Paper – 14 – ADVANCED FINANCIAL MANAGEMENT

The following table lists the learning objectives and the verbs that appear in the syllabus learning aims and examination questions:

	Learning objectives	Verbs used	Definition
LEVEL C	KNOWLEDGE What you are expected to know	List	Make a list of
		State	Express, fully or clearly, the details/facts
		Define	Give the exact meaning of
	COMPREHENSION What you are expected to understand	Describe	Communicate the key features of
		Distinguish	Highlight the differences between
		Explain	Make clear or intelligible/ state the meaning or purpose of
		Identity	Recognize, establish or select after consideration
		Illustrate	Use an example to describe or explain something
	APPLICATION How you are expected to apply your knowledge	Apply	Put to practical use
		Calculate	Ascertain or reckon mathematically
		Demonstrate	Prove with certainty or exhibit by practical means
		Prepare	Make or get ready for use
		Reconcile	Make or prove consistent/ compatible
		Solve	Find an answer to
		Tabulate	Arrange in a table
	ANALYSIS How you are expected to analyse the detail of what you have learned	Analyse	Examine in detail the structure of
		Categorise	Place into a defined class or division
		Compare and contrast	Show the similarities and/or differences between
		Construct	Build up or compile
		Priorities	Place in order of priority or sequence for action
		Produce	Create or bring into existence
	SYNTHESIS How you are expected to utilize the information gathered to reach an optimum conclusion by a process of reasoning	Discuss	Examine in detail my argument
		Interpret	Translate into intelligible or familiar terms
		Decide	To solve or conclude
	EVALUATION How you are expected to use your learning to evaluate, make decisions or recommendations	Advise	Counsel, inform or notify
		Evaluate	Appraise or asses the value of
		Recommend	Propose a course of action

Paper – 14 – ADVANCED FINANCIAL MANAGEMENT

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

This paper contains 5 questions. All questions are compulsory, subject to instruction provided against each question. All workings must form part of your answer. Assumptions, if any, must be clearly indicated.

Question No. 1 (Answer **all** questions. Each question carries **2 marks)**

1. (a) The current price of an equity share of ₹ 10 are ₹ 20. The next expected dividend per share is 20%. The dividends are expected to grow at a rate of 5%. Calculate the cost of equity based on dividend growth model. [2]

Answer to (a):

Next expected Dividend per share (D_1) = 20% of ₹ 10 = ₹ 2
Market Price (P_0) = ₹ 20
Growth rate in Dividends (g) = 5%

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

$$\text{or } K_e = \frac{₹2}{₹20} + 0.05$$

$$K_e = 0.15 \text{ or } 15\%$$

(b) SIDBI came out with an issue of Deep discount Bond. Each bond having a face value of ₹ 1,00,000 was issued at a deep discounted price of ₹ 5,000 with a maturity period of 25 years from the date of allotment. The corporate tax rate applicable is 20%. If the Indexed Cost of acquisition is 6%, calculate the Post-tax Yield to maturity of the bond. [2]

Answer to (b):

Post-tax redemption value:

Redemption Value – [Redemption Value – Indexed Cost of acquisition] × Tax rate

₹ 1,00,000 – [1,00,000 – 5,000x $(1.06)^{0.25}$] x 0.20

= 1,00,000 – [1,00,000 – 5,000x4.2919]x0.20 = ₹ 84,292

Cost of acquisition × $(1+r)^{25}$ = Post tax redemption Value

5000 $(1+r)^{25}$ = 84292 or $(1+r)^{25}$ = 16.8584

$r = \sqrt[25]{16.8584} - 1$

= 1.1196 – 1 = 0.1196 i.e. 11.96%

(c) The Portfolio composition of Mr. Satendra is given below:

	(Amount in ₹ lakh)
Equity	**120**
Cash/Cash equivalent	**40**
Total	**160**

The beta of Equity portion of the Portfolio is 0.85 and the Current Nifty futures is at 4261.5. The multiple attached to Nifty future is 100. If Mr. Satendra purchases 23 future contracts, find out his portfolio Beta. [2]

Answer to (c):

120 Lakh × 0.85 + 4261.5 × 100 × 23 = 160 lakh × Beta of Portfolio.

or 102 lakh + 98.0145 lakh = 160 lakh × Beta of Portfolio

or Beta of Portfolio = 1.25

(d) Excel Exporters are holding an Export Bill in United State Dollor (USD) 1,00,000, due 60 days hence. They are worried about the falling USD value which is currently at ₹ 45.60 per USD. The concerned Export Consignment has been priced on an Exchange rate of ₹ 45.50 per USD. The Firm's Bankers have quoted a 60-day Forward Rate of 45.20.

Calculate-

(I) Rate of discount quoted by the Bank

(II) The probable loss of operating profit if the forward sales is agreed to. [1+1]

Answer to (d):

$$\textbf{Forward Discount} = \frac{\text{Forward Rate} - \text{Spot Rate}}{\text{Spot Rate}} \times 100 \times \frac{365\text{Days}}{\text{Forward Period}}$$

$$= \frac{₹45.20 - ₹45.60}{₹45.60} \times 100 \times \frac{365\ \text{Days}}{60\ \text{Days}} = 5.34\%$$

Probable Loss to the Company

Total Loss = (Forward Rate Billed Rate) × Amount of USD = (45.20 – 45.50) × 1,00,000 = ₹ 30,000

(e) Distinguish between mutual funds and hedge funds. [2]

Answer to (e):

(I) Mutual Funds seek Relative Returns whereas Hedge Funds actively seek Absolute Returns.

