Semester – II : Mathematical Finance

Question Bank

Unit-1	Time value of money
[A]	**5 – Marks Questions**
1.	Write a short note on time value of money.
2.	State and discuss the different compounding method in detail.
3.	Explain the mechanism of calculating the present value of cash flow.
4.	Nano Ltd. Expects cash inflows from its investment proposal it has undertaken in time period 1 is Rs. 3,55,567 and 2 is Rs. 1,60,876. And then expects 1,05,100 for next seven years, determine the present value of cash inflow. i=10.
5.	Mr. Sharma has been given an opportunity to receive Rs. 2500 two year from now at 7% interest rate. What amount he is prepared to invest for his opportunity?
6.	Determine the present value of the cash inflows of Rs 3,000 at the end of each year for next 4 years and Rs 7,000 and Rs 1,000 respectively at the end of years 5 and 6. The appropriate discount rate is 14 per cent.
7.	Mr. Kishor deposits Rs. 2,000/- at the end of every year for 5 years in his saving account paying 5 per cent interest compounded annually. He wants to determine how much sum of money he will have at the end of the 5^{th} year.
8.	Ms. Daxsha deposits Rs. 20,000/- at the end of every year for 7 years in his saving account paying 5 per cent interest compounded semi annually. He wants to determine how much sum of money he will have at the end of the 7^{th} year.
9.	Assume that you are given a choice between incurring an immediate outlay of Rs 10,000 and having to pay Rs 2,310 a year for 5 years (first payment due one year from now); the discount rate is 11 per cent. What would be your choice? Will your answer change if Rs 2,310 is paid in the beginning of each year for 5 years?
10.	Mr Sundaram is planning to retire this year. His company can pay him a lump sum retirement payment of Rs 2,00,000 or Rs 25,000 lifetime annuity—whichever he chooses. Mr Sundaram is in good health and estimates to live for at least 20 more years. If his interest rate is 12 per cent, which alternative should he choose?
11.	Shalini deposits Rs. 8,55,533/- at the end of every year in his saving account paying 7 per cent interest compounded annually. She wants to determine how much sum of money she will have at the end of 6^{th} year?
[B]	**10 – Marks Questions**
1.	Find out the present value of future cash flow of i. Rs. 1000 deposited at the end of 1^{st} year ii. Rs. 2000 deposited at the end of 2^{nd} and 3^{rd} year iii. Rs. 3000 deposited at the end of 4^{th} and 5^{th} year iv. Rs. 4000 deposited at the end of 6^{th} and 7^{th} year and v. Rs. 5000 deposited at the end of 8^{th} year. Assume interest rate is 12%.
2.	If Sharma & Co. expects cash inflows from its investment proposal it has undertaken in time period zero, Rs. 2,00,000 and Rs. 1,50,000 for the first two years respectively and then expects annuity payment of Rs. 1,00,000 for the next eight years, what would be the present value of cash inflows, assuming a 10 per cent rate of interest.
3.	Compute the present value of each of the following cash flows using a discount rate of

	13 per cent: i. Rs 2,000 cash outflow immediately. ii. Rs 6,000 cash inflow one year from now. iii. Rs 6,000 cash inflow two years from now. iv. Rs 4,000 cash outflow three years from now. v. Rs 7,000 cash inflow three years from now. vi. Rs 3,000 cash inflow four years from now. vii. Rs 4,000 cash inflow at the end of each of the next five years.
4.	If Suhani & Co. expects cash inflows from its investment proposal it has undertaken in time period zero, Rs. 5,00,000 and Rs. 3,50,000 for the first two years respectively and then expects annuity payment of Rs. 2,50,000 for the next eight years, what would be the present value of cash inflows, assuming a 8 per cent rate of interest.
5.	Jaykumar is planning for his retirement. He is 45 years old today, and would like to have Rs 3,00,000 when he attains the age of 60. He intends to deposit a constant amount of money at 12 per cent at each year in the public provident fund in the State Bank of India to achieve his objective. How much money should Jai Chand invest at the end of each year for the next 15 years to obtain Rs 3,00,000 at the end of that period?
6.	If Dhyani Ltd. expects cash inflows from its investment proposal it has undertaken in time period zero, Rs. 2,50,000 and Rs. 2,20,000 for the first two years respectively and then expects annuity payment of Rs. 1,20,000 for the next eight years, what would be the present value of cash inflows, assuming a 9 per cent rate of interest.
7.	Compute the present value of each of the following cash flows using a discount rate of 13 per cent: i. Rs 5,000 cash outflow immediately. ii. Rs 7,000 cash inflow one year from now. iii. Rs 8,500 cash inflow two years from now. iv. Rs 9,700 cash outflow three years from now. v. Rs 9,600 cash inflow three years from now. vi. Rs 4,500 cash inflow four years from now. vii. Rs 9,800 cash inflow at the end of each of the next five years.
8.	Determine the future values utilizing a time preference rate of 9 per cent: i. The future value of Rs 15,000 invested now for a period of four years. ii. The future value at the end of five years of an investment of Rs 6,000 now and of an investment of Rs 6,000 one year from now. iii. The future value at the end of eight years of an annual deposit of Rs 18,000 each year. iv. The future value at the end of eight years of annual deposit of Rs 18,000 at the end of each year. v. The future values at the end of eight years of a deposit of Rs 18,000 at the end of the first four years and withdrawal of Rs 12,000 per year at the end of year five through seven.
9.	Determine the compounded value of the following: i. Mr. Lakshya invest Rs. 4,500 at 5 percent interest compounded annually, how much he will get after 5 year? ii. Ms. Roshani invest Rs. 8750 at 7 per cent interest compounded semi annually, how much he will get at the end of 5^{th} year?

