R20 Regulation *Subject code:3H4GA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech IV Semester Regular/Supplementary Examinations, September 2023

PROBABILITY & ALGEBRA

(Common to CSE (AI&ML) & CSE(DS))

Maximum Marks: 70 Date:13.09.2023 Duration: 3 hours

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 When 2 cards are drawn from a well-shuffled pack of playing cards, what is the probability that they are of the same suit?

2 Write down the Axioms of Probability.

3 Define random variable.

4 A continuous random variable X that can assume any value between $X = 2$ and $X = 5$ has a density function given by $f(x) = k(1 + x)$. Find the value of 'k'.

5 The no of monthly breakdown of a computer is a RV having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month without a breakdown.

6 The mean and variance of a binomial distribution are 4 and 2 respectively. Find the probability mass function of X.

7 Define an equivalence relation.

8 Draw the Hasse diagram for {(a,b)/a divides b} on{1,2,3,4,6,8,12}.

9 Define a group homomorphism.

10 Give any two properties of cyclic group.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 In a bolt factory machines A, B, C manufacture respectively 25%, 35% and 40% of the total. Of their output 5%, 4% and 2% are defective bolts. A bolt is drawn at random from the produce and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C? [10]

OR

12 In shooting test, the probability of hitting the target is 1/2, for A, 2/3 for B and 3/4 for C. If all of them fire at the target, find the probability that (i) none of them hits the target and (ii) at least one of them hits the target. [10]

13 Find the mean and variance of the density function. $f(x) = k\,x^2e^{-x}; x > 0$. [10]

OR

14 Let (X,Y) be a bivariate random variable with joint probability distribution function $p(x, y) = \lambda(2x + 3y); x = 0,1,2$ &$y = 1,2,3$. Find (i) the value of λ (ii) Marginal probability distributions of X & Y. [5+5]

15 Find the mean, variance of Binomial distribution. [10]

OR

16 An electrical firm manufactures light bulbs that have a life, before burn out, that is normally distributed with mean equal to 800 hours and a standard deviation of 40 hours. Find (i) the probability that a bulb burns more than 832 hours (ii) the probability that bulb burns between 780 and 832 hours. [10]

17 Given $f(x) = x^2 + 6$ and $g(x) = 2x - 1$, find i) $(f \circ g)(x)$ ii) $(g \circ f)(x)$. [10]

OR

18 Three friends A, B, and C live near each other at a distance of 5 km from one another. We define a relation R between the distances of their houses. Is R an equivalence relation? [10]

19 Show that the set of all non-zero real numbers is a group under the operation $*$ defined by $a * b = ab/2$. [10]

OR

20 State and Prove Lagranges theorem on Cosets. [10]