R15

Code No: 123AN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, April/May - 2018
PROBABILITY AND STATISTICS
(Common to ME, CSE, IT, MCT, AME, MIE, MSNT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Define discrete and continuous random variables. [2]

b) If a random variable X follows a Poisson distribution such that $P(X=1)=P(X=2)$, find the mean. [3]

c) The joint probability functions of X and Y is $f_{XY}(x,y)=\begin{cases}9e^{-3x-3y}, & x\geq 0, y\geq 0\\ 0\ , & otherwise\end{cases}$.
Check whether the probability function is a valid density function. [2]

d) Show that the correlation coefficient is the geometric mean of the two regression coefficients. [3]

e) The sample of size 4 has values 25, 28, 26, 25. Find the variance of the sample. [2]

f) Write any two properties of F-distribution. [3]

g) Define transient state in a queuing system. [2]

h) Arrival rate is 10 per day and service rate is 16 per day. The day consists of 8 working hours. Find the average number of customers in the system. Assuming that arrivals are Poisson and service time distribution is exponential. [3]

i) Define continuous random process. [2]

j) What do you mean by stochastic matrix? Give an example. [3]

PART-B

(50 Marks)

2. A continuous random variable X has the p.d.f. $f(x)=\begin{cases}kxe^{-x}, & 0<x<1\\ 0\ , & otherwise\end{cases}$

Find (a) k (b) *E(X)* (c) *E(2X-3)* (d) *V(X)* and (e) *V(4X+3)*. [10]

OR

3.a) The first three moments of a distribution about the value 3 are 2, 10, -30. Find the moments about $x=0$.

b) Find the moment generating function of Normal distribution and hence find its mean. [5+5]

4. The joint p.d.f of the random variables X and Y is given by
$f_{XY}(x, y) = K\ e^{-(x+y)}, x > 0, y > 0$. Find
a) K
b) $P(X > 2)$
c) $P(2 < X + Y < 3)$ and
d) prove that X and Y are independent. [2+2+2+4]

OR

5. Compute the rank correlation coefficient for the following data: [10]

X:	65	63	67	64	68	62	70	66	68	67	69	71
Y:	68	66	68	65	69	66	68	65	71	67	68	70

6.a) Explain briefly interval estimation.
b) A random sample of 400 items is found to have mean 82 and standard deviation 18. Find the maximum error of estimation at 95% confidence interval and the confidence limits for the mean if $\bar{x} = 82$. [5+5]

OR

7. The nicotine content in milligrams of the samples of tobacco were found as follows.
$Sample\ 1:$ 24 27 26 21 25
$Sample\ 2:$ 30 28 31 22 36
Can it be said that the two samples come from normal population with the same mean? [10]

8. Explain $(M/M/1):(\infty/FCFS)$ queueing model. [10]

OR

9. Arrival rate of telephone calls at a telephone booth are according to Poisson distribution with an average time of 12 minutes between two consecutive call arrivals. The length of telephone calls is assumed to be exponentially distributed with mean 4 minutes. Find:
a) the probability that a caller arriving at the booth will have to wait
b) the average queue length that forms from time to time
c) the fraction of a day that the phone will be in use and
d) the probability that an arrival will have to wait for more than 15 minutes before the phone is free. [10]

10. In a cascade of binary communication channels, the symbols 0 and 1 are transmitted in successive stages. In any stage, the probability that a transmitted 1 is received as a 1 is 0.75 and the probability that a transmitted 0 is received as a 0 is 0.5. Find the probability that

a) 1 transmitted in the first stage and is received correctly and

b) 0 transmitted in the first stage and is received as 1 after the third stage. [10]

OR

11. Find the transition probability matrix of a Markov chain $\{X_n\},\ n = 1,2,3$ having three stages 1, 2 and 3 is $P = \begin{pmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{pmatrix}$ and the initial distribution is $P^{(0)} = (0.7,\ 0.2,\ 0.1)$. Find also:

a) $P\{X_2 = 3\}$

b) $P\{X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2\}$. [10]

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