1561550 after 3 months, he sells forward US $ 1561550 at the rate of ₹ 66.40.

(vi) As a result of forward deal, at the end of 3 months from now, he would get ₹ 103686920, i.e. ($ 1561550 x 66.40)

(vii) He refunds ₹ 100 million borrowed, along with interest due on it. The refunded sum is ₹ 100,000000 + ₹ 1750,000 i.e. (₹ $100,000,000 \times \frac{3}{12} \times \frac{7}{100}$) ₹ 101750000.

(viii) Net gain is ₹ 103686920 – 101750000 = ₹ 1936920

(c) (I) A portfolio Manager owns three stocks.

Stock	Shares owned	Stock price	Beta
1	40,000	₹300	1.1
2	80,000	₹200	1.2
3	1,20,000	₹80	1.3

The spot Nifty Index is at 1,400 and futures price is 1,420; the index factor is 100.

Use stock index futures to:

(i) decrease the portfolio beta to 0.8 and
(ii) increase the portfolio beta to 1.5
(iii) Find out the number of contracts of stock index futures to be bought or sold. 6

(II) State any four assumptions of the Black & Schools Model of option valuation. 4

Answer:

3. (c) (I) Computation of Existing portfolio Beta

Security	Market value of security	Proportion	Beta of the security	Weighted beta
1	₹ 300 × 40,000 = 120 Lakhs	$\frac{120}{376}$	1.1	0.35
2	₹ 200 × 80,000 = 160 Lakhs	$\frac{160}{376}$	1.2	0.51
3	₹ 80 × 1,20,000 = 96 Lakhs	$\frac{96}{376}$	1.3	0.33
	376			**1.19**

Value per futures contract

= Index price per unit × lot size per futures contract.

₹ 1,400 × 100 = ₹ 1,40,000

I Activity to reduce portfolio Beta to 0.8

Objective – Reduce portfolio Beta

Activity – Sell Index Futures.

Beta of Existing Portfolio = $\beta_1 = 1.19$

Desired Beta of the New Portfolio - $\beta_N = 0.8$

Contract size = 100 units.

Value per futures contract in NIFTY V_F = ₹ 1,400 × 100 = ₹ 1,40,000

Value of portfolio = V_P = ₹ 376 Lakhs.

No. of futures contract to be sold

$$= \text{Portfolio Value} \times \frac{\text{Beta of Portfolio} - \text{Desired Value of Beta}}{\text{Value of a futures contract in NIFTY}} \text{ Or } V_P \times \frac{\beta_1 - \beta_N}{V_F}$$

$$= ₹\,376 \text{ Lakhs} \times \frac{(1.19 - 0.8)}{₹1,40,000} = 104.7 \text{ or } 105 \text{ Contracts}$$

II Activity to increase the portfolio Beta to 1.5

Object – Increase portfolio Beta

Activity – Buy Index Futures.

No. of futures contract to be bought

$$= \text{Portfolio Value} \times \frac{\text{Desired value of beta - Beta of portfolio}}{\text{Value of a Futures Contract}}$$

$$= V_P = \frac{\beta_N - \beta_1}{V_F} = \frac{₹376\text{Lakhs} \times (1.50 - 1.19)}{₹1,40,000} = 83 \text{ Contracts}$$

(II) Assumptions of the Black and Scholes Model of option valuation:

- Rates of return on a share/stock are log normally distributed.
- Value of the share and risk free rate are contract during the life of the option.
- Market is efficient and there is no transaction cost and taxes.
- No dividends are paid on the share during the life of the option.
- No restrictions or penalties for short selling.
- Option can be exercised only on the Expiry Date. (i.e. options are all European options).

4. Answer any two sub-divisions from (a) to (c): 8×2 = 16

(a) (I) The following information is given:

Investment	Initial Price (₹)	Dividend (₹)	Market Price at the end of the year (₹)	Beta risk factor
(I) In Equity Shares:				
J Ltd.	**60**	**4**	**120**	**0.8**
K Ltd.	**70**	**6**	**130**	**0.7**
M Ltd.	**70**	**6**	**200**	**0.5**
(II) Govt. of India Bonds	**2,000**	**300**	**2,040**	**0.9**

Risk – free return = 16%

Compute the expected return under the Capital Asset Pricing Model (CAPM) and the average return of portfolio, assuming a weightage of the proportion of initial price, considering one unit of each security in the portfolio. 5

