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BT-7/D-17 **37003**

STATISTICAL MODELS FOR COMPUTER SCIENCE

Paper : CSE-405

Time : Three Hours] [Maximum Marks : 100

Note : Attempt *five* questions, selecting at least *one* question from each unit.

UNIT–I

1. (a) Suppose that a laboratory test to detect certain disease has the following statistics :

A = Tested person has the disease.

B = Test result is positive.

$P(B/A) = 0.99$ and $P(B/\bar{A}) = 0.005$ and 0.1 percent of the population has the disease.

What is the probability that a person has the disease given that test result is positive ? 12

(b) Derive the expression for generalized Bernoulli trial. 8

2. (a) Three officers–a president, a treasurer and a secretary, are to be chosen among four people Amit, Sumit, Mohan and Mukesh. Suppose that Sumit is not qualified for treasurer and Mohan can't become secretary. In how many ways can the officers be chosen ? 10

(b) Derive an expression for inclusion and exclusion principle when number of events are three. 10

UNIT–II

3. (a) The spectrum of random variable X consists of points 1, 2, ... n and $P(X = i) = \frac{1}{i(i+1)}$. Determine CDF of X. Also compute $P(3 < X <= n)$ and $P(X > 5)$. 10

(b) Derive the expression of Poisson disribution for the following parameters.

(i) PMF, (ii) CDF, (iii) First moment, (iv) Second moment (v) Generating function representation. 10

4. (a) If PDF of X is $f(x) = 8/x^3$ where $x > 2$ and $W = X/3$, then evaluate E[W] using p.d.f. of W. 12

(b) Prove that there exists relationship between Poisson and Exponential distribution. 8

UNIT–III

5. (a) Consider a computer system with Poisson job arrival stream at an average rate of 80 per hour. Determine the probability that the time interval between successive job arrival is (i) between 2 and 8 minutes, (ii) longer than 5 minutes, and (iii) shorter than 10 minutes. 10

(b) Give conditions for Wide sense stationary process. Show that first order inter arrival time of the non-homogeneous Bernoulli procss is not memoryless. 10

6. (a) Derive an expression for decomposition of Poisson process. 10

   (b) Derive an expression for Renewal density. 10

UNIT–IV

7. (a) Prove that n-step transition probability matrix can be derived from one step transition probability matrix. 10

   (b) Explain Discrete parameter birth death process. 10

8. (a) Explain Machine repairman model. 10

   (b) Derive all parameters of M/M/1 queuing system. 10
