

M.Sc.(Maths) Semester - 4 (CBCS) Examination
May/June-2021 (NEW COURSE)
Financial Mathematics (Elective)

Time: 1:30 Hours

Marks: 42

Instructions:

1. Figures to the right indicate marks.
2. There are five questions in the question paper.
3. Answer any three of the following questions.

Question-1(A): Answer the following.**(04)**

What is an option? Explain the following terms:

- (i) Call Option
- (ii) Put Option
- (iii) American Option
- (iv) European Option

Question-1(B): Attempt any two out of three.**(10)**

- (i) Explain in detail: The forward & Future Contract
- (ii) A company whose share price is ₹200 and offers bonus shares in the ratio 1:1. What will be the asset price and how should option contracts be altered?
- (iii) 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 option is ₹200 per share and price of share is ₹6500 per share on 1st March 2021 then find the total profit to Amit on exercising the option. Also find the profit in percentage corresponding to up-front premium paid.

Question-2(A): Answer the following questions.**(04)**

- (i) Name the two indices of the Indian Stock Market.
- (ii) Obtain the Stochastic differential equation for $f(s) = s^n$

Question-2(B): Attempt any two out of three.**(10)**

- (i) 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.)
- (ii) Derive Stochastic differential equation and also give mathematical justification of the derived equation.
- (iii) State and Prove Ito's Lemma and extend the result for $f \equiv f(s, t)$.

Question-3(A): Explain the following terms.**(04)**

- (i) Arbitrage
- (ii) Risk-free investment
- (iii) Hedging
- (iv) Portfolio

Question-3(B): Attempt any two out of three.**(10)**

- (i) What is Put-Call Parity? Explain in detail.
- (ii) Derive the Black-Scholes Partial Differential Equation.
- (iii) Discuss the mathematical significance of Black-Scholes equation and derive the boundary and final conditions for the same. (For European Call and Put Option)

Question-4(A): Answer the following questions.**(04)**

- (i) Write the general form of diffusion (heat) equation.
- (ii) Explain the following terms:
 - (A) Backward Partial Differential Equation
 - (B) Forward Partial Differential Equation

Question-4(B): Attempt any two out of three.**(10)**

- (i) State Black-Scholes equation and stating the boundary conditions, solve the Black-Scholes Equation for European Options.
- (ii) Derive the Black-Scholes Partial Differential Equation corresponding to constant dividend yield structure.
- (iii) Explain discrete dividend structure and derive the jump conditions for the same.

Question-5(A): Explain in brief the following terms:**(04)**

- (i) ET-market
- (ii) OTC-market

Question-5(B): Attempt any two out of three.**(10)**

- (i) Explain how the call option value is a function of exercise price and time to expiry.
- (ii) Explain the simple model of asset price.
- (iii) Discuss in detail the elimination of Randomness.