(II) When we compare the return under CAPM with the estimated return, different situations arise. State the inference and corresponding recommended action for each of the situations. 3

Answer:

4. (a)

I Computation of expected return and average return:

Securities	Cost	Dividend	Capital Gain	Expected Return
J Ltd.	60	4	60	[16 + 0.80 x (27.55-16) = 25.24%
K Ltd.	70	6	60	[16 + 0.70 x (27.55 -16) = 24.09%
M Ltd.	70	6	130	[16 +0.50x (27.55-16) = 21.78%
Govt. of India Bond	2000	300	40	[16 + 0.90 x (27.55 -16) = 26.40%
Total	2200	316	290	

Return on Market Portfolio (R_m)

Dividend + Capital Gain ÷ Cost of Investment

$\frac{316+290}{2200} \times 100 = 27.55\%$

In the absence of return of a market portfolio, it is assumed that portfolio containing one units of the four securities listed above would result in a completely diversified portfolio and therefore represent the market portfolio. Portfolio's expected return based on CAPM.

If the portfolio contains one unit of above securities, then

Securities	Cost	Proportion	Expected Return	Weighted Return
J Ltd.	60	0.026	25.24%	0.656%
K Ltd.	70	0.032	24.09%	0.771%
M Ltd.	70	0.032	21.78%	0.697%
Govt. Bond	2000	0.910	26.40%	24%
	2200			**26.124%**

Expected Return from portfolio = 26.12% (based on CAPM)

II

Situation	Inference	Action
CAPM Return < Estimated Return (CR < ER)	Undervalued Security	Buy
CR = ER	Correctly valued	Hold
CR > ER	Overvalued	Sell

(b) (I) The following independent situations are given. Identify the type of risk and state whether it is systematic or unsystematic risk.

(i) Company A was earning high revenues due to significant market share in a particular variety of sweets. In the recent past, the market share has considerably reduced due to competition, resulting in drop in revenues and profits.

(ii) Announcement of a change in government triggered an immediate crash in the prices of securities. 2 ×2=4

(II) Explain the concept of 'Beta of security'. 4

Answer:

4. (b) I

(i) Business Risk : Unsystematic Risk

(ii) Market Risk : Systematic Risk

II Beta of a Security (β)

β measures non diversifiable risk.

β of a security measures the sensitivity of the security with reference to a broad based market index like BSE Sensex, NIFTY.

β measures systematic risk, which affects the market as a whole and hence cannot be eliminated through diversification.

β is a factor of

'σ' Std deviation (risk) of the security or portfolio

'σ' of the market and correlation between security and market.

β_S (Beta of Security) = $\frac{\sigma_S}{\sigma_M} \times \rho_{SM}$

β is the expected movement of the return of a security per unit of movement in market portfolio return.

β < 1 Security is less risky than market portfolio.

β = 1 Security is equally risky as market portfolio.

β > 1 Security is riskier than market portfolio.

(c) M Ltd. and Q Ltd. are in the same industry and risk class. They pay taxes at 35% and have steady earnings. The following information is given:

	M Ltd. ₹ (Crores)	Q Ltd. ₹(Crores)
Capital Employed (₹)	**1,200**	**800**
Share Capital	**680**	**480**
Reserve and surplus	**520**	**240**
9% Debt	**—**	**400**
Market value of shares	**2,800**	**1,480**
Market value of Debentures	**—**	**200**
Profit After Tax	**378**	**316.8**

Equity Beta of M Ltd. is 1.2

(i) Calculate cost of equity of Q Ltd.

(ii) Calculate Beta of Equity of Q Ltd. (Assume zero beta for debt). 3+5 =8

Answer:

4. (c) (i) Cost of equity of Q Ltd. (K_e) = $\frac{\text{Equity Earning}}{\text{Market value of Equity}} \times 100$

= $\frac{₹316.8 \text{ Crore}}{1480 \text{ Crores}} \times 100$ = 21.4%

(ii) Beta value of equity of Q Ltd.

Beta of Q Ltd. = Beta of its assets.

Since M Ltd. and Q Ltd. are in the same industry and in the same risk class. Beta of Q Ltd. = Beta of M Ltd.

