

M.Sc.(Maths.) Semester - 4 (CBCS) Examination
March/April - 2025 (NEW COURSE)
Financial Mathematics (Elective-1)

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

- Que1(A) **Answer any two out of three** (10)
- (1) What are options? Explain Call Option, Put Option, and European Options.
 - (2) Explain in detail: The forward & Future Contract.
 - (3) Explain in detail the term: Over the Counter Market.
- Que-1(B) **Answer any one out of two** (04)
- (1) Write differences between forward and future contracts.
 - (2) Name different indices of the Stock Market.
- Que-2(A) **Answer any two out of three** (10)
- (1) State and Prove Ito's Lemma and extend the result for $f \equiv f(s, t)$.
 - (2) Derive Stochastic differential equation and give mathematical justification of the derived equation.
 - (3) Explain the simple model of asset price.
- Que-2(B) **Answer any one out of two** (04)
- (1) Obtain the Stochastic differential equation for $f(s) = s^n$.
 - (2) Explain the simple model of asset price.
- Que-3(A) **Answer any two out of three** (10)
- (1) Explain the term risk and its types.
 - (2) Explain how the call option value is a function of exercised price and expiration time.
 - (3) How much should one pay now to receive a guaranteed amount at the future time T ? Discuss both cases where the interest rate is independent of time and dependent on time.
- Que-3(B) **Answer any one out of two** (04)
- (1) Explain the significance of Put-Call Parity.
 - (2) A company whose share price is ₹ 200/- offers bonus shares in the ratio 1:1. What will be the asset price, and how should option contracts be altered?
- Que-4(A) **Answer any two out of three** (10)
- (1) Derive the Black-Scholes partial differential equation.
 - (2) Discuss the mathematical significance of the Black-Scholes equation and derive the boundary conditions for European options.
 - (3) State the Heat equation and find its solution.
- Que-4(B) **Answer any one out of two** (04)
- (1) Explain discrete dividend structure and derive the jump conditions for the same.
 - (2) Define dividend yield and explain the constant dividend yield structure.
- Que-5(A) **Answer any two out of three** (10)
- (1) Derive solution of Black-Scholes partial differential equation.
 - (2) Viru holds an option to purchase 100 shares of ICICI bank at ₹500 per share after 1 month. If the share price is ₹350 per share and the cost of the option is ₹200 per share, will Viru exercise the option? Why? Explain.
 - (3) Amit holds an option on 1st March 2020 to purchase 300 shares of Pioneer Industries for ₹5500 per share after one year. If the cost of the option is ₹200 per share and the price of the share is ₹6500 per share on 1st March 2021, then find the total profit for Amit on exercising the option. Also, find the profit percentage corresponding to the upfront premium paid.
- Que-5(B) **Answer any one out of two** (04)
- (1) Explain why a higher asset price on the expiry of a call option leads to greater profit.
 - (2) Explain in detail the term: Derivative Table.
