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Er. No. 2110083

Semester V (B. Tech)

Academic Year: 2023-24

Jaypee University of Engineering & Technology, Guna

T-2 (Odd Semester 2023)

18B11MA511 – Probability Theory and Random Processes

Maximum Duration: 1 Hour 30 minutes

Maximum Marks: 25

Notes:

1. This question paper has five (05) questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).

Q1. Two balls are selected at random from a box containing three red, two green and four white balls. If X & Y are the number of red balls & green balls respectively included among the two balls drawn from the box, find **[06] CO3**

a) Joint probability of X & Y

b) Marginal probabilities of X & Y

c) Conditional distribution of X given $Y=1$

Q2. Find the expected value and variance of the random variable k with PMF **[06] CO4**

$$p_k(K)=\frac{\lambda^k}{k!}e^{-\lambda} \qquad k=0,1,2,3....$$

Q3. Joint probability density function for random variable is given by **[03] CO4**

$$f(x,y)=\begin{cases}\frac{xy}{96}; & 0<x<4,\ 1<y<5\\ 0; & elsewhere\end{cases}$$

Find:

a) $f_x(x)$

b) $E(Y)$

c) $E(2X+3Y)$

Q4. If X is a discrete random variable with probability function [04] CO2

X = x	-2	-1	0	1
P (X = x)	0.4	k	0.2	0.3

Find:

a) k

b) P[X < 0]

c) P[X ≥ 0]

d) Mean of random variable X

Q5. Let X denotes the number of mechanical components that are defective in a testing process and X is binomial random variable with $p = 0.001$. If 1000 of these components are tested, find the following: [06] CO3

a) P (X = 1)

b) P (X ≥ 1)

c) P (X ≤ 2)

d) Variance of X