Since M Ltd. is an all equity company, Beta of M Ltd. = Beta of Equity share of M Ltd. = 1.2

Therefore, Beta of Assets of Q = 1.20, Beta of Debenture = 0

$$\beta = \frac{\beta\text{equity} \times \text{Equity}}{\text{Equity} + \text{Debenture}(1-\text{Tax})} + \frac{\beta\text{Debenture} \times \text{Debentures}(1-\text{Tax})}{\text{Equity} + \text{Debenture}(1-\text{Tax})}$$

$\Rightarrow$ = 1.2 = β_E ×1480 ÷ [1480+200 × (1–35%) + 0]

$\Rightarrow$ = 1.2 = β_E ×1480 ÷ [1480+200 × 65%]

$\Rightarrow$ = 1.2 = β_E ×1480 ÷ [1480+130]

$\Rightarrow$ = 1.2 = β_E ×1480 ÷ 1610

$\Rightarrow$ = 1.2 = β_E × 0.919

$\beta_E = \frac{1.20}{0.919} = 1.306$

5. Answer any two sub-divisions from (a) to (c): 10×2=20

(a) A company is considering which of two mutually exclusive projects it should undertake. The Finance Director thinks that the project with the higher Net Present Value (NPV) should be chosen whereas the Managing Director thinks that the one with the higher Internal Rate of Return (IRR) should be undertaken especially as both projects have the same initial outlay and length of life. The company anticipates cost of capital of 10% and the net after tax cash flows of the projects are as follows:

Year end	0	1	2	3	4	5
Cash flows (000) Project X	(200)	35	80	90	75	20
Project Y	(200)	218	10	10	4	3

(i) Calculate the NPV of each project 4

(ii) Which project do you think will have a higher internal rate of return (IRR)? Why? 2

(iii) Under what circumstances will NPV and IRR give different ranking of projects? Why? 2

(iv) Which project would you recommend? Why? 2

Answer:

5. (a) (i) Calculation of the NPV

Project X

Years	Cash Flows	Discount Factor @10%	Discounted values
0	(200)	1.00	(200)
1	35	0.91	31.85
2	80	0.83	66.40
3	90	0.75	67.50
4	75	0.68	51.00
5	20	0.62	12.40
NPV			**+29.15**

Project Y

Years	Cash Flows	Discount Factor @10%	Discounted values
0	(200)	1.00	(200)
1	218	0.91	198.38
2	10	0.83	8.30
3	10	0.75	7.50
4	4	0.68	2.72
5	3	0.62	1.86
NPV			**+18.76**

(ii) Project Y will have a higher IRR since Y has very high initial cash inflow.

Project Y has a payback of less than 2 years. Whereas project X has smaller cash flows which are never in bulk. Hence Y will have a much higher IRR.

IRR assumes that cash flows are reinvested at IRR rates. Whereas NPV assumes investment only at the discount rate.

(iii) IRR and NPV can give different ranking if, projects compared have uneven cash inflows – the one with higher initial inflows has a higher IRR. When there are initial as well as intervening cash outlays (for eg. heavy repairs, etc), so that in the intervening period within the life of the project net cash flows are negative and positives we have a multiple IRR situation. Whereas the NPV is unique.

(iv) Project X can be recommended if the project has to run through completion and must exist for 5 years, since the net wealth added is higher.

Project Y can recommended if there is any other investment opportunity for the cash flows generated in the 1st year such that total NPV during the full 5 years is higher than project X.

(b) Lotus Finance Ltd. is engaged in leasing business. The company wants your advice to structure the lease of a machine costing ₹30 lacs. The machine will have no salvage value. The life of the machine and the lease period will be 5 years and it has to be fully depreciated in 5 years on straight line basis. The average post-tax cost of funds to Lotus Finance is 10%, but to cover the effects of inflation, they prefer to hike this rate by 2%. Assume tax rate is 50% and that taxes are paid on the last day of the year.

Calculate the minimum annual lease rent to be charged if

(i) the lease rents are payable on the first day of each year.

(ii) the lease rents are payable on the last day of each year;

(iii) What is the type of the above lease? Give reasons for your classification. 5+3+2=10

Answer:

5. (b) (i)

End of Year	0	1	2	3	4	5	Annuity Factor
Inflows: Lease rent	x	x	x	x	x		4.0382
Depreciation Tax Shield $50\% \left[\frac{30-0}{5}\right]$		3	3	3	3	3	3.6052
Outflows: Taxes		(x/2)	(x/2)	(x/2)	(x/2)	(x/2)	3.6052
Initial	(30)						1
P/V factor 12%	1	0.893	0.797	0.712	0.636	0.567	

Minimum lease rental if paid on the 1st day of the year.