(II) In a bull market, hedge funds may not perform as well as mutual funds, but in a bear market - taken as a group or asset class – they do better than mutual funds because they hold short positions and hedges.

(f) Nishce Ltd. is an all equity financed company. The current market price of the share is ₹ 180. It had just paid a dividend of ₹ 15 per share and expected future growth in dividends is 12%. Currently, it is evaluating a proposal requiring funds of ₹ 20,00,000 with annual inflows of ₹ 10,00,000 for 3 years. Find out the NPV of the proposal if:

(I) It is financed from retained earnings.

(II) It is financed by issuing fresh equity (flotation costs 5%). [1+1]

Answer to (f):

P_0 = ₹ 180, D_0 = ₹ 15, g = 12%

$D_1 = D_0(1+g) = 15(1.12) = ₹ 16.80$

$$K_{re} = \frac{D_1}{NP} + g = \frac{16.80}{180} + 12\% = 21.33\%$$

(I) N.P.V. (21.33%) = (10,00,000 × 2.063) – 20,00,000 = 63,000

(II) N.P. = (180 × 95%) = ₹ 171

$$K_e = \frac{D_1}{NP} + g = \frac{16.80}{171} + 12\% = 21.82\%$$

$$NPV(21.82\%) = (10,00,000 \times 2.048) - 20,00,000 = 48,000$$

(g) Distinguish between the primary market and the secondary market. [2]

Answer to (g):

In the primary market, securities are offered to public for subscription for the purpose of raising capital or fund. Secondary market is an equity trading avenue in which already existing/pre-issued securities are traded amongst investors. Secondary market could be either auction or dealer market. While stock exchange is the part of an auction market, Over-the-Counter (OTC) is a part of the dealer market.

(h) Mr. A purchased a 3 month Call Option for 100 Shares in XYZ Ltd at a Premium of ₹ 30 per share, with an Exercise Price of ₹ 550. He also purchased a 3 month Put Option for 100 Shares of the same Company at a premium of ₹ 5 per Share with an Exercise Price of ₹ 450. The Market Price of the Share on the date of Mr. A's purchase of Options is ₹ 500. Calculate the Profit or Loss that Mr. A would make assuming that the Market Price falls to ₹ 350 at the end of 3 months. [2]

Answer to (h):

Particulars	Call Option	Put Option
Exercise Price	₹ 550	₹ 450
Spot Price on Expiry	₹ 350	₹ 350
Position	Out of Money	In the Money
Action	Lapse	Exercise

Value of Option	Nil	₹ 100
Less: Premium Paid	(₹ 30)	(₹ 5)
Net Pay Off	**(₹ 30)**	**₹ 95**

(i) Novell, which had a market value of equity of ₹ 2 billion and a beta of 1.50, announced that it was acquiring WordPerfect, which had a market value of equity of ₹ 1 billion and a beta of 1.30. Neither firm had any debt in its financial structure at the time of the acquisition. Estimate the beta for Novell after the acquisition, assuming that the entire acquisition was financed with equity. [2]

Answer to (i):

The combined beta for Novell after the acquisition =

$$\left[1.5\times\frac{2\text{ billion}}{3\text{ billion}}\right]+\left[1.3\times\frac{1\text{billion}}{3\text{ billiion}}\right]=1.43$$

(j) The buy and sell value of two securities in stock exchange are as under:

Security	Buy Value (₹)	Sell Value (₹)
L	**5,00,000**	**2,00,000**
M	**3,00,000**	**7,00,000**

Calculate the Gross Exposure Margin. [2]

Answer to (j):

Security	Buy Value (₹)	Sell Value (₹)	Buy Value – Sell Value (₹)
L	5,00,000	2,00,000	3,00,000
M	3,00,000	7,00,000	- 4,00,000

The Gross Exposure Margin: S (|300000| + |- 400000|) = ₹ 7,00,000.

Question No. 2. (Answer **any three** questions. Each question carries **8 marks**)

2. (a) (i) Describe the benefits of future trading. [3]

Answer to 2(a)(i):

Benefits of Futures Trading

- **Price discovery for commodity players**
  - A farmer can plan his crop by looking at prices prevailing in the futures market

- **Hedging against price risk**
  - A farmer can sell in futures to ensure remunerative prices
  - A processor/ manufacturing firm can buy in futures to hedge against volatile raw material costs
  - An exporter can commit to a price to his foreign clients
  - A stockiest can hedge his carrying risk to ensure smooth prices of the seasonal commodities round the year
- **Easy availability of finance**
  - Based on hedged positions commodity market players (farmers, processors, manufacturers, exporters) may get easy financing from the banks.

