B.A./B.Sc. 5th Semester (Honours) Examination, 2023 (CBCS)

Subject : Mathematics

Course : BMH5DSE22

(Portfolio Optimization)

Time: 3 Hours

Full Marks: 60

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.

Notation and symbols have their usual meaning.

1. Answer *any ten* questions:

   2×10=20

   (a) What do you mean by cash flow?

   (b) Describe the two well known risk premiums.

   (c) Define return relative.

   (d) What are the properties of normal distribution?

   (e) What is a growing annuity?

   (f) Discuss the important turnover ratio.

   (g) What are the different types of financial ratios?

   (h) Explain the important profit margin ratio.

   (i) Discuss the key valuation ratio.

   (j) What is the risk of a 2-security portfolio?

   (k) What is an efficient portfolio?

   (l) State the relationship between covariance and correlation.

   (m) What is the expected return on a portfolio of risky assets?

   (n) Discuss the limitations of betas based on accounting earning.

   (o) What adjustment is done to historical betas?

2. Answer *any four* questions:

   5×4=20

   (a) What is a multifactor model? Describe the types of multifactor models used in practice. 2+3

   (b) Discuss the procedure commonly used in practice to test the CAMP.

   (c) Explain the nature of a risk-return indifference curve.

   (d) What is the risk-free rate? How would you measure it?

   (e) Explain the single index model proposed by William Sharpe.   3+2

   (f) Describe the procedure developed by Markowitz for choosing the optimal portfolio of risky assets.

3. Answer *any two* questions: 10×2=20

(a) Define the return generating process according to APT. What is the equilibrium risk return relationship according to APT?   5+5

(b) The stock of ABC Limited performs well relative to other stocks during recessionary periods. The stock of XYZ Limited, on the other hand, does well during growth periods. Both the stocks are currently selling for Rs. 100 per share. Assess the rupee return (dividend plus price) of these stocks for the next year as follows:

| | Economic Condition | | Stagnation | Recession |
	High Growth	Low Growth		
Probability	0·3	0·4	0·2	0·1
Return on ABC's stock	100	110	120	140
Return on XYZ's stock	150	130	90	60

Calculate the expected return and standard deviation of investment: 3+3+4

(i) Rs. 1,000 in the equity stock of ABC Limited

(ii) Rs. 1,000 in the equity stock of XYZ Limited

(iii) Rs. 500 each in the equity stock of ABC Limited and XYZ Limited.

(c) (i) What is an annuity? What is the difference between an ordinary annuity and an annuity due?

(ii) What is the present value of the following cash flow stream if the discount rate is 14 per cent?   (2+3)+5

Year	0	1	2	3	4
Cash flow	5000	6000	8000	9000	8000

(d) (i) What is the risk of an *n*-security portfolio?

(ii) Show why the covariance term dominates the risk of a portfolio as the number of securities increase.

(iii) How does the efficient frontier change, when the probability of lending and borrowing at a risk-free rate is introduced?   2+5+3