R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2017
PROBABILITY AND STATISTICS
(Common to ME, CSE, IT, MCT, MIE, AME, 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) If probability density function is $f(x) = \begin{cases} kx, & 0 < x < 1 \\ 0, & \text{other wise} \end{cases}$, find the value of k. [2]

b) Prove that $Var(ax+b) = a^2 Var(x)$ where a and b are non zero constants. [3]

c) Define the correlation coefficient. [2]

d) Find the $Cov(x, y)$ from the following table [3]

x	1	3	5	6
y	15	18	25	16

e) What is maximum error of estimation for large sample? [2]

f) Explain the null and alternative hypothesis. [3]

g) What is the probability that there are n or more number of customers in a system. [2]

h) Write few characteristics of a queuing system. [3]

i) Define regular matrix. [2]

j) Show that a square matrix $\begin{bmatrix} 1 & 0 \\ 0.5 & 0.5 \end{bmatrix}$ is stochastic matrix. [3]

PART-B

(50 Marks)

2.a) The density function of a random variable X is $f(x) = \begin{cases} Ke^{-x}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$. Find the value of K, mean and Variance.

b) Write the characteristics of Normal distribution. [5+5]

OR

3.a) The probability that the life of a bulb for working 10 years is 0.05. Find the probability that out of 6 bulbs (i) At least one, (ii) greater than four and (iii) none work for 10 years.

b) A random variable X has the following probability function:

x	1	2	3	4
P(x)	0.1	0.3	0.4	0.2

Determine (i) Expectation, (ii) variance and (iii) Standard deviation. [5+5]

4.a) Write short notes on correlation and regression coefficients.

b) Heights of fathers and sons (in inches) are given in the following table:

Heights of father	65	66	67	67	68	69	71	73
Heights of son	67	68	64	68	72	70	69	70

Form the two lines of regression and calculate the expected average height of the son when the height of the father is 67.5. [5+5]

OR

5.a) Write the properties of rank correlation coefficient.

b) A random sample of 5 college students is selected and their grades in Mathematics and Mechanics are found to be

Mathematics	85	60	73	40	90
Mechanics	93	75	65	50	80

Calculate Pearman's rank correlation coefficient. [5+5]

6.a) Test whether there is significant difference at 0.05 level in the quality of teaching among four engineering colleges A, B, C, D of a technological university if the number of failures are 26, 23, 15, 32 respectively. Assume that each college has strength of 200 students.

b) The mean and standard deviation of a sample are 11795 and 14054 respectively. If 50, find the 95% confidence interval for the population mean. [5+5]

OR

7.a) The mean life of a sample of 10 electric bulbs was found to be 1456 hours with S.D. of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with S.D. of 398 hours. Is there a significant difference between the means of two batches?

b) Define i) Estimator of a statistical constant.
ii) Standard error of a probability distribution. [5+5]

8. In a store with one server, 9 customers arrive on an average of 5 minutes and service is done for 10 customers in 5 minutes.
Find:
a) The average number of customers in the system.
b) The average queue length.
c) The average time a customer spends in the store.
d) The average time a customerspends before being served. [10]

OR

9.a) Discuss Queuing theory. Explain its applications.

b) Define Queue discipline and size of the queue. [5+5]

10.a) Check whether the following Markov chain is regular and ergodic:

$$\begin{bmatrix} 0 & 0.5 & 0.5 & 0 \\ 0.5 & 0 & 0 & 0.5 \\ 0.5 & 0 & 0 & 0.5 \\ 0 & 0.5 & 0.5 & 0.5 \end{bmatrix}$$

b) Explain Markov Chain. [5+5]

OR

11.a) Describe the types of stochastic process.

b) Give some examples of stochastic process. [5+5]

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