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
		Prioritise	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 by 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**)

(a) 15% debentures of ₹1,000 (face value) to be redeemed after 10 years. Net proceeds are after 5% floatation costs and 5% discount. The tax rate is 50%. Calculate the cost of debt. [2]

Answer to (a):

Year	Cash flows
0	1,000 – 5% of 1,000 (floatation) – 5% of discount = 900 C. Inflow
1 – 10	₹15% of 1,000 (1 – 0.5) = ₹75 C. outflow
10	₹1,000 (repayment) C. outflow

So, 900= 10 = $\sum$ 75/(1 + kd)n + 1,000/(1 + kd)^{10}

n = 1

By trial and error; kd = 9% approx.

Note: As the first method is simple to calculate, and second one is bit lengthy, the first method is preferred in general.

Alternative:

$$K_d = \frac{I(1-t) + \frac{RV - SV}{n}}{\frac{RV + SV}{2}}$$

$$K_d = \frac{150(1-0.50) + \frac{1000 - 900}{10}}{\frac{1000 + 900}{2}} Kd$$

$$K_d = \frac{75 + 10}{950} = 9\%(\text{approx})$$

(b) Ms. Vasuda is considering an investment in a Mutual Fund with a 2% load. As another alternative, she can also invest in a Bank deposit paying 10% interest. Her investment planning period is 3 years. What should be the annual rate of return on Mutual fund so that she prefers the investment in the fund to the investment in Bank Deposit? [2]

Answer to (b):

$(1 - 0.02) \times (1+r)^3 \geq (1.10)^3$
Or, $0.98 \times (1+r)^3 \geq 1.331$ or $(1+r)^3 \geq (1.331 \div 0.98)$ or, $(1+r)^3 \geq 1.358163$
Or, $(1+r) \geq (1.107433)$ or, $r = (1.107433 - 1)$ or $r = 0.107433$ i.e. $r = 10.743\%$
The annual rate of return on mutual fund = 10.743%

(c) The characteristics of two securities A and B are as follows:

Particulars	Security A	Security B
Expected Return (%)	**12**	**13**
Standard deviation of return (%)	**21**	**29**
Beta (β)	**1.10**	**1.20**

The correlation co-efficient between the return on Securities A and B is 0.94. If variance of returns on the market index is 400%, calculate the systematic risk of a portfolio consisting of two securities in equal proportion. [2]

Answer to (c):

The Beta of portfolio consisting of two securities given that money is allotted equally between two assets.
$= 1.10 \times 0.5 + 1.20 \times 0.5$
$= 1.15$

The Systematic Risk of a portfolio $= \beta^2 \sigma_m^2$
$= (1.15)^2 \times 400$
$= 529\%$

(d) The Sterling is trading at $ 1.6100 today. Inflation in U. K. is 4% and that in U. S.A. is 3%. What could be the spot rate ($/£) after 2 years? [2]

Answer to (d):

$S (\$/£) = F (\$/£) \times (1 + r\$)^2 / (1 + r£)^2$

$= 1.61 \times (1+ 0.03)^2/(1+ 0.04)^2$

$= 1.5792.$

(e) Immense Regional Disparities is a key reason to invest in infrastructure in India- Justify. [2]

Answer to (e):

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.

(f) An investor buys a call option contract for a premium of ₹200. The exercise price is ₹20 and the current market price of the share is ₹17. If the share price after three months reaches ₹25, what is the profit made by the option holder on exercising the option? Contract is for 100 shares. Ignore the transaction charges. [2]

Answer to (f):

Assuming in call option, the total outgo Premium + Exercise Price = ₹200 + (₹20 × 100)
= ₹2,200.

After 3 months, if the share price is ₹2,500, the net profit = ₹2,500 – ₹2,200 = ₹300.

(g) State the term "Commission house" and "Consumption Commodity" in commodity market. [1+1]

Answer to (g):

Commission House: A concern that buys and sells actual commodities or futures contract for the accounts of customers.

Consumption Commodity: - Consumption commodities are held mainly for consumption purpose. Example: Oil, Steel

(h) Your customer requests you to book a sale forward exchange contract for US $ 2 million delivery 3rd month. The quotes are:

Spot US$ 1	**=**	**₹48.050/60**
1 month margin	**=**	**0.0850/0900**
2 month margin	**=**	**0.2650/2700**
3 month margin	**=**	**0.5300/5350**

You are required to make an exchange profit of 0.125%. Ignore telex charges and brokerage. What will be your profit? [2]

Answer to (h):

3 month interbank rate (ask) with margin = ₹(48.0600 + 0.5350)
= ₹48,5950

With exchange profit @ 0.125%, the quote will be ₹48.5950 × 1.00125 = ₹48.66

Profit = ₹(48.66 – 48.60) × 2m USD = ₹1,20,000.

