UJ – 170

VI Semester B.E. (CSE/ISE) Degree Examination, June/July 2017
(2K11 Scheme)
CI 62 : PROBABILITY AND STOCHASTIC PROCESSES

Time : 3 Hours   Max. Marks : 100

Instruction : *Answer **any five** questions choosing atleast **two** from **each** Part.*

PART – A

1. a) State and prove Baye's theorem using total probability theorem. **8**

   b) With an example, explain the following :
      i) Sample space and sample outcome
      ii) Exhaustic events
      iii) Conditional probability. **12**

2. a) Let A and B be events in a sample space S. Show that if A and B are independent, then the events
      i) A and $\overline{B}$ and
      ii) $\overline{A}$ and $\overline{B}$ are also independent. **10**

   b) A laboratory test to detect a certain disease has the following statistics :

      Let A = event that the tested person has the disease

      B = event that the test result is positive.

      It is known that P(B/A) = 0.87 and P(B/$\overline{A}$) = 0.004 and 0.2 percent of the population actually has the disease. What is the probability that a person has the disease given that the test result is positive ? Prove the equation that you have used to solve the problem. **10**

3. a) In a period of time, 5 out of 20 screws produced by a manufacturing company are found to be defective. If 10 of the total screws are selected at random for inspection, what is the probability that 2 of 10 will be defective ? **10**

   b) If X and Y are independent Poisson variables such that P(X = 1) = P(X = 2) and P(Y = 2) = P(Y = 3), find the variance of X – 2Y. **10**

P.T.O.

4. a) A group of telephone subscriber is observed continuously during 60 minute busy hour period. During this period they make 40 calls, with the total conversation time being 1000 seconds. Compute the call arrival rate and the traffic intensity. **10**

   b) The failure rate of a device is given by

$$h(t) = \begin{cases} at & \text{if} \quad 0 < t < 2000 \text{ hours} \\ & \text{if} \quad t \geq 2000 \text{ hours} \end{cases}$$

   Choose 'b' so that h(t) is continuous and find an expression for device reliability. **10**

PART – B

5. a) Define the following types of processes :
   i) Strictly stationary process
   ii) Independent process
   iii) Renewal process
   iv) Markov process. **12**

   b) Consider a computer system with Poisson job-arrival stream at an average rate of 60 per hour. Determine the probability that the time interval between successive job arrival is
   i) Longer than 4 minutes
   ii) Shorter than 8 minutes
   iii) Between 2 and 6 minutes. **8**

6. a) Explain the M/M/m queuing system. **10**

   b) What are pure birth and death processes ? Explain each one of them for constant rate and linear rate. **10**

7. a) Assuming that the number of arrivals in the interval (0, t] is Poisson distributed with parameter λt, compute the probability of an even number of arrivals. Also, compute the probability of an odd number of arrivals. **10**

   b) Differentiate between open queuing networks and closed queuing networks. **10**

8. Write short notes on the following :
   i) Availability analysis
   ii) Geometric distribution
   iii) Reliability, failure density and hazard function
   iv) Properties of expectations. **(4×5=20)**