$-30 \times 1 - 3.605 \times \frac{x}{2} + 3 \times 3.6052 + x \times 4.0382 = 0.$

$x (4.0382 - 1.8026) = 30 - 10.8156$

$= 19.1844$

$x = \frac{19.1844}{2.2356} = 8.58132$

Lease rent = ₹ 8,58,132.

(ii) If lease rents are paid on the last day of the years

$-30 \times 1 + 3.6052 \times \frac{x}{2} + 3 \times 3.6052 = 0.$

$\frac{3.6052 \times x}{2} = 19.1844$

$x = \frac{19.1844}{3.6052} \times 2 = 10.6426273$

∴ Lease rent = 10,64,263

(iii) The type of lease is a financial lease

Reason:

- Lessor is only the financier, not interested in the asset.
- Term of the lease is the same as the life of the assets.
- Cost of the asset fully amortised during the base period.

(c) (i) A Textile Manufacturing Company is considering one of two mutually exclusive proposals, Projects M and N, which require initial cash outlays of ₹8,40,000 and ₹ 8,75,000 respectively. The expected net cash flows and their certainty equivalents (C.E.) are as follows:

Year end	Project M		Project N	
	Cash flow ₹	C.E.	Cash flows ₹	C.E.
1	4,50,000	0.8	4,50,000	0.9
2	5,00,000	0.7	4,50,000	0.8
3	5,00,000	0.5	5,00,000	0.7

The risk-free rate is 7% and the risk adjusted discount rate is 10%. Based on the certainty equivalent approach, advise the company on which project to choose. 6

(ii) State any four assumptions relating to investors under the Modern Portfolio Theory. 4

Answer:

5. (c) (i) Statement showing Net Present Value of Project M:

Year end	Cash Flow (₹)	C.E	Adjusted Cash Flow (₹)	P.V. Factor @ 7%	Total Present Value
	(a)	(b)	(c)	(d)	(e) = (c) × (d)
1	4,50,000	0.8	3,60,000	0.9346	3,36,456
2	5,00,000	0.7	3,50,000	0.8734	3,05,690
3	5,00,000	0.5	2,50,000	0.8163	2,04,075
					8,46,221
Less: Initial Investment					8,40,000
Net Present Value					**6,221**

Statement showing Net Present Value of Project N:

Year end	Cash Flow (₹)	C.E	Adjusted Cash Flow (₹)	P.V. Factor @ 7%	Total Present Value
	(a)	(b)	(c)	(d)	(e) = (c) × (d)
1	4,50,000	0.9	4,05,000	0.9346	3,78,513
2	4,50,000	0.8	3,60,000	0.8734	3,14,424
3	5,00,000	0.7	3,50,000	0.8163	2,85,705
					9,78,642
Less: Initial Investment					8,75,000
Net Present Value					**1,03,642**

Decision: Since the net present value of project N is higher, the project N should be accepted.

(ii) Assumptions of the Modern Portfolio Theory – relating to investors.

- Investors are interested in maximising the mean for a given variance.
- All investors aim to make as much money as possible, regardless of any other consideration.
- All investors are rational and risk average.
- All investors have access to the same information at the same time.
- Investors have an accurate conception of possible returns i.e. probabilities match the true distribution.
- Investors do not influence prices by their actions.

Table values/measures for use in various answer:

$e^{0.015}$	= 1.01511
$e^{0.0225}$	= 1.022755
$e^{0.025}$	= 1.02532
$e^{0.03}$	= 1.030455
$e^{0.045}$	= 1.04603
$e^{0.36}$	= 1.4333294

(1.01)36	= 1.43076878

Present value factors $\left(\frac{1}{1+x}\right)^n$

End of year (n) / Rate (x)	1	2	3	4	5	6	7
7%	0.9346	0.8734	0.8163	0.7629	0.7130	0.6663	0.6227
10%	0.9091	0.8264	0.7513	0.6830	0.6209	0.5645	0.5132
12%	0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523
20%	0.8333	0.6944	0.5787	0.4823	0.4019	0.3349	0.2791