(i) The capital structure of a company is as under:
3,00,000 Equity Shares of ₹10 each.
32,000, 12% Preference Shares of ₹100 each
General Reserve ₹15,00,000
Securities Premium Account ₹ 5,00,000
25,000, 14% Fully Secured Debentures of ₹100 each,
Term Loan of ₹13,00,000.
Based on these, calculate the leverage of the company. [2]

Answer to (i):

(a) Fixed income Funds = ₹(32,00,000 + 25,00,000 + 13,00, 000)

(b) Equity Funds = ₹(30,00,000 + 15,00,000 + 5,00,000)

Leverage = $\frac{a}{a+b} = \frac{₹70,00,000}{1,20,00,000} = 58.33\%$

(j) The standard deviation of Greaves Ltd. stock is 24% and its correlation coefficient with market portfolio is 0.5. The expected return on the market is 16% with the standard deviation of 20%. If the risk-free return is 6%, calculate the required rate of return on Greaves Ltd. script. [2]

Answer to (j):

R_f (risk free return) as 6%
R_m (Market return) as 16%
σ_m (standard deviation of market return) as 20%.
σ_g (standard deviation of Greaves stock) as 24%,
And P_{gm} (correlation coefficient of Greaves stock) and then use the CAPM formula for the required return on Greaves stock.

Beta of Greaves stock = $\frac{P_{gm} \times \sigma_g \times \sigma_m}{(\sigma_m)^2} = \frac{0.5 \times 0.24 \times 0.20}{(0.20)^2} = 0.6$

The required return = $R_f + \beta_g (R_m - R_f) = 6\% + 0.6 (16 - 6) = 12\%$

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

2(a)(i). A mutual fund has a NAV of ₹8.50 at the beginning of the year. At the end of the year NAV increases to ₹9.10. Meanwhile fund distributes ₹0.90 as dividend and ₹0.75 as capital gains.

I. Calculate the fund's return during the year.

II. Assuming that the investor had 200 units and also assuming that the distributions been re-invested at an average NAV of ₹8.75, find out the return. [2+4]

Answer to 2(a)(i):

I. Return for the year (all changes on a per unit basis):

Change in price (₹9.10 – ₹8.50)	=	₹0.60
Dividends received		0.90
Capital gains distributions		0.75
Total return		₹2.25
Holding period return	=	$\frac{₹2.25}{₹8.50} \times 100 = 26.47\%$

II. When all dividends and capital gains distributions are reinvested into additional units of the fund (₹8.75/unit):

Dividends and capital gains per unit:	₹0.90 + ₹0.75	= ₹1.65
Total received from 200 units:	₹1.65 × 200	= ₹330.00
Additional units acquired:	₹330/₹8.75	= 37.7 unit
Value of 237.7 units held at end of year	= 237.7unit × ₹9.10 = ₹2,163	
Price paid for 200 units at beginning of year	200 units × ₹8.50	= ₹1,700
Thus, the holding period return would be: =	(2,163 – 1,700)/1,700	= 27.24%

2(a) (ii). State the Forward Market Commission of India. [2]

Answer to 2(a)(ii):

The Forward Markets Commission is a regulatory body for commodity markets in India. The forward contracts in commodities are regulated as per F.C.(R) Act, 1952 by this body. Inherent objective is to achieve price stability by means of price discovery and risk management. The Commission also collects information regarding the trading conditions in respect of goods to which any of provisions of Act is made applicable. It also advises Central Government regarding recognition of associations.