2.(a) (ii) You are required to compute the annualized cost of fund to ABC Bank Ltd., Given:

Face Value of CD	**= ₹ 15 lakhs**
Issue price	**= ₹ 14,45,000**
Tenure	**= 5 months**
Stamp duty	**= 0.25% of face value.**

[5]

Answer to 2 (a)(ii):

Face Value = ₹ 15 lakh

Issue Price = ₹ 14,45,000

To find the annualized rate we first find the inherent rate for 5 months and compound the same to find the annualized rate. The five month rate is given by r which satisfies the following equation:

$D = 1 \times \frac{r}{100} \times \frac{n}{365}$, where D= ₹ 55,000 for an investment of ₹ 15 lakhs i.e. ₹ 3.67 for an investment of ₹ 100.

Thus we get r as follows:

$3.67 = 100 \times \frac{r}{100} \times \frac{5}{12}$ which implies r = 8.8%

A CD paying 8.8% p.a. would pay monthly 8.8% /12 = 0.733%

This when compounded 12 times we get annualized rate:

Amount = $1000 \times (1+0.00733)^{12}$ = ₹ 1091.59

i.e. 9.16% on an investment of ₹ 1000.

Cost of funds to the Bank = Effective interest rate + Stamp duty

= 9.16% +0.25%

= 9.41%

2. (b) (i)State whether Secured debentures can be treated as Public Deposit? If not who regulates them? [2]

Answer to 2(b)(i):

Debentures secured by the mortgage of any immovable property of the company or by any other asset or with an option to convert them into shares in the company, if the amount raised does not exceed the market value of the said immovable property or other assets, are excluded from the definition of 'Public Deposit' in terms of Non-Banking Financial Companies Acceptance of Public Deposits (Reserve Bank)

Directions, 1998. Secured debentures are debt instruments and are regulated by Securities & Exchange Board of India.

2. (b) (ii)Nomination facility is available to the Depositors of NBFCs. - Justify. [3]

Answer to 2(b)(ii):

Nomination facility is available to the depositors of NBFCs. The Rules for nomination facility are provided for in section 45QB of the Reserve Bank of India Act, 1934. Non-Banking Financial Companies have been advised to adopt the Banking Companies (Nomination) Rules, 1985 made under Section 45ZA of the Banking Regulation Act, 1949. Accordingly, depositor/s of NBFCs are permitted to nominate one person to whom the NBFC can return the deposit in the event of the death of the depositor/s. NBFCs are advised to accept nominations made by the depositors in the form similar to one specified under the said rules, viz Form DA 1 for the purpose of nomination, and Form DA2 and DA3 for cancellation of nomination and change of nomination respectively.

2.(b)(iii)The following information is available regarding four Mutual Funds.

Fund	Risk Free Rate of Return	Portfolio Return (%)	Portfolio Risk (%)	Portfolio Beta
Franklin	**6**	**11**	**10**	**0.5**
Sundram	**6**	**16**	**20**	**1.0**
ABN	**6**	**21**	**30**	**1.5**
ASK	**6**	**13**	**28**	**0.7**

Based on the above information you are required to analyze and comment on the extent of diversification of these funds. [3]

Answer to 2 (b)(iii):

Fund	σ	β
Franklin	10	0.5
Sundram	20	1.0
ABN	30	1.5
ASK	28	0.7

We know that level of beta measures systematic risk and level of sigma measures total risk. Looking at the values in the table we can say that ASK Fund has more unsystematic risk and less systematic risk, as its beta is lower and sigma is higher, which indicates poor diversification. Since beta of 1.0 is identified with market portfolio (considered to be well diversified), we can say Sundram is as diversified as market. Since beta of ABN Fund is greater than 1, and since its sigma is also is the highest, the fund does not appear to be that well diversified. Finally, Franklin has the lowest beta and sigma, indicating that the fund can be considered as well diversified portfolio, especially when we look at Sundaram's beta, sigma and portfolio return together.

2. (c) Evaluate performance of Funds M, N and the Market Portfolio from the following information available for the past six months —

Month (Return %)	Apr	May	Jun	Jul	Aug	Sep
Fund M	3.25	1.50	(1.00)	3.75	1.25	0
Fund N	2.50	(1.25)	0	2.75	2.25	1.25
Market Portfolio	1.00	(0.75)	2.00	1.75	0.25	3.25

The 6 Month Treasury Bills carry an interest rate of 6% p.a. [8]

Answer to 2(c):

(1) Computation of Factors

Month	Fund M		Fund N		Market portfolio	
	Return	Risk of Loss	Return	Risk of Loss	Return	Risk of Loss
(1)	(2)	(3)= (2) - 0.50 [if (2)<0.50]	(4)	(5)= (4) - 0.50 [if (4)<0.50]	(6)	(7)= (6) - 0.50 [if (6)<0.50]
Apr	3.25	0.00	2.50	0.00	1.00	0.00
May	1.50	0.00	(1.25)	1.75	(0.75)	1.25
Jun	(1.00)	1.50	0.00	0.50	2.00	0.00
Jul	3.75	0.00	2.75	0.00	1.75	0.00
Aug	1.25	0.00	2.25	0.00	0.25	0.25
Sep	0.00	0.50	1.25	0.00	3.25	0.00
Total	8.75	2.00	7.50	2.25	7.50	1.50
Average	1.46 (8.75/6)	0.33 (2.00/6)	1.25 (7.50/6)	0.38 (2.25/6)	1.25 (7.50/6)	0.25 (1.50/6)

Monthly Risk Free Return = 6% p.a. ÷ 12 = 0.50% p.m.

