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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, M. Tech - Computer Science and Engineering

Make – up Examination; Feb - 2016

Probability and Statistics

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.*

UNIT - I

1 a. Define Probability. If a box contains 75 good IC chips and 25 defective and 12 chips are selected at random, Find the probability that at least one chip is defective. 6

b. Define the following terms : 7
(i) Conditional probability (ii) Independent events (iii) Mutually exclusive events.

c. Three balls are drawn from a box containing 6 red, 4 white and 5 blue balls. Find the probability that they are drawn in order red, white and blue. If each ball is (i) Replaced (ii) Not replaced. 7

2 a. Define Probability mass function and Probability density function with usual notations. 6

b. Suppose a pair of fair dice are tossed and X random variable denote the sum of the two dice.
(i) Obtain the probability mass function for X 8
(ii) Construct a graph for this distribution.

c. Given the probability density function for a random variable x is,

$$f(x)=\begin{cases}2e^{-2x} & x\geq 0\\ 0 & x<0\end{cases}$$

Find : (i) Commutative distribution function 6
(ii) Probability that $x>2$
(iii) Probability that $-3<x\leq 4$

UNIT - II

3 a. Define : (i) Joint probability function (ii) Marginal distribution function,
For both discrete and continuous random variables x and y. 6

b. The Joint probability function of two discrete random variables X and Y is given by $f(x,y)=c(2x+y)$ when $0\leq x\leq 2$ and $0\leq y\leq 3$ *and* $f(x,y)=0$ otherwise 8
(i) Find c ii) Find $P(X\geq 1,\ Y\leq 2)$ iii) Find $P(X=2,\ Y=1)$
(iv) Find the marginal distribution functions of X

c. Find the probability in a family of 4 children. There will be,
(i) atleast one boy (ii) atleast one boy (iii) atleast one body and atleast one girl. 5
Assume that probability of a male birth is $1/2$.

4 a. Find mean and Variance : 10
(i) Binomial Distribution (ii) Poisson distribution.

b. If the probability of a bad reaction from a certain injection is 0.001 determine the chance that out of 2000 individuals more than two will get a bad reaction. 6

c. Write short notes on computation of mean time to failure. 4

Contd….2

UNIT - III

5 a. A computer center has two computer systems labeled A and B. Incoming jobs are independently routed to system A with probability P and to system A with probability $(1-p)$. The number of jobs X arriving per unit time is Poisson distributed with parameter X. Find distribution function of number of jobs, Y received by system as per unit time. 10

b. Write short notes on : 10

(i) Reliability and imperfect fault coverage (ii) Random sums.

6 a. Define stochastic process and its classifications. 10

b. Consider a computer system with Poisson job-arrival stream at an average rate of 70% per hour. Determine the probability that time interval between successive job arrival is, 10

(i) longer than four minutes (ii) shorter than eight minutes (iii) between 3 and 6 minutes

UNIT - IV

7 a. Explain what is transition probability matrix and when it is called stochastic matrix and when it is called stochastic matrix. 10

b. Write short notes on following terms : 10

(i) Limiting distributions (ii) Distribution of times between state (iii) A channel diagram.

8 a. Assume that a computer system is in one of three states; busy, idle or undergoing repair, respectively denoted by states, 0, 1 and 2. Observing its approximately behaves like a homogeneous Markov chain with transition probability matrix. 10

$$P = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.1 & 0.8 & 0.1 \\ 0.6 & 0.0 & 0.4 \end{bmatrix}$$

Prove that the chain is irreducible and find the steady state probabilities.

b. Distinguish between open queing and closed queing networks. 6

c. (i) Pure Birth Processes (ii) Pure Death processes 4

(iii) With constant Rate (iv) with linear rate

UNIT - V

9 a. Define statistic, Estimator, unbiased function in a Random sample of size n. 6

b. Let X denote the main memory requirement of a job as a fraction of the total user allocatable main memory of a computing center & density function of x is 6

$$f(x) = \begin{cases} (k+1)x^k & 0 < x < 1,\ k > 0 \\ 0 & otherwise \end{cases}$$

Find the estimate K.

c. An examination was given to two classes consisting of 40 and 50 students respectively. In first class the mean grade was 74 with standard deviation of 8 while in the second class 78 mean and 7 is the standard deviation. If there a significant difference between the performance of two classes a level of significance of, (i) 0.05 (ii) 0.01 8

10 a. Fit a least- square parabola having the $y = a + bx + cx^2$ in to the data given 10

x	1.2	1.8	3.1	4.9	5.7	7.1	8.6	9.8
y	4.5	5.9	7	7.8	7.2	6.8	4.5	2.7

b. Write short notes on the following terms: (i) Null hypothesis (ii) alternate hypothesis 10

(iii) linear mathematical model for Analysis of variance

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