	iii. Mr. Malya invest 12,700 at 9% interest compounded quarterly, how much he will get at the end of 3rd year.
10.	Assume Mr. Dravid places his saving of Rs. 5000 in a 5 year time deposit scheme of a bank which yields 6 per cent interest compounded semi-annually. He will be paid 3 percent interest compounded over 10 periods-each of six month duration. Determine the value over a period of years.
Unit-2	**Valuation of Bonds and Shares**
[A]	**5 – Marks Questions**
1.	Briefly explain concepts of value.
2.	Write down meaning of following term: i. Book value ii. Market value iii. Maturity iv. Premium bond v. Discount bond
3.	Explain the concept of valuation of securities? Why is the valuation concept relevant for financial decision making purposes?
4.	Write a short note on Yield-to-Maturity.
5.	Differentiate between equity share and debenture.
6.	Explain in detail the method of valuing an ordinary share.
7.	Suppose the price of the share today is Rs.20 and it is expected to increase at an annual rate of 5%. Expected dividend at the end of 1st year is Rs. 2 and it is also expected to grow at a rate of 5 % per annum. Opportunity cost of capital is 15%. What would be the price of share if it is hold for 5 Year?
8.	Laxmi marble co. earned Rs. 6 per share and paid Rs. 3.48 per share as dividend in previous year. Its earnings are expected to grow at 15% for 6 years and then at a rate of 8% indefinitely. The capitalization rate is 18%. What is the price of share today?
9.	The share of Shraddha Ltd. will pay a dividend of Rs. 5 per share after a year. It is currently selling at Rs. 60/- and it is estimated that after a year the price will be Rs. 65/-. What is the present value of the share if the required rate of return is 8%? Should share be bought?
10.	The bond of premier company Ltd. is currently selling for Rs. 10,800. Assuming a coupon rate of interest 10%. Par value Rs. 10,000. Years to maturity 10 years. Interest paid annually. Compute YTM.
11.	A company has issued Rs. 100 irredeemable preference shares on which it pays a dividend of Rs. 9. Assume that this type of preference share is currently yielding a dividend of 11%. What is the value of preference share?
12.	A company has paid a dividend of Rs. 3.70 in a previous year and dividend in future expected to grow at 8%. Find out current market price of share, if capitalization rate is 5 per cent.
13.	The bond of premier company Ltd. is currently selling for Rs. 12,800. Assuming a coupon rate of interest 8%. Par value Rs. 11,000. Years to maturity 8 years. Interest paid annually. Compute YTM.
14.	Suppose investor expects the share to pay dividend of Rs. 2 next year and would sell the share at an expected price of Rs. 21 at the end of the year. If the investor