(2) Computation of Ranking

Particulars	Fund M	Fund N	Market Portfolio
Average Monthly Return [A]	1.46%	1.25%	1.25%
Average Monthly Risk of Loss [B]	0.33%	0.38%	0.25%
(Excess Return) [A] - [B]	1.13% [1.46% -0.33%]	0.87% [1.25% -0.38%]	1% [1.25% -0.25%]
Ranking	**1**	**3**	**2**

Evaluation: Fund M has performed better than the Market Portfolio, while Fund N has not performed as good as the Market Portfolio despite having the equivalent average return during the period.

2 (d)(i) Describe the key reasons to invest in infrastructure in India. [4]

Answer to 2(d)(i):

The key reasons to invest in infrastructure in India are as follows:

(1) Infrastructure: Major growth driver: The booming Indian economy combined with the high population growth rate is creating tremendous pressure to modernize, sustain and accelerate investment in country's infrastructure. This has become more prominent over the past few decades since the investment backlog has exceeded billions.

(2) Private Capital Requirements: The basis of economic activity is infrastructure. India could have grown faster had the investments in infrastructure been commiserate with economic activity. Construction activity has a direct impact on output and all economic sectors benefit from comprehensive infrastructure.

(3) Immense Regional Disparities: Inter-state disparity in per capita income among Indian states has been rising over the last couple of decades. In addition, the inter-state disparities in economic and social infrastructure facilities too have remained at alarmingly high levels. Hence, investment in infrastructure is required in order to boost inter-state level of development.

(4) Managing Institutional Risks: The big infrastructure opportunities are not without inherent risks like macroeconomic risks associated with emerging markets like India, low degree of liquidity in markets and unsatisfactory transparency of market players and the market itself. Therefore, these risks need to be managed competently for Indian infrastructure to flourish.

2. (d)(ii) The following portfolio details of a fund are available:

Stock	Shares	Price (₹)
A	**200000**	**35**
B	**300000**	**40**
C	**400000**	**20**
D	**600000**	**25**

The fund has accrued management fees with the portfolio manager totaling ₹30000. There are 40 lakhs shares outstanding. Calculate the NAV of the fund. If the fund is sold with a front end load of 5%, calculate the sale price. [3+1]

Answer to 2(d)(ii):

The following portfolio details of a fund are available:

Stock	Shares	Price (₹)	Value
A	200000	35	70,00,000
B	300000	40	1,20,00,000
C	400000	20	80,00,000
D	600000	25	1,50,00,000
Total			4,20,00,000

NAV of the fund = (4,20,00,000-30,000)/40,00,000 = ₹ 10.4925
Sale Price = NAV (1+ Load %)
= 10.4925*(1.05) = ₹11.02 approx.

Question No. 3. (Answer **any two** questions. Each question carries **10 marks**)

3. (a)(i) State swaps. Explain its necessity. Also state financial benefits created by swap transactions. [2+2+1]

Answer to 3(a)(i):

Swaps Exchange of one obligation with another -- Financial swaps are funding technique, which permit a borrower to access one market and exchange the liability for another market / instrument - exchange one type of risk with another.

Necessity –
1. Difference in borrowers and investors preference and market access
2. Low cost device
3. Market saturation
4. Differences in financial norms followed by different countries.

Financial Benefits Created by Swap Transactions
- The Theory of Comparative Advantage
- Information asymmetries.

3. (a)(ii) The following quotes are available.

Spot ($/Euro)	**0.8385/0.8391**
3-m swap points	**20/30**
Spot ($/Pound)	**1.4548/1.4554**
3-m swap points	**35/25**

Find the 3-m (€/£) outright forward rates. [5]

Answer to 3(a)(ii):

Given $/€ = 0.8385 / 0.8391 3M fwd = 0.8405 / 0.8421
(Swap points ascending order ⟶ add to find forward rates)
$/£= 1.4548/1.4554 3M fwd = 1.4513 / 1.4529
(Swap points descending order ⟶ deduct to find forward rates)

To find € /£ (3M outright forward rates)
Bid (€/£) = Bid (€ /$) x Bid ($/£)

We do not have a quote of € /$, instead we have $/ €.

Bid (€ /£) = I/Ask($/€) x Bid($/£)

Substituting the values,

Bid rate for € /£= 1/0.8421 x 1.4513 = 1.7234

Similarly Ask (€ /£) = 1/Bid($/€) x Ask($/£)

= 1/0.8405x1.4529 = 1.7286

∴ 3M outright forward rates (€ /£) = 1.7234 / 1.7286

3. (b)(i) List the benefits of Rolling Settlement. [4]

Answer to 3(b)(i):

Benefits of Rolling Settlement:

(1) In rolling settlements, payments are quicker than in weekly settlements. Thus, investors benefit from increased liquidity,
(2) It keeps cash and forward markets separate,
(3) Rolling settlements provide for a higher degree of safety,
(4) From an investor's perspective, rolling settlement reduces delays. This also reduces the tendency for price trends to get exaggerated. Hence, investors not only get a better price but can also act at their leisure.

3 (b)(ii) Suppose a dealer Rupam quotes 'All-in-cost' for a generic swap at 8% against six month LIBOR flat. If the notional principal amount of swap is ₹5,00,000,

(I) Calculate Semi-Annual fixed payment.