2(b)(i). From the following particulars, calculate the effective rate of interest p.a. as well as the total cost of funds to Bhaskar Ltd., which is planning a CP issue: [2+2]

Issue Price of CP	**:**	**₹97,550**
Face Value	**:**	**₹1,00,000**
Maturity Period	**:**	**3 Months**
Issue Expenses	**:**	
Brokerage	**:**	**0.15% for 3 months**
Rating Charges	**:**	**0.50% p. a.**
stamp Duty	**:**	**0.175% for 3 months**

Answer to 2(b)(i):

$$\text{Effective interest} = \left(\frac{F-P}{P}\right)\times\frac{12}{M}\times 100$$

Substituting the given values of F, P and M we get,

$$\text{Effective Interest} = \left(\frac{1,00,000 - 97,550}{97,550}\right)\times\frac{12}{3}\times 100 = 10.05\%$$

Cost of funds to the company

Effective interest rate	=10.05%
Brokerage (0.15 × 4)	= 0.60%
Rating charges	= 0.50%
Stamp Duty (0.175 × 4)	= 0.70%
Total cost of Funds to Bhaskar Ltd.	**= 11.85% p.a.**

2(b) (ii). List the key elements of a well – functioning Financial System. [4]

Answer to 2(b)(ii):

Key elements of a well-functioning financial system are:

(i) A strong legal and regulatory environment;

(ii) Stable money;

(iii) Sound public finances and public debt management;

(iv) a central bank;

(v) a sound banking system;

(vi) an information system; and

(vii) well functioning securities market.

2(c)(i). Suppose a bank offers a 6-month CD at an annual percentage rate of 11.5% compounded monthly and a 1-year CD with an annual percentage rate of 11.3% compound weekly. You are required to find out which of them offers a higher rate of interest. Assume a face value of ₹1000. [4]

Answer to 2(c)(i):

Effective annual interest rate on the 6 month CD – 11.5% compounded monthly:

A CD paying 11.5% p.a. would pay monthly 11.5%/12 = 0.958%
This when compounded 12 times (corresponding to monthly compounding), we get:
Amount = 1,000 × $(1+ 0.00958)^{12}$ = ₹1121.214
i.e. 12.12% on an investment of ₹1,000.

Effective annual interest rate on the a one year CD -11.3% compounded weekly:
A CD paying 11.3% p.a. would pay weekly 11.3%/52 = 0.217%
This when compounded 52 times (corresponding to weekly compounding), we get:
Amount = 1000 × $(1+ 0.00217)^{52}$ = ₹1119.315
i.e. 11.93% on an investment of ₹1,000.

Comment: The effective annual interest rate of 1st CD is higher than that of the 2nd CD.

2(c)(ii).Explain two main distinguishing features of Project Finance compared to Corporate Finance. [4]

Answer to 2(c)(ii):

Two main distinguishing features of Project Finance compared to Corporate Finance are:

(a) Enhanced verifiability of cash flows: Due to contractual agreements possible because of a single, discrete project in legal isolation from the sponsor and the resultant absence of future growth opportunities in the Project Financed Company. Since Corporate Finance involves a multitude of future and current projects the same contractual agreements cannot be effected in Corporate Finance Company, and

(b) Lack of sponsors' assets and cash flows: In case of Corporate Finance the lender has a potentially larger pool of cash flows from which to get paid as compared to Project Finance where the cash flows from the project only are used to pay the investors.

According to some empirical researches, Project Finance is more likely than Corporate Finance in countries where the investor protection against managerial self-dealing is weaker and investor protection is low. This can be better understood in terms of comparison between the neighboring countries: India and China. India used predominantly Project Financing for Infrastructure Projects while China has started using Capital Finance for its huge infrastructure projects.

2 (d). Two funds are available for investment. Fund A is being launched today i.e. 30/9/2005 and available for investment at ₹10 per unit. A similar fund B (same risk profile like Fund A) is also available for investment at ₹19.45 per unit. The information of quarterly NAV for the next three quarters are available as given below.

Closing NAV	Fund A	Fund B
30/09/2015	10	19.45
31/12/2015	11.1567	21.50
31/03/2016	14.768	27.15
30/06/2016	12.8554	23.69

Assuming that investor X prefers fund A and investor Y prefers Fund B for investment through SIP (Systematic Investment Plan) each installment entailing ₹2,000 for the four quarters including the initial investment, which investor (X or Y) would clock a higher return on investment, as on 30/6/2006? (Ignore time value of money). Is the difference in return because of one investor chose to invest at ₹10 and the other at ₹19.45? [8]

Answer to 2(d):

Amount in ₹	Fund A		Fund B	
Installment = 2000	NAV	Units	NAV	Units
30/09/2015	10.0000	200.0000	19.4500	102.8278
31/12/2015	11.1567	179.2645	21.5000	93.0233

31/3/2016	14.7680	135.4280	27.1500	73.6648
30/6/2016	12.8554	155.5766	23.6900	84.4238
		670.2691		353.9397
Value	670.2691 ×12.8554	8616.577	353.9397 × 23.69	8384.830
Investment		8000		8000
Return	616.577/8000	7.71%	384.83 / 8000	4.81%

X has fetched a higher return from Fund A. The difference in performance is not due to investing at the ₹10 or ₹19.45. It is due to comparative poor performance of Fund B during the period.