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	opportunity cost of capital is 15%, find out the value of share today.
[B]	**10 – Marks Questions**
1.	The government is proposing to sell a 10 year bond of Rs. 5,00,000 at 9% rate of interest per annum. The bond amount will be amortized equally over its life. If an investor has a minimum required rate of return of 10%, what is a bond present value for him?
2.	Central bank is proposing to sell a 10 year bond of Rs. 10,00,000 at 12% rate of interest per annum. The bond amount will be amortized equally over its life. If an investor has a minimum required rate of return of 10%, what is a bond present value for him?
3.	The government is proposing to sell a 10 year bond of Rs. 2,50,000 at 8% rate of interest per annum. The bond amount will be amortized equally over its life. If an investor has a minimum required rate of return of 9%, what is a bond present value for him?
4.	A company earned Rs. 6 per share and paid Rs. 3.48 per share as dividend in previous year. Its earnings are expected to grow at 15% for 6 years and then at a rate of 8% indefinitely. The capitalization rate is 18%. What is the price of share today?
5.	The government company is proposing to sell a 10 year bond of Rs. 12,00,000 at 12% rate of interest per annum. The bond amount will be amortized equally over its life. If an investor has a minimum required rate of return of 10%, what is a bond present value for him?
6.	What is debenture? Explain the features of debenture in detail.
7.	Explain preference share. Discuss it features in detail.
8.	Define equity share. Discuss the features and advantage of equity share.
9.	Write a short note on following method of valuing: (i) Bonds with perpetuity (ii) Bonds with maturity
10.	(a) A Rs. 100 perpetual bond is currently selling for Rs. 95. The coupon rate of interest is 13.5 per cent and the appropriate discount rate is 15 per cent. Calculate the value of bond. Should it be bought? Why is it yield at maturity? (b) A company proposes to sell ten-year debenture of Rs. 10,000/- each. The company would repay Rs. 1,000/- at the end of every year and will pay interest annually at 15 per cent on the outstanding amount. Determine the present value of the debenture issue if the capitalization rate is 16 per cent.
11.	The MD of a company decides that his company will not pay any dividend till he survives. His current life expectancy is 20 years. After that time it is expected that company could pay dividend of Rs. 30 per share indefinitely. At present the firm could afford to pay Rs. 5 per share forever. The Required rate is 10 per cent. What is the current value of share? What is the cost to each shareholder of the mananging director's policy?

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Unit-3	Capital Budgeting
[A]	**5 – Marks Questions**
1.	Write a short note on NPV Method.
2.	Discuss in detail IRR method.
3.	Discuss in detail types of capital budgeting decisions.
4.	Define Capital budgeting and explain its significance.
5.	Write a short note on Payback Period Method and Profitability Index.
6.	Explain Average Rate of Return Method.
[B]	**10 – Marks Questions**
1.	X ltd. is initially investing cash outlay of Rs. 50,000/ in a project- and have a life of 5 years. The company's required rate of return is 10% and pays tax at a 50% rate. The project will be depreciated on a straight line basis. The net cash flows expected to be generated by the projects are as follows. Year Project 1 30,000 2 15,000 3 12,000 4 25,000 5 25,000 You are required to calculate: Net present value and Profitable index
2.	A company desire to purchase a machine of Rs. 5,00,000. A machine is to be written off in 5 years by straight line method of depreciation. A discount rate of 10 % is to be used. Cash flows after tax are expected as follows: Year | Machine | PV Factor 1 | 1,50,000 | 0.909 2 | 2,00,000 | 0.826 3 | 2,50,000 | 0.751 4 | 1,50,000 | 0.683 5 | 1,00,000 | 0.621 Find out: (a) Net Present Value (b) Pay Back period (c) Average Rate of Return (d) Profitability Index
3.	A ltd. has investment as under: Year | Cash flow | Discount factor at 12 % 0 | -1,00,000 | - 1 | 20,000 | 0.893 2 | 30,000 | 0.797 3 | 40,000 | 0.712 4 | 40,000 | 0.636 5 | 30,000 | 0.657 The above cash flow is before depreciation and tax. Economic life of the project is 5 years. Depreciation is as per straight line method. Corporate tax is 50%.

Find out:
(a) Average rate of return
(b) Net present value
(c) Profitability index
(d) Payback Period

4. A Company is considering an investment proposal to acquire a new machine. The project will cost Rs. 50,000. The machine has a life expectancy of 5 years and has no salvage value. The tax rate is 55%. The firm uses SLM method for depreciation. The estimated PBDT are as follows.

Years	PBDT (Rs)	PVF@ 10%
1	12,000	0.909
2	11,000	0.826
3	10,000	0.751
4	15,000	0.683
5	20,000	0.621

Compute Average rate of return.

5. A company desire to purchase a machine of Rs. 5,00,000. A machine is to be written off in 5 years by straight line method of depreciation. A discount rate of 10 % is to be used. Cash flows after tax are expected as follows:

Year	Machine	PV Factor
1	50,000	0.909
2	1,50,000	0.826
3	2,00,000	0.751
4	3,00,000	0.683
5	2,00,000	0.621

Find out: Net Present Value, Pay Back period, Average Rate of Return, Profitability Index

6. Modern steels ltd. is considering two mutually exclusive projects. Both require an initial cash outlay of Rs. 50,000/- each and have a life of 5 years. The company's required rate of return is 10% and pays tax at a 50% rate. The project will be depreciated on a straight line basis. The net cash flows expected to be generated by the projects are as follows.