(II) Find the first floating rate payment for (I) above if the six month period from the effective date of swap to the settlement date comprises 183 days and that the corresponding LIBOR was 6% on the effective date of swap.

(III) In (II) above, if settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer?

Generic swap is based on 30/360 days basis. [2+2+2]

Answer to 3 (b)(ii):

Computation of Factors

Factor	Notation	Value
Notional Principal	P	5,00,000
Time	N	180 days
All in Cost Rate	R	0.08

(I) Computation of Semi Annual Fixed Rate Payment

Semi-Annual Fixed Rate Payment = P X (N ÷ 360) X R

= 5,00,000 x (180 ÷ 360) x 0.08

= 5,00,000 x 0.5 x 0.08 = ₹20,000/-

(II) Computation of Floating Rate Payment

Floating Rate Payment = P x (N ÷ 360) x LIBOR

Where N = Period from the effective date of SWAP to the date of Settlement

= 5,00,000 x (183 ÷ 360) x 0.06

= 5,00,000 x (0.5083) x 0.06 = ₹15,250.

(III) Computation of Net Amount

Net Amount to be paid by the Person Requiring Fixed Rate Payment = Fixed Rate Payment Less Floating Rating Payment = ₹20,000 - ₹15,250 = ₹4,750.

3. (c) (i)Following are the details of cash inflows and outflows in foreign currency denominations of Mac Co., an Indian export firm, which have no foreign subsidiaries —

Currency	Inflow	Outflow	Spot rate	Forward rate
US $	**4,00,00,000**	**2,00,00,000**	**48.01**	**48.82**
French Franc (F Fr)	**2,00,00,000**	**80,00,000**	**7.45**	**8.12**
UK £	**3,00,00,000**	**2,00,00,000**	**75.57**	**75.98**

(I) Determine the net exposure of each foreign currency in terms of Rupees.

(II)Are any of the exposure positions off-setting to some extent? [6+2]

Answer to 3(c)(i):

(I) Computation of Net Exposure

Particulars	US $	F Fr	UK £
Inflow (in Lakhs)	400.00	200.00	300.00
Less: Outflow	(200.00)	(80.00)	(200.00)
Net Exposure (Foreign Currency Terms)	200.00	120.00	100.00
Spot Exchange Rate	48.01	7.45	75.57
Net Exposure (in Rupee Terms based on Spot Exchange Rate)	9602 [200x48.01]	894 [120 x 7.45]	7557 [100 x 75.57]

Particulars	US $	F Fr	UK£
Forward Rate [₹ , FC]	48.82	8.12	75.98
Less: Spot Exchange Rate [₹ / FC]	48.01	7.45	75.57
Forward Premium/ (Discount)	0.81	0.67	0.41
Net Exposure in Rupee Terms based on extent of uncertainty represented by Premium / (Discount)	162.0 [200 x 0.81]	80.4 [120 x 0.67]	41.0 [100 x 0.41]

(II) Off Setting Position:

- Net Exposure in all the currencies are offset by better forward rates. In the case of USD, F Fr and UK Pound, the net exposure is receivable, and the forward rates are quoted at a premium for these currencies.

3.(c)(ii) A sold in June Nifty futures contract for ₹3,60,000 on June 15, For this he had paid an initial margin of ₹34,000 to his broker. Each Nifty futures contract is for the delivery of 200 Nifties. On June 25, the index was closed on 1850. How much profit / loss A has made? [2]

Answer to 3(c)(ii):

Sale Price per NIFTY Future

= Contract Amount ÷ Lot size
= ₹3,60,000 ÷ 200
= **₹1,800**

Futures Price as on June 25

= ₹ 1,850

Loss on Sale of Futures Contract

= (1,850 - 1,800) × 200

= **₹10,000.**

Question No. 4. (Answer **any two** questions. Each question carries **8 marks**)

4. (a)(i) Explain the financial meaning of investment? [4]

Answer to 4(a)(i):

Financial Meaning of Investment:

- Financial investment involves of funds in various assets, such as Stock, Bond, Real Estate, Mortgages etc.
- Investment is the employment of funds with the aim of achieving additional income or growth in value.
- It involves the commitment of resources which have been saved or put away from current consumption in the hope some benefits will accrue in future. Investment involves long term commitment of funds and waiting for a reward in the future.
- From the point of view people who invest their funds, they are the supplier of 'Capital' and in their view investment is a commitment of a person's funds to derive future

income in the form of interest, dividend, rent, premiums, pension benefits or the appreciation of the value of their principle capital.

- To the financial investor it is not important whether money is invested for a productive use or for the purchase of second hand instruments such as existing shares and stocks listed on the stock exchange.
- Most investments are considered to be transfers of financial assets from one person to another.

4. (a)(ii) Let's say you have 2 stocks: I-flex and BFL. Assume that I-flex's average return over the last 5 years has been 20% per year and that of BFL has been 25%. Also assume that the standard deviations of those returns were 30% and 40%, respectively.

(I) If the correlation coefficient for these two stocks is 0.8, calculate the standard deviation of a portfolio invested 40% in I-flex and 60% in BFL.