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

3(a)(i).The Price of Infosys Stock of a Face Value of ₹10 on 31st December was ₹350 and the Futures Price on the same stock on the same date i.e. 31st December for March (next year) was ₹370.

Other features of the contract are as –

- **Time to expiration 3 months (0.25 year)**
- **Annual dividend on the stock of 30% payable before 31st March.**
- **Borrowing rate is 20% p. a.**

Based on the above information, calculate Future Price for Infosys stock on 31st Dec. Also explain whether any arbitrage opportunity exists. [5+3]

Answer to 3(a)(i):

Securities of	**Infosys**
Spot price [Sx]	₹350
Expected rate of Dividend [y]	30% or 0.30
Borrowing rate	20%
Tenor/Time Period [t] in years	3 Months or 0.25 Year
Theoretical Forward Price [TFP_x] $TFPx = (AS_x \times e^{rt}) -$ Dividend at T_3	$= ₹350 \times e^{0.20\times0.25} - (30\% \times 10)$ $= ₹350 \times e^{0.05} - 3$ $= (₹350 \times 1.0513) - 3$ **= ₹364.96**
3 – Months Futures Contract rate [AFP_x]	₹370
TFP_x Vs. AFP_x	AFP_x is Higher
Inference	AFP_x is overvalued
Recommended action	Buy spot, Sell Future.

Note: Since the dividend is payable at t_3, no discounting is required.

Cash Flows arising out of the Activities to gain on the Arbitrage.

	₹
(a) Borrow for a period of 3 months and Buy Stock at T_0	₹350
(b) Receive the dividend at the end of 3 months	3
(c) Sell the Futures at the Forward price at the end of 3 months	370
(d) Repay the amount of borrowing together with interest = $(350 \times e^{0.20\times0.25})$	367.96
(e) Net Cash Inflow [(b) + (c) – (d)]	**₹5.04**

3. (a) (ii) Describe the two main types of commodity swaps. [2]

Answer to 3(a)(ii):

Two main types of commodity swaps are:

- **Fixed-floating commodity swaps** are similar to the interest rate fixed-floating swaps except that both legs are commodity based. These are used by commodity producers and consumers to lock in commodity prices.
- **Commodity for interest swaps** are similar to equity swaps, in which a total return on the commodity is exchanged for some money market rate (plus or minus a spread).

3(b)(i). M/s Parker & Company is contemplating to borrow an amount of ₹60 Crores for a period of 3 months in the coming 6 month's time from now. The current rate of Interest is 9% p.a. but it may go up in 6 months' time. The Company wants to hedge itself against the likely increase in Interest Rate. The Company 'Bankers quoted an FRA (Forward Rate Agreement) at 9.30% p.a.

What will be the effect of FRA and actual rate of Interest Cost to the company, if the actual arte of Interest after 6 months happens to be (i) 9.60% p.a. and (ii) 8.80% p.a.? [3+3]

Answer to 3(b)(i):

Particulars	If Actual rate is 9.60%	If Actual rate is 8.80%
Forward Rate quoted by bank	9.30%	9.30%
Profit/(Loss)	Since the Actual rate is higher than the FRA, the profit is 9.60 – 9.30 = 0.30	Since the actual rate is lower than the FRA, the Loss is 8.80 – 9.30 = (0.50)
Profit/(Loss) on Settlement **(See Note Below)**	$60\,\text{Crores}\times\frac{(0.096-0.093)\times\left(\frac{3}{12}\right)}{1+0.096\left(\frac{3}{12}\right)}$ = 60 Crores × (0.00075 ÷ 1.024) = 4,39,453	$60\,\text{Crores}\times\frac{(0.088-0.093)\times\left(\frac{3}{12}\right)}{1+0.080\left(\frac{3}{12}\right)}$ = 60 Crores × (0.00125 ÷ 1.02) = (7,35,294)

