

Code No: 114DK

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, May-2015

PROBABILITY AND STATISTICS

(Common to CE, CHEM, CEE)

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) Given that  $f(x) = \frac{K}{2^x}$ , if  $x = 1, 2, 3, 4$ , is a probability distribution of a random variable X Find K. [2M]
- b) Derive moment generating function of Binomial Distribution. [3M]
- c) Find the standard error of r, the coefficient of correlation, given that  $r = 0.95$  and  $n = 12$ . [2M]
- d) The joint probability density function is given by
- $$f(x, y) = \begin{cases} x + y, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{elsewhere} \end{cases}$$
- Find Marginal probability density function for X. [3M]
- e) Define Null Hypothesis. [2M]
- f) A random sample of 100 apples were taken and out of which 15 were found to be bad. Find the maximum error of proportions. [3M]
- g) Define Balking. [2M]
- h) Explain service discipline patterns. [3M]
- i) Define recurrent state of Markov chain. [2M]
- j) Define ergodic Markov chain. [3M]

**Part-B**

**(50 Marks)**

2. The marks obtained in statistics in a certain examination are found to be normally distributed. If 15% of the candidates  $\geq 60$  marks, 40%  $< 30$  marks. Find the mean and standard deviation of marks. [10]

**OR**

- 3.a) Ten coins are thrown simultaneously. Find the probability of getting:
- i) At least one head ii) At least seven heads
- b) 1000 students had written an examination the mean of test is 35 and standard deviation is 5. Assuming the distribution to be normal find how many students got more than 40. [5+5]

4. The joint probability density function is given by

$$f(x, y) = \begin{cases} 10xy^2, & 0 < x < y < 1 \\ 0, & \text{elsewhere} \end{cases}$$

- a) Marginal probability density function for X  
 b) Marginal probability density function for Y  
 c) Conditional probability density function for X given Y  
 d) Conditional probability density function for Y given X. [2+2+3+3]

OR

5. 10 observations on price  $x$  and the supply  $y$  the following data were obtained.  
 $\sum x = 130$ ,  $\sum y = 220$ ,  $\sum x^2 = 2288$ ,  $\sum y^2 = 5506$ ,  $\sum xy = 3467$   
 Obtain the line of regression of  $y$  on  $x$  and estimate the supply when the price is 16 units and also find the standard error of estimate. [10]

6. Given below is the number of male births in 1000 families having five children

Male Children	0	1	2	3	4	5
No. of Families	40	300	250	200	30	180

Test whether the given data is consistent with the hypothesis that the binomial law holds if the chance of a male birth is equal to that of female birth. [10]

OR

7. The following table gives the number of aircraft accidents that occurred during the six days of the week. Find whether the accidents are uniformly distributed over the week. [10]

Days	Mon	Tue	Wed	Thu	Fri	Sat
No. of Accidents	14	18	12	11	15	14

8. Arrival rate of telephone calls at a telephone booth is according to a Poisson distribution with an average time of 9 minutes between two consecutive calls. The length of a telephone call is assumed to be exponentially distributed with mean 3 minutes.  
 a) The probability that the person arriving at the booth will have to wait.  
 b) The average queue length that forms from time to time.  
 c) The manager of the shop will install a second booth when arrival would have to wait for 10 minutes or more for the service. By how much must the rate of arrival be increased in order to justify a second booth? [3+3+4]

OR

9. A maintenance service facility has poisson arrival rates, negative exponential service times and operates and first come first served queue discipline, breakdown occur on an average of three per day with a range of zero to eight. The maintenance can service, on an average six machines per day with a range zero to seven. Find:  
 a) Utilization factor of the service facility.

- b) Mean time in the system
- c) Expected number of units in the system
- d) Average waiting time in the queue. [3+2+3+2]

10. A training process is considered as a two state marcov chain. If it rains it is considered as 0, if not 1. The transitin probability matrix of the marcov chain is:

$$\begin{bmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{bmatrix}$$

Find the probability that it will rain after three days, assuming that the initial probabilities are 0.4 and 0.6. [10]

OR

11. Define the following:
- a) Probability vector and The transition probability.
  - b) Homogeneous Marcov chain.
  - c) Multi step transition probability. [4+3+3]

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