(II) If the correlation coefficient were 0.5 instead, would the portfolio standard deviation be greater than or less than in (I)? Why? [2+2]

Answer to 4(a)(ii):

(I) The standard deviation of the portfolio comprising of investment of 40% I-flex and 60% BFL would be

$$\sigma_p = \left[\sum_{j=1}^{n} x_i x_j \rho_{ij} \sigma_i \sigma_j \right]^{1/2}$$

Substituting we have $\sigma_p = [(0.4)^2 \times (0.3)^2 + (0.6)^2 \times (0.4)^2 + 2 \times 0.4 \times 0.6 \times 0.8 \times 0.3 \times 0.4]^{1/2} = 34.36\%$

(II) If the correlation coefficient is 0.5, then portfolio risk would be:

Substituting we have $\sigma p = [(0.4)^2 \times (0.3)^2 + (0.6)^2 \times (0.4)^2 + 2 \times 0.4 \times 0.6 \times 0.5 \times 0.3 \times 0.4]^{1/2} = 31.75\%$

It is less, because the portfolio risk is directly proportional to the correlation between two stocks.

4. (b) An investor has two portfolios known to be on minimum variance set for a population of three securities A, B and C having below mentioned weights:

	W_a	W_b	W_c
Portfolio X	**0.3**	**0.4**	**0.3**
Portfolio Y	**0.2**	**0.5**	**0.3**

It is supposed that there are no restrictions on short sales.

(I) Calculate the weight for each stock for a portfolio constructed by investing ₹5,000 in

portfolio X and ₹3,000 in portfolio Y.

(II) Suppose the investor invests ₹4,000 out of ₹8,000 in security A. How he will allocate the balance between security B and C to ensure that his portfolio is on minimum variance set? [3+5]

Answer to 4 (b):

Given:

	W_a	W_b	W_c
Portfolio X	0.3	0.4	0.3
Portfolio Y	0.2	0.5	0.3

(I) If ₹5000 is invested in X, it would be invested in the proportion of 0.3, 0.4 and 0.3 in three stocks, A, B and C. Again, if ₹3,000 is invested in Y, it would be invested in the proportion of 0.2, 0.5 and 0.3 in three stocks, A, B and C. The appropriate returns can be tabulated and weight of each stock can be calculated as follows:

	W_a	W_b	W_c
Portfolio X	1500	2000	1500
Portfolio Y	600	1500	900
Total	2100	3500	2400
Weight	2100/8000	3500/8000	2400/8000
Weight	0.2625	0.4375	0.3

(II) Portfolios lying on the same minimum variance set can be joined by a straight line. In a three stock portfolio we can plot the weights of stock B and stock A (knowing that we can find weight of stock C using the formula $w_C = 1 - w_A - w_B$) and find the equation of the line. The equation of the line can be written as, $w_B = a + bw_A$, where 'a' is the y intercept and 'b' is the slope of the line. Knowing 'a' and 'b' and knowing just one weight, we can find the other two weights easily.

We are given two portfolios are in minimum variance set. Using the weights of these two portfolios, we can first find 'a' and 'b'.

0.4 = a + 0.3b and 0.5 = a + 0.2b

Solving we get slope = b = -1 and y intercept = a = 0.7

Thus we get the general equation of line as: $w_B = 0.7 + -1w_A$

Now we are provided with information about the third portfolio, of which we have to find the weights of respective stocks. With half of the funds in A, substituting $w_A = 0.5$, we get $w_B = 0.7 + -1 \times 0.5 = 0.2$. Thus, $w_C = 1 - w_A - w_B = 1 - 0.5 - 0.2 = 0.3$.

we have $w_B = 0.20$ and therefore $w_C = 0.30$ i.e. ₹1600 and ₹2400 in B and C respectively.

4. (c)(i)We have been given a strange observation that the return on the stock market has been exactly 1 percent in each of the last eight months. The return on Alfa Laval however exhibited tremendous volatility when the stock in the past months provided returns as follows: 18%, 14%, -16%, -30%, 6%, 12%, 30%, -25%. From this information, estimate the beta of Alfa Laval. [2]

Answer to 4 (c)(i):

The beta of a stock tells us how much, on average, a stock moves when the market moves by 1%. In this problem, because the market's move in all eight months was 1%, we can simply take the average of the stock returns to estimate the beta of Alfa Laval. In this case we get 1.125 and from that we can infer that the Alfa Laval's beta is 1.125.

4. (c) (ii) The historical returns of two securities over the past ten years are given. Calculate the covariance and correlation coefficient of the two securities: [3+3]

Years	1	2	3	4	5	6	7	8	9	10
Security 1 (Returns %)	12	8	7	14	16	15	18	20	16	22
Security 2 (Returns %)	20	22	24	18	15	20	24	25	22	20

Answer to 4(c)(ii):