Note: Profit/ (Loss) on settlement is identified using the following –

$$\textbf{Profit/(Loss)} = \text{Principal} \times \frac{(\text{Actual Rate} - \text{Forward Rate}) \times \left(\frac{\text{Period}}{12}\right)}{1 + \text{ActualRate}\left(\frac{\text{Period}}{12}\right)}$$

3(b)(ii). MNC rolls over a $25 million loan priced at LIBOR on a three-month basis. The company feels that interest rates are rising and that rates will be higher at the next roll-over date in three months. Suppose the current LIBOR is 5.4375%. Explain how MNC can use FRA at 6% offered by a bank to reduce its interest rate risk on this loan. In three months, if interest rates have risen to 6.25%, how much will MNC receive/pay on its FRA? Assume the three month period as 90 days. [4]

Answer to 3(b)(ii):

MNC can use 3 × 6 FRA, if it expects that the rates would be higher at the next roll-over of three months, starting three months from today. In other words MNC would buy 3 ×6 FRA @ 6%, clearly with a view that higher rate would prevail on the settlement date i.e. 3 months from now.

Now if on the settlement date, the rate is 6.25%, then MNC's decision to buy 3 × 6 FRA has been proved right and it would receive the present value of the interest differentials on the loan amount i.e. it would receive:

$$\text{Payoff} = \text{Notional Amount} \times \frac{(\text{Reference Rate} - \text{Fixed rate})}{1 + \text{Reference Rate} \times a} \times (a \text{ is the day count function})$$

$$= \$2,50,00,000 \times \frac{(0.0625 - 0.0600) \times 90/360}{1 + 0.0625 \times 90/360} = \$15,385$$

3 (c). Given the following:

Strike price	**₹200**
Current stock price	**₹185**
Risk free rate of interest	**5 % p.a**

I. Calculate the theoretical minimum price of a European put option after 6 months.

II. If European put option price is ₹5 , then how can an arbitrageur make profit. [4+6]

Answer to 3(c):

I. Computation of theoretical Minimum price

Particulars	Value
Exercise price	₹200
Current Stock Price	₹185
Risk Free Rate of Return (r)	5% or 0.05

Time (in years)	6 ÷ 12 = 0.5
Theoretical Minimum Price	= Present Value of Exercise Price - Current Stock Price = 200 × e^{-rt} – 185 = 200 + $e^{0.05\times0.5}$ – 185 = (200 ÷ 1.02532) – 185 = 195.0611 – 185 = 10.0611

Inference: Since the Value of Put Option is more than the price of the Put Option, it is under priced and the recommended action will be to buy the Put Option.

II. Cash Flows to make Profit for the Arbitrageur Activity Flow:

1. Arbitrageur can borrow the amount required to buy the Put Option and Stock at the rate of 5% p.a. for 6 months.
2. Buy Put Option.
3. Take the opposite position and buy stock at spot price.
4. At the end of six months, exercise the Put option and realise the receipts.
5. Pay the amount of Borrowing together with Interest.

Particulars	Time	₹
1. Borrow at the rate of 5% for 6 months [185 + 5]	T_0	190
2. Buy Put Option	T_0	(5)
3. Buy Stock at Spot Price	T_0	(185)
4. Exercise the Put Option and realise the Sale Proceeds	T_1	200
5. Repay the amount of Borrowing together with Interest [190 $e^{0.05\times0.5}$] = [190 × 1.02532]	T_1	194.81
6. Net Gain made [(4) - (5)]	T_1	**5.19**

Note: the amount of gain is the minimum amount and will increase with every increase in Spot Price as on the Exercise Date.

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

4(a)(i). Suppose that all stocks have a rate of return with a standard deviation of 40% and that the correlation between rates of returns for all pairs of stocks is 0.6.

I. Consider forming an equally-weighted portfolio of 10 stocks. Calculate the standard deviation of this port-folio's return?

