

M.Sc.(Maths.) Semester - 4 (CBCS) Examination
April/May-2023 (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.

Q.1(A) Answer the following questions. (Any Two) (10)

1. Explain in brief the central idea behind theory and practice of option pricing.
2. Ravi has an option to purchase 50 shares of SKF industries at rupees 400 per share. After one year if the price of share is rupees 300 per share and cost of option is rupees 200 per share then will Ravi exercise his option? Why? Explain the reason.
3. Explain in detail: The Forward & Future Contract.

Q.1(B) Answer the following question. (Any One) (04)

1. Explain: Higher the asset price on expiry of call options, greater the profit.
2. Define the following terms: **(I)** Barrier options **(II)** Look-Back options

Q.2(A) Answer the following questions. (Any Two) (10)

1. State and Prove Ito's Lemma and extend the result for $f \equiv f(s, t)$.
2. How much one should pay now to receive a guaranteed amount at the future time T . (Discuss both the cases, where interest rate is independent of time and dependent on time.)
3. Explain simple model for asset price.

Q.2(B) Answer the following question. (Any One) (04)

1. Derive stochastic differential equation for the function $f(S) = S^{2023}$.
2. Name two different stock indices of the world with their respective country names.

Q.3(A) Answer the following questions. (Any Two) (10)

1. Derive the Black-Scholes Partial Differential Equation.
2. Explain the situation of a call option and put option at the time $t = T$.
3. What is Put-Call Parity? Explain in detail.

Q.3(B) Answer the following question. (Any One) (04)

1. Explain the term Risk and their type.
2. What is backward parabolic partial differential equation and also give one example of it.

Q.4(A) Answer the following questions. (Any Two) (10)

1. Solve the Black-Scholes partial differential equation for European call options.
2. Explain discrete dividend structure and derive the jump conditions for the same.
3. Derive the Black-Scholes Partial Differential Equation corresponding to constant dividend yield structure.

Q.4(B) Answer the following question. (Any One) (04)

1. (I) Which options are used by oil refiners?
(II) What is dividend yield?
2. Define the terms: Sensitivity to volatility and sensitivity to interest rate.

Q.5(A) Answer the following questions. (Any Two) (10)

1. Describe the procedure to eliminate the randomness from *Ito's* lemma.
2. Explain how the call option value is a function of exercise price and time to expiry.
3. A company whose share price is Rs. 400 offers bonus shares in the ratio of 1:1.
What will be the asset price and how should options be altered?

Q.5(B) Answer the following question. (Any One) (04)

1. When any investment is called Risk-free? Also give two examples of it.
2. Define the term financial derivatives with example.
