

M.Sc.(Maths.) Semester - 4 (CBCS) Examination
March/April - 2026 (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.

- Que.1(A) Answer any two out of three (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.
- Que.1(B) Answer any one out of two (04)**
- (1) Explain: Higher the exercising price on expiry of put options, greater the profit.
 - (2) What is an option? Explain the following terms:
 - (i) American Options
 - (ii) European Options
- 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) 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.
- Que.2(B) Answer any one out of two (04)**
- (1) Derive stochastic differential equation for the function $f(S) = S^{2026}$.
 - (2) Define the following terms:
 - (i) Drift rate
 - (ii) Wiener process
- Que.3(A) Answer any two out of three (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.
- Que.3(B) Answer any one out of two (04)**
- (1) Explain the term arbitrage and heading.
 - (2) What is forward parabolic partial differential equation and also give one example of it.
- Que.4(A) Answer any two out of three (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.
- Que.4(B) Answer any one out of two (04)**
- (1) Define smaller order effects on portfolio.
 - (2) Define following terms:
 - (i) Sensitivity to volatility
 - (ii) Sensitivity to interest rate

Que.5(A) Answer any two out of three

(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 ₹ 400 offers bonus shares in the ratio of 1: 1. What will be the asset price and how should options be altered?

Que.5(B) Answer any one out of two

(04)

- (1) Amit holds an option on March 1, 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 March 1, 2021 then find the total profit to Amit on exercising the option. Also find the profit in percentage corresponding to up-front premium paid.
- (2) Explain the term financial derivatives and also give any two examples of it.