II. How many stocks would be required in an equally-weighted portfolio in order to have a portfolio standard deviation of 31%? [4+2]

Answer to 4(a)(i):

I. The variance of N = 10 stock portfolios would comprise of 10 variance terms + 10(10-1) covariance/correlation terms.

$$= \left[N \times w_1^2 \sigma_i^2 + \sum_{i=1}^{N} \sum_{i=1}^{N} w_i w_j \sigma_i \sigma \rho_{ij} \right]^{1/2}$$

Since weights, standard deviation and correlation coefficient are same for all the ten stocks,

$$= \left[10 \times w_{i\ i^2}^2 + 10(10-1) w_i^2 \sigma_i^2 \rho_{ij} \right]^{1/2}$$

$= [10 \times (1/10)^2 (0.4)^2 + 10(10 - 1)(1/10)^2 (0.40)^2 (0.6)]^{1/2}$

= 32%

II. Now we are given the portfolio risk, and we are asked to find N. Therefore we have the

LHS = 0.31 and RHS = $\left[N \times \left(1/N \right)^2 (0.4)^2 + N(N-1) \left(1/N \right)^2 (0.40)^2 (0.6) \right]^{1/2}$

Solving we get N = 640 stocks.

4(a)(ii). State gross national product analysis. [2]

Answer 4(a)(ii):

Gross National Product Analysis: Gross National Product (GNP) as a measure national income reflects the growth rate in economic activities and is regarded as a forecasting tool for analyzing the overall economy along with its various components during a particular period.

4 (b). Currently the risk-free rate equals 5% and the expected return on the market portfolio equals 11%. We also have the following information:

Stock	Beta	Expected Return
A	1.33	12%
B	0.70	10%
C	1.50	14%
D	0.66	9%

I. Which stock has the highest reward to risk ratio and which has the lowest?

II. Show how an investor could construct a portfolio of stocks C and D that would outperform stock A.

III. Construct a portfolio consisting of some combination of the market portfolio and the risk-free asset such that the portfolio's expected return equals 9%. What is the beta of this portfolio? What does this say about stock D? [4+2+2]

Answer to 4(b):

I. The reward to risk ratio can be found as: $(R_s - R_f) / \beta_s$. We calculate for each of these stocks below:

A: (12- 5)/1.33 = 5.26

B: (10- 5)/0.7 = 7.14

C: (14 - 5)/1.5 = 6

D: (9- 5)/0.66 = 6.06

We have market risk premium =11- 5 = 6%. C, the fairly priced stock, has a ratio exactly equal to the market risk premium of 6%. The overvalued stock has a ratio less than the market risk premium and the under priced stocks have ratios greater than the market risk premium.

II. A portfolio of C and D that would equal the return of A can be found, by assuming proportion of investment in C as X and solving the equation X × 14 + (1- X) × 9 =12. Solving for X, we get X = 0.60. Any portfolio with more than 60% of stock C will have a return greater than the return of stock A.

III. A portfolio with a return of 9% combining the risk free rate and market can be found, by assuming proportion of investment in risk free rate as X and solving the equation X × 5 + (1 - X) × 11 = 9. Solving for X, we get X = 0.33. Therefore the portfolio beta =1/3 × 0 + 2/3 ×1= 0.66. This is same as stock D's risk & return.

4(c)(i).Century is an Indian conglomerate, with holdings in Cement & Textiles. The beta estimated for the firm, relative to the Indian stock exchange is 1.15, and the long term government borrowing rate in India is 11.5% and market risk premium is 12%.

I. Estimate the expected return on the stock.

II. If you are an international investor, what concerns if any, would you have about using the beta estimated relative to the Indian Index? If you have concerns, how would you modify the beta? [2+3]

Answer to 4(c)(i):

I. The expected return on this Indian stock is given by the CAPM that shows the minimum return on the stock expected by investors. The CAPM gives k_e = 0.115 + (1.15)(0.12) = 0.25 or 25%

II. The beta estimated relative to the Indian index may be a good estimate of risk for a Indian investor. However, an international investor would be better off using a beta for that stock that has been estimated relative to an international index, such as the Morgan Stanley Capital Index. This index captures better the returns of the market portfolio that an internationally diversified investor holds.

4(c)(ii).A fund manager knows that her fund currently is well diversified and that it has a CAPM beta of 1.0. The risk-free rate is 8 percent and the CAPM risk premium is 6.2 percent. She has been learning about APT measures of risk and knows that there are

(at least) two factors: changes in the industrial production index, d1, and unexpected inflation, d2. The APT equation is E (Ri) = 0.08 + 0.05 b_i1 + 0.11b_i2.

I. If her portfolio currently has a sensitivity to the first factor of bp1= - 0.5, calculate its sensitivity to unexpected inflation.