We know that covariance and correlation can be found out using the following formulae:

$$\sigma_{12} = \frac{\sum(R_1 - \bar{R}_1)(R_2 - \bar{R}_2)}{n-1}$$

$\rho_{12} = \sigma_{12} / \sigma_1\sigma_2$

Years	Return %		Deviations		Product of deviations	Square of Deviations	
	1	2	$R_1 - \bar{R}_1$	$R_2 - \bar{R}_2$	$R_1 - \bar{R}_1 . R_2 - \bar{R}_2$	$\left(R_1 - \bar{R}_1\right)^2$	$\left(R_2 - \bar{R}_2\right)^2$
1	12	20	-2.8	-1	2.8	7.84	1
2	8	22	-6.8	I	-6.8	46.24	1
3	7	24	-7.8	3	-23.4	60.84	9
4	14	18	-0.8	-3	2.4	0.64	9
5	16	15	1.2	-6	-7.2	1.44	36
6	15	20	0.2	-1	-0.2	0.04	1
7	18	24	3.2	3	9.6	10.24	9
8	20	25	5.2	4	20.8	27.04	16
9	16	22	1.2	1	1.2	1.44	1
10	22	20	7.2	-1	-7.2	51.84	1

Sum	148	210		TOTAL	-8	207.6	84
Mean	14.8	21					

Therefore, Covariance of two securities = $\sigma_{12} = \frac{\sum(R_1 - \bar{R}_1)(R_2 - \bar{R}_2)}{n-1} = \frac{-8}{9}$ = - 0.89

Now, $\sigma_1 = \sqrt{\frac{207.6}{9}}$ = 4.80 and $\sigma_2 = \sqrt{\frac{84}{9}}$ = 3.06

Correlation of two securities $\rho_{12} = \sigma_{12}/\sigma_1\ \sigma_2$ = - 0.89/ (4.80 × 3.06) = - 0.06

Question No. 5. (Answer **any two** questions. Each question carries **10 marks**)

5. (a)(i) As an executive of a lending institution, what factors should you critically evaluate with respect to a large industrial project, from the perspectives of environmental and economic viability? [4]

Answer to 5(a)(i):

Factors to consider for critical evaluation of a large industrial project, from the perspectives of environmental and economic viability are:

(i) Employment potential.
(ii) Utilisation of domestically available raw material and other facilities.
(iii) Development of industrially backward areas as per government policy.
(iv) Effect of the project on the environment with particular emphasis on the pollution of water and air to be caused by it.
(v) Arrangements for effective disposal of effluent as per government policy.
(vi) Energy conservation devices, etc. employed for the project.

Other economic factors that influence the final approval of a particular project are:

- Internal Rate of Return (IRR) and Domestic Resources Cost (DRC).

5. (a)(ii) A Production Manager is planning to produce a new product and he wishes to estimate the raw material requirement for that new product. On the basis of usage for a similar product introduced previously, he has developed a frequency distribution of demand in tonnes per day for a two month period. Use this data to simulate the raw material usage requirements for 7 days. Compute also expected value and comment on the result.

Demand Tonnes/day	Frequency No. of days

10	**6**
11	**18**
12	**15**
13	**12**
14	**6**
15	**3**

Random Number: 27, 13, 80, 10, 54, 60, 49. **[6]**

Answer to 5(a)(ii):

Demand Tonnes/day	Frequency No. of days	Probability	Cumulative Probability	Random Numbers
10	6	6÷60 = 0.10	0.10	00 - 09
11	18	18÷60 = 0.30	0.40	10 - 39
12	15	15÷60 = 0.25	0.65	40 - 64
13	12	12÷60 = 0.20	0.85	65 - 84
14	6	6÷60 = 0.10	0.95	85 - 94
15	3	3÷60 = 0.05	1.00	95 - 99
	60	1.00		

The first seven random numbers (two digits only) are simulated:

Random No.	Corresponding demand Tonnes/day
27	11
13	11
80	13
10	11
54	12
60	12
49	12
	82

Mean requirement per = 82 / 7 = 11.7 Tonnes

The expected value (EV) = (10×0.1)+(11×0.3)+(12×0.25)+(13×0.2)+(14×0.1)+(15×0.05)
= 12.05 Tonnes

The difference = 12.05 – 11.7 = 0.35

This indicates that the small sample size of only 7 days had resulted in some error. A much larger sample should be taken and several samples should be simulated before the simulation results are used for decision making.

5. (b) VEDAVYAS Ltd. is considering two mutually exclusive projects M and project N. The

Finance Director thinks that the project with higher NPV should be chosen, whereas the Managing Director thinks that the one with the higher IRR should be undertaken, especially as both projects have the same initial outlay and length of life. The company anticipates a cost of capital of 10% and the net after-tax cash flow of the projects are as follows:

Year	0	1	2	3	4	5
Cash flows (₹)						
Project M	(4,00,000)	70,000	1,60,000	1,80,000	1,50,000	40,000
Project N	(4,00,000)	4,36,000	20,000	20,000	8,000	6,000

You are required to:

(I) Calculate the NPV and IRR of each project.

(II) State with reasons, which project you would recommend.

(III) Explain the inconsistency in the ranking of the two projects.

Present value Table is given:

Year	0	1	2	3	4	5
PVIF at 10%	1.000	0.909	0.826	0.751	0.683	0.621
PVIF at 20%	1.000	0.833	0.694	0.579	0.482	0.402

[(3+4)+2+1]

Answer to 5 (b).

