



**PV-003-1164005**

Seat No. \_\_\_\_\_

**M. Sc. (Sem. IV) (CBCS) Examination**

**August - 2020**

**EMT - 4011 : Mathematics**

*(Financial Mathematics)*

*(New Course)*

**Faculty Code : 003**

**Subject Code : 1164005**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- Instructions :** (1) Attempt all the questions.  
(2) There are 5 questions.

**1 Attempt the following : (Any Seven) 14**

- (1) State minimum two differences between forward and futures contracts.
- (2) Explain the terms : bid-ask or bid-offer
- (3) What are look-back options? Give an example.
- (4) Obtain the stochastic differential equation for  $f(S) = AS$ .
- (5) Name two popular indices each of India and America.
- (6) Explain the terms : (i) Risk free investment (ii) Hedging.
- (7) Explain the term financial derivatives.
- (8) What are foreign exchange markets? What they dealt with?
- (9) State minimum three differences each between call option and put option.
- (10) Define American options and explain why they are popular in compare to European options.

**2 Attempt the following : 14**

- (a) Define exercise price and explain higher the exercise price more is received for the asset at expiry of put option.

- (b) Define call option and explain how the call option value is a function of exercise price and time to expiry.
- (c) Atul Holds an option to purchase 50 shares of Amrita industries at Rs. 400 per share. If the asset price is Rs. 300 per share after one year and up-front premium is Rs. 10 per share then will Atul exercise his option? Why? Explain with reasons.

**3** Attempt the following : **14**

- (a) Establish the relation  $M = E e^{-\int_t^T r(s)ds}$ .
- (b) What is put-call parity?

**OR**

**3** (a) Explain the simple model of asset pricing. **14**

- (b) State and prove Itô's lemma and extend the result when the function  $f$  is also a function of  $t$ .

**4** Attempt the following : **14**

- (a) Describe the procedure to eliminate the randomness from Itô's lemma.
- (b) Derive the Black-Scholes partial differential equation.

**5** Attempt the following : (Any **Two**) **14**

- (a) Explain the situation of a call option and put option at the time of expiry of options.
- (b) Solve the Black-Scholes differential equation.
- (c) Define the terms :
  - (i) Portfolio
  - (ii) Dividends (iii) discrete dividend structure. Also derive the jump conditions for the same.
- (d) What is dividend yield? Explain in detail the constant dividend yield structure and derive the Black-Scholes partial differential equation corresponding to it.