II. If the fund manager rebalances her portfolio to keep the same expected return but to reduce the exposure to inflation to zero, calculate the portfolio's sensitivity to the first factor. [2+1]

Answer:

I. The general APT equation is given by:

E (R) = 0.08 + 0.05b_i1 + 0.11 b_i2

The sensitivity to the first factor if - 0.5; Using the expected return (as arrived at from CAPM), we can calculate b_i2:

As per CAPM,

E (R_i) = 8 + 1 × (6.2) = 14.2%

Substituting in the APT equation,

0.142 = 0.08 + 0.05 × (-0.5) + 0.11 × b_i2

We get, b_i2 = 0.79

II. By keeping E (R_i) = 14.2% & substituting b_i2 = 0,, we can use the same equation to find b_i1 and we get:

∴ 0.142 = 0.08 + 0.05 b_i1 + 0

∴ b_i1 = 1.24

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

5 (a) JKL Ltd. has the following book-value capital structure as on March 31, 2015.

	Amount in (₹)
Equity Share capital (2,000 shares)	**40,00,000**
11.5% preference shares	**10,00,000**
10% Debentures	**30,00,000**
	80,00,000

The equity share of the company sells for ₹20. It is expected that the company will pay next year a dividend of ₹2 per equity share, which is expected to grow at 5% p.a. forever. Assume a 35% corporate tax rate. Required:

I. Compute weighted average cost of capital (WACC) of the company based on the existing capital structure.

II. Compute the new WACC, if the company raises an additional ₹20 lakhs debt by issuing 12% debentures. This would result in increasing the expected equity dividend to ₹2.40 and leave the growth rate unchanged, but the price of equity share will fall to ₹16 per share.

III. Comment on the use of weights in the computation of weighted average cost of capital. [3+3+(2+2)]

Answer to 5(a):

I. Computation of weighted Average cost of capital of the company

Capital Structure	Amount	Cost of Capital	Weights	WACC
Equity Share Capital	40,00,000	15%	0.500	7.50%
11.5% Preference Shares	10,00,000	11.5%	0.125	1.4375%
10% Debentures	30,00,000	6.5%	0.375	2.4375%
	80,00,000		1.000	11.375%

Working Notes:

1. Cost of Equity Capital (K_e) = $\frac{D_1}{P_O} + g$ = $\frac{₹2}{₹20} + 5\% = 15\%$

2. Cost of Preference Share Capital (K_p) = $\frac{D}{P} = \frac{₹11.5}{₹100} = 11.5\%$

3. Cost of New Debentures (K_d) = $\frac{I(1-t)}{P}$ = $\frac{₹10(1-0.35)}{₹100} = 6.5\%$

II. Computation of New weighted Average cost of Capital of the company

Capital Structure	Amount (₹)	Cost of Capital	Weights	WACC
Equity Share Capital	40,00,000	20%	0.40	8.00%
11.5% Preference Shares	10,00,000	11.5%	0.10	1.15%
10% Debentures	30,00,000	6.5%	0.30	1.95%
12% Debentures	20,00,000	7.8%	0.20	1.56%
	1,00,00,000		1.00	12.66%

Working notes: Cost of Equity Capital (K_e) = $\frac{D_1}{P_O} + g = \frac{₹2.40}{₹16} + 5\% = 20\%$

III. Comment:

(a) Book Value Weights: The weights are said to be book value weights if the proportions of different sources are ascertained on the basis of the face value i.e., the accounting values. The book value weights can be easily calculated by taking the relevant information from the capital structure as given in the balance sheet of the firm. Based on the value proportions in the company's Balance Sheet, this represents the proportion a particular source of financing has in the Balance Sheet total.

(b) Market Value Weights: The weights may also be calculated on the basis of the market value of different sources i. e,, the proportion of each source at its market value. In order to calculate the market value weights, the firm has to find out the current market price of the securities in each category. However, a problem may arise if there is no market value available for a particular type of security.

5 (b). Nine Gems Ltd. has just installed Machine R at a cost of ₹2,00,000. The machine has a five-year life with no residual value. The annual volume of production is estimated at 1,50,000 units, which can be sold at ₹6 per unit. Annual operating costs are estimated at ₹2,00,000 (excluding depreciation) at this output level. Fixed costs are estimated at ₹3 per unit for the same level of production.

Nine Gems Ltd. has just come across another model called Machine — S capable of giving the same output at an annual operating cost of ₹1,80,000 (exclusive of depreciation). There will be no change in fixed costs. Capital cost of this machine is ₹2,50,000 and the estimated life is for five-years with nil residual value.