(I) Calculation of NPV and IRR

NPV of Project M:

Year	Cash Flows (₹)	Discount factor (10%)	Discounted Values(₹)	Discount factor (20%)	Discounted Values (₹)
0	(4,00,000)	1.000	(4,00,000)	1.000	(4,00,000)
1	70,000	0.909	63,630	0.833	58,310
2	1,60,000	0.826	1,32,160	0.694	1,11,040
3	1,80,000	0.751	1,35,180	0.579	1,04,220
4	1,50,000	0.683	1,02,450	0.482	72,300
5	40,000	0.621	24,840	0.402	16,080
NPV			58,260		(38,050)

IRR of Project M:

At 20%, NPV is (-) 38,050 and at 10% NPV is 58,260

$$\therefore \text{IRR} = 10 + \frac{58260}{58260+38050} \times 10 = 10 + \frac{58260}{96310} \times 10 = 10 + 6.05 = 16.05\%$$

NPV of Project N:

year	Cash Flows (₹)	Discount factor (10%)	Discounted Values(₹)	Discount factor (20%)	Discounted Values (₹)

0	(4,00,000)	1.000	(4,00,000)	1.000	(4,00,000)
1	4,36,000	0.909	3,96,324	0.833	3,63,188
2	20,000	0.826	16,520	0.694	13,880
3	20,000	0.751	15,020	0.579	11,580
4	8,000	0.683	5,464	0.482	3,856
5	6,000	0.621	3,726	0.402	2,412
NPV			37,054		(5,084)

IRR of Project N:

At 20%, NPV = (-) 5,084 and at 10% NPV = 37,054

$\therefore$ IRR = $10 + \frac{37054}{37054 + 5084} \times 10 = 10 + \frac{37054}{42138} \times 10 = 10 + 8.79\% = 18.79\%$

(II) Both the projects are acceptable because they generate the positive NVP at the company's cost of capital at 10%. However, the company will have to select PROJECT M because it has higher NPV. If the company follows IRR method, then PROJECT N should be selected because of higher internal rate of return (IRR). But when NPV and IRR give contradictory results, a project with higher NPV is generally preferred because of higher return in absolute terms. Hence, Project M should be selected.

(III) The inconsistency in the ranking of the projects arises because of the difference in the pattern of the cash flows. Project M's major cash flow occur mainly in the middle three years whereas project N generated the major cash flow in the first year itself.

5. (c) (i) XYZ Ltd adopts constant WACC approach and believes that its cost of debt and overall cost of capital is at 9% and 12% respectively. If the ratio of the market value of debt to the market value of equity is 0.8, what rate of return do Equity Shareholders earn? Assume that there are no taxes. [2]

Answer to 5(c)(i):

Constant WACC implies the use of NOI or M&M Approach. Under M&M Approach,
$K_e = K_o$+Risk Premium.
So, $\mathbf{K_e = K_0 + (K_0 - K_d)}$ Debt/Equity
On substitution, we have, $\mathbf{K_e}$=12%+(12%-9%)×80%=**14.4%**

Alternatively,

$\mathbf{K_e}$ can be obtained as balancing figure as under --
(Note: Debt: Equity = 0.8 = 4:5)

Component	%	Individual Cost in %	WACC %
Debt	4/9th	K_d = 9.00%	9.00% × 4/9th = 4.00%
Equity	5/9th	K_e = 8.00 ÷ 5/9th = **14.40%** (final balancing figure)	12% – 4% = **8.00%** (balance figure)

5. (c)(ii) Company Z is operating an elderly machine that is expected to produce a net cash inflow of ₹ 40,000 in the coming year and ₹ 40,000 next year. Current salvage value is ₹ 80,000 and next year's value is ₹ 70,000. The machine can be replaced now with a new machine, which costs ₹ 1,50,000, but is much more efficient and will provide a cash inflow of ₹ 80,000 a year for 3 years Company Z wants to know whether it should replace the equipment now or wait a year with the clear understanding that the new machine is the best of the available alternatives and that it in turn be replaced at the optimal point. Ignore tax. Take opportunity cost of capital as 10 per cent. Advise with reasons. [3+3+2]

Answer to 5(c)(ii):

Statement showing present value of cash inflow of new machine when it replaces elderly machine now

	₹	₹
Cash inflow of a new machine per year		80,000
Cumulative present value for 1-3 years @ 10%		2.48685
Present value of cash inflow for 3 years (₹ 80,000 x 2.48685)		1,98,948
Less: Cash outflow		
Purchase cost of new machine	1,50,000	
Less: Salvage value of old machine	80,000	70,000
N.P.V. of cash inflow for 3 years		1,28,948
Equivalent annual net present value of cash Inflow of new machine (₹1,28,948/2.48685)		51,852

Statement showing present value of cash inflow of new machine when it replaces elderly machine next year

	₹	₹
Cash inflow of a new machine per year		80,000
Cumulative present value for 1-3 years @ 10%		2.48685
Present value of cash inflow for 3 years (₹ 80,000 x 2.48685)		1,98,948
Less: Cash outflow		
Purchase cost of new machine	1,50,000	
Less: Salvage value of old machine	70,000	80,000
N.P.V. of cash inflow for 3 years		1,18,948
Equivalent annual net present value of cash Inflow		47,831

Advise: Since the equivalent annual cash inflow of new machine now and next year is more than cash inflow (₹ 40,000) of an elderly machine the company Z is advised to replace the elderly machine now.

Company Z need not wait for the next year to replace the elderly machine since the equivalent annual cash inflow now is more than the next year's cash inflow.