# GIET UNIVERSITY, GUNUPUR – 765022

Ph.D. (Second Semester) Examinations, November – 2023

## WPPEMT2036 – Computational Finance

(Mathematics)

Time: 3 hrs                                          Maximum: 70 Marks

**The figures in the right hand margin indicate marks.**

## Answer ANY FIVE Questions          (14 x 5 = 70 Marks)

Marks

1.a. What is conditional probability in the context of computational finance?    14

2.a. Derive Bayes Theorem and solve the following problem using Baye's theorem A bag – I contain 4 White and 6black balls while another bag -II contains 4 white and 3 black balls. One ball is drawn at random from one of the bags and it is found to be black. find the probability that it was drawn from bag – I.    14

3.a. What is geometric Brownian motion and how can it be used to model rates of change.    7

   b. Let W(t) be a standard Brownian motion ,find $P(W(1)+W(2)>2)$    7

4.a. Consider an AR(I) process . $\varepsilon_t + P\varepsilon_{t-1} + u_t$ where $E(u_t)=0, E(u_t^2)=\sigma^2_u$ and $E(u_t u_s)=0$ for all t not equal to s . Assume that $\varepsilon_t$ is stationary. Derive a formula for cov $(\varepsilon_t, \varepsilon_{t-s})$, the covariance of $\varepsilon\text{-}t$ and $\varepsilon_{t-s}$ that holds for s=0,1,2,3....    14

5.a. What do you mean GARCH model and integrated GARCH model? Write the difference between a GARCH model and an integrated GARCH model. Write some limitations of GARCH model and integrated GARCH model.    14

6.a. A manufacturer who produces medicines bottles, find that 0.1 % bottles are defective. The bottles are placed in a box containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using poison distribution, find how many hours will contain i) no defective, ii) at least two defective, iii) at most 2 defective .    14

7 a. What do you mean by limit behaviour of birth and death process?    14

8 a. How does the poison process differ from other renewal processes? How does the renewal function for a poison process differ from the renewal function for a general renewal process?    14

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