The company has an offer for sale of Machine — R at ₹1,00,000. But the cost of dismantling and removal will amount to ₹30,000. As the company has not yet commenced operations, it wants to sell Machine — R and purchase Machine — S. Nine Gems Ltd. will be a zero-tax company for seven years in view of several incentives and allowances available. The cost of capital may be assumed at 14%.

P. V. factors for five years are as follows:

Year	1	2	3	4	5
PVF	0.877	0.769	0.675	0.592	0.519

I. Advise whether the company should opt for the replacement.

II. Will there be any change in your view, if Machine — R has not been installed but the company, is in the process of selecting one or the other machine?

Support your view with necessary workings. [6+4]

Answer to 5 (b):

I. Statement showing evaluation of Replacement Proposal

Particulars		Time	P.V. Factor	Amount in (₹)	PV in (₹)
Cash Outflows:					
Cost of machine				2,50,000	
Less: Scrap value				(70,000)	
Sale Proceeds	₹1,00,000				
Less: Dismantling & removal costs	₹(30.000)				
Net Cost of Replacement		0	1	1,80,000	1,80,000
PVCO (A)					**1,80,000**
Cash Inflows:					
Incremental CFAT [2,00,000 - 1,80,000]		1-5	3.432	20,000	68,640
PVCI (B)					**68,640**
NPV (B) - (A)					**(1,11,360)**

Advise: No, the company should not opt the replacement.

II. Statement showing Evaluation of Proposal:

	Time	PV Factor	Machine R		Machine S	
			Amount in (₹)	PV in (₹)	Amount in (₹)	PV in (₹)
Cash Outflows:						
Cost of machine	0	1	2,00,000	2,00,000	2,50,000	2,50,000
Annual Operating Costs	1-5	3.432	2, 00,000	6,86,400	1,80,000	6,17,760
PVCO				8,86,400		8,67,760

Advise: Machine S should be installed as it has lower PVCO.

5 (c). A company is engaged in evaluating an investment project, which requires on initial cash outlay of ₹2,50,000 on equipment. The project's economic life is 10 years and its salvage value ₹30,000. It would require current assets of ₹50,000. An additional investment of ₹60,000 would also be necessary at the end of five years to restore the efficiency of the equipment. This would be written off completely over the last five years. The project is expected to yield Annual (before tax) Cash Inflow of ₹1,00,000. The company follows sum of year's digit method of depreciation. Income tax is assumed to be 40%. Should be project be accepted if the minimum required rate of return is 20%? [10]

Note: PVs of ₹1at 20% discount rate are as follows:

Year	1	2	3	4	5	6	7	8	9	10
PVF	0.833	0.694	0.579	0.482	0.402	0.335	0.279	0.233	0.194	0.162

Answer to 5 (c):

Statement showing computation of PVCO:

Particulars	Time	PVF	Amount	PVF
Cash outflows:				
Initial Cash outlay of equipment	0	1	2,50,000	2,50,000
Working capital/Current Assets	0	1	50,000	50,000
Additional investment to restore efficiency of equipment	5	0.402	60,000	24,120
PVCO (A)				3,24,120

Statement showing computation of PVCI:

Particulars	1	2	3	4	5	6	7	8	9	10
CFBT (1)	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000
Less: Depreciation	(40,000)	(36,000)	(32,000)	(28,000)	(24,000)	(20,000)	(16,00)	(12,000)	(8,000)	(4,000)
Less: Additional Depreciation						(20,000)	(16,000)	(12,000)	(8,000)	(4,000)
PBT	60,000	64,000	68,000	72,000	76,000	60,000	68,000	76,000	84,000	92,000
Tax Liability (2) (40%)	24,000	25,600	27,200	28,800	30,400	24,000	27,200	30,400	33,600	36,800
CFAT (1) – (2)	76,000	74,400	72,800	71,200	69,600	76,000	72,800	69,600	66,400	63,200
Add: Terminal Value										80,000
	76,000	74,400	72,800	71,200	69,600	76,000	72,800	69,600	66,400	1,43,200
PV Factor	0.833	0.694	0.579	0.482	0.402	0.335	0.279	0.233	0.194	0.162
PVCI (B)	63,308	51,634	42,151	34,318	27,979	25,460	20,311	16,217	12,882	23,198

Particulars	Amount in (₹)
Total PVCI	3,17,458
Less: PVCO	(3,24,120)
NPV	(6,662)

Advise: reject the proposal