Year	Project A	Project B
1	20,000	30,000
2	20,000	15,000
3	20,000	12,000
4	20,000	25,000

	5	20,000	25,000

You are required to calculate: Payback period, Average rate of return, Net present value and Profitable index

Unit-4	**Portfolio Management**
[A]	**5 – Marks Questions**
1.	Discuss the relationship between simple diversification and risk.
2.	Discuss the process of selection of portfolio.
3.	Explain in detail type of systematic risk.
4.	Discuss in detail various types of risk.
5.	Write a short note on basic concept of CAPM model.
6.	Write a short note on Markowitz Efficient Frontier.
7.	Briefly explain Sharpe single index model.
[B]	**10 – Marks Questions**
1.	A financial analyst is analyzing two investment alternatives, Stock Z and Stock Y. The estimated rates of return and their chances of occurrence for the next year are given below.

Probability of Occurrence	Rate of Return (%)	
	Y	Z
0.20	22	5
0.60	14	15
0.20	- 4	25

(a) Determine expected rates of return, variance and standard deviation of Y and Z.

(b) If the financial analyst wishes to invest half in Z and another half in Y, would it reduce the risk? Explain.

2. Assume you are a portfolio manager. Based on the following details, determine the securities that are overpriced and those that are underpriced in terms of the SML.

Security	Actual Return	B	σ
A	0.33	1.7	0.50
B	0.13	1.4	0.35
C	0.26	1.1	0.40
D	0.12	0.95	0.24
E	0.21	1.05	0.28
F	0.14	0.70	0.18
Nifty Index	0.13	1.00	0.20
T – Bills	0.09	0	0.0

3. The expected rates of return and the possibilities of their occurrence for Alpha company and Beta company scripts are given below.

Probability of Occurrence	Return on Alpha's Script	Return on Beta's Script
0.05	- 2.0	- 3.0
0.20	9.0	6.0
0.50	12.0	11.0
0.20	15.0	14.0
0.05	26.0	19.0

(a) Find out the expected rates of return for Alpha and Beta Scripts.
(b) If an investor invests equally in both the scripts what would be the return.
(c) If the proportion is changed to 25% and 75% and then to 75% and 25%, what would be the expected rates of return.

4. The following data give the market return and the sun company scrip's return for a particular period. Find out beta and correlation.

Index Return	Scrip Return
0.50	0.30
0.60	0.60
0.50	0.40
0.60	0.50
0.80	0.60
0.50	0.30
0.80	0.70
0.40	0.50
0.70	0.60

5. Two companies' returns are given below.

Probability	Security A	Security B
0.5	4	0
0.4	2	3
0.1	0	3

Find out Expected return and Risk for each security

6. Stocks L and M have yielded the following returns for the past two years.

Years	Return	(%)
	L	M
2011	12	14
2012	18	12

(a) What is expected return on a portfolio made up of 60 % of L and 40 % of M?
(b) Find out the Standard Deviation of each stock?
(c) What is the covariance and co – efficient of correlation between stocks L and M?

7. Ms. Shraddha wants to invest in the stocks of Reliance Ltd. and Wipro Ltd. The returns expected from each company and their probabilities of occurrence, are given in the table.

	Reliance Ltd.	Wipro Ltd.
Return%	11 or 7	20 or 8
Probability	0.5 each return	0.5 each return

Find out expected return, variance and standard deviation of each stock.

Suppose Shraddha hold two third of Reliance Ltd. and one third of Wipro Ltd, then find out return (R_p)and portfolio risk (σ_p) of Sradhha's portfolio. Also give your viewpoint for this investment.

8. The following parameters apply to stocks Y and Z.

	Stock Y	Stock Z
Expected Return	20	30
Expected Variance	16	25
Covariance YZ	20	

Is there any advantage to holding a combination of Y and Z?

9. An investor has a choice of four stocks of investment. Their rate of return and probabilities are given below. Find out standard deviation and variance.

A		B		C		D	
Ri	Pi (%)	Ri	Pi (%)	Ri	Pi (%)	Ri	Pi (%)
-30	20	-20	15	-20	20	-10	10
0	40	0	35	10	40	0	25
30	30	20	45	40	30	10	40
70	10	40	5	80	10	20	25