Code No: 113AN

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November - 2015
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) Explain, with suitable examples, discrete and continuous random variables.[2M]

b) Find the first 3 moments about origin from Moment generating function of the Binomial distribution. [3M]

c) Write the relation between correlation and regression coefficients. Is it possible to have two variables x and y with regression coefficient as 2.8 and -0.5? Explain. [2M]

d) Is the function $f(x)=\begin{cases}\frac{1}{2}x\,e^{-y}, 0<x<2, y>0\\ 0, \textit{Otherwise}\end{cases}$ can be considered as a joint density function of two random variables X and Y? [3M]

e) Write the standard error of (i) sample mean (ii) difference of two sample means. [2M]

f) Mean of population = 0.700, mean of the sample = 0.742, standard deviation of the Sample = 0.040 sample size = 10. Test the null hypothesis for population mean = 0.700. [3M]

g) Explain queue classification-Kendall's notation. [2M]

h) Write:
i) the relation between Expected number of customers in the queue and in the system.
ii) waiting time of a customer in the queue and in the system
iii) the formula for finding the probability that there are more than n customers in the system. [3M]

i) Classify the random processes. [2M]

j) Find the values of x,y,z inorder for $\begin{bmatrix}0 & x & 1/3\\ 0 & 0 & y\\ 1/3 & 1/4 & z\end{bmatrix}$ to be transition matrix. [3M]

PART-B (50 Marks)

2.a) Is $f(x)=\frac{1}{2}x^2e^{-x}$ when $x\geq 0$ can be regarded as a probability function for a continuous random variable? If, so find Mean and Variance of the random variable.

b) Find the moment generating function of the Normal distribution. Show that all odd order moments of a normal distribution are zero. [5+5]

OR

3.a) In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find:

i) How many students score between 12 and 15?

ii) How many score above 18?

iii) How many score below 18?

b) Find the Moment generating function of Poisson distribution and find the first 3 moments. [5+5]

4.a) If X and Y are two random variables having joint density function

$$f(x,y)=\begin{cases}\frac{1}{8}(6-x-y), 0\leq x\leq 2, 2\leq y<4\\ 0, otherwise\end{cases}$$

Find: i) $P\left(X<1/Y<3\right)$ ii) $f_X(x)$ & $f_Y(y)$.

b) Find the coefficient of correlation between X and Y for the following data. [5+5]

X	1	2	3	4	5	6	7	8	9
Y	10	11	12	14	13	15	16	17	18

OR

5.a) Joint distribution of X and Y is given by $f(x,y)=4xy\,e^{-(x^2+y^2)}; x\geq 0, y\geq 0$ .Test whether X and Y are independent. Also find conditional density of X given Y=y.

b) F or the following data, find equations of the two regression lines. [5+5]

X	1	2	3	4	5
Y	15	25	35	45	55

6.a) Fit a binomial distribution to the following data and test the good ness of fit.

x	0	1	2	3	4
f	38	144	342	287	164

b) A researcher wants to know the intelligence of students in a school. He selected two groups of students. In the first group there 150 students having mean IQ of 75 with a S.D of 15 in the second group there are 250 students having mean IQ of 70 with S.D of 20. Is there a significant difference between the means of two groups? [5+5]

OR

7.a) Fit a Poisson distribution to the following data and test the goodness of fit.

x	0	1	2	3	4	5	6
Observed frequency	275	72	30	7	5	2	1

b) In a city A 20% of a random sample of 900 school boys had a certain physical defect. In another city B 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? [5+5]

8.a) State and prove Arrival Distribution theorem.

b) In a telephone exchange the arrival of calls follow Poisson distribution with an average of 8 minutes between two consecutive calls .The length of a call in 4 minutes. Determine:

i) The probability that the person arriving at the booth will have to wait

ii) The average queue length that forms from time to time. [5+5]

OR

9.a) Prove that the probability of having 'n' customers in the queuing system (M/M/1) :(∞, FCFS) is $P_n = \rho^n(1-\rho)$, where ρ is traffic intensity of the system

b) In a public Telephone both the arrivals are on the average 15 per hour. A call on the average takes 3 minutes. If there is just one phone, find (i) expected number of callers in the booth at any time (ii) The proportion of the time the booth is expected to be idle. [5+5]

10.a) Write about the different states of the Stochastic process.

b) The three state markov chain is given by the transition probability matrix

$$P = \begin{pmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{pmatrix}$$. Prove that the chain is irreducible. [5+5]

OR

11.a) The transition probability matrix of a Markov chain $\{X_n\}; n = 1,2,3\ldots$having three states 1,2,3 is $\begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$ and the initial distribution is $P^{(0)} = \{0.7, 0.2, 0.1\}$ then find $P = \{X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2\}$

b) The transition probability matrix of a Markov chain is given by $\begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$.

Is this Matrix irreducible? [5+5]

---ooOoo---