Name:

Enrolment No:

UPES

End Semester Examination, DEC 2023

Course: Probability and Statistics **Semester: III**

Program: B.Tech. (Electrical Engineering) **Time: 03 hrs.**

Course Code: MATH2046 **Max. Marks: 100**

Instructions: Attempt All Questions.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Ten numbered cards are there from 1 to 15, and two cards are chosen at random such that the sum of the numbers on both the cards is even. Find the probability that the chosen cards are odd-numbered.	**4**	**CO1**
Q 2	A coin that is fair in nature is tossed n number of times. The probability of the occurrence of a head six times is the same as the probability that a head comes 8 times, then find the value of n.	**4**	**CO1**
Q 3	Fit a Straight line to the following data. X: 1, 2, 3, 4, 6, 8 Y: 2.4, 3, 3.6, 4, 5, 6	**4**	**CO4**
Q 4	Given $f(x,y) = xe^{-x(y+1)}, x \geq 0, y \geq 0$. Find the regression curve of Y on X.	**4**	**CO4**
Q 5	Define Chi-square and obtain its sampling distribution. Mention prominent features of its frequency curve.	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Let X be a continuous random variable with PDF $$f_X(x) = \begin{cases} x^2\left(2x+\frac{3}{2}\right) & 0 < x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$ If $Y = \frac{2}{X} + 3$, find $\text{Var}(Y)$.	**10**	**CO3**
Q 7	The equations of two regression lines, obtained in a correlation analysis of 60 observations are: $15x = 6y + 34$ and $100y = 76x - 368$. What is the correlation coefficient?	**10**	**CO4**

Q 8	A Person has two coins in his pocket, a fair coin, and a two-headed coin. He picks one at random from his pocket, flips it and gets heads. a) What is the probability that he flipped the fair coin? b) If he flips the same coin a second time and again gets heads, what is the probability that he flipped the fair coin?	**10**	**CO1**
Q 9	The number of automobile accidents per week in a certain community were as follows: 12, 8, 20, 2, 14, 10, 15, 6, 9, 4 Are these frequencies in agreement with the belief that accident conditions were the same during this 10-week period? [Note: tabulated χ^2 with 9 degrees of freedom at 0.05 level =16.916 at 0.01 level =21.666] **OR** Derive the least square equations for fitting a curve of the type $Y = aX + (b/X)$, to a set of n points $(x_i, y_i); i = 1,2, \dots, n$.	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q 10	For a distribution the mean is 10, variance is 16, γ_2 is +1 and $\beta_2$is +4. Obtain the first four moments about the origin, i.e., zero. Comment upon the nature of distribution.	**20**	**CO2**
Q 11	Between the hours of 2 P.M. and 4 P.M. the average number of Phone calls per minute coming into switch board of a company is 2.5. Find the probability that during one particular minute there will be (i) no phone call at all (ii) exactly 3 calls (iii) at least 5 calls. (Given $e^{-2.5} = 0.0821$). **OR** Let X and Y be two jointly continuous random variables with joint PDF $$f_{XY}(x,y) = \begin{cases} x + cy^2 & 0 \le x \le 1, 0 \le y \le 1 \\ 0 & \text{otherwise} \end{cases}$$ a. Find the constant c. b. Find $P\left(0 \le X \le \frac{1}{2}, 0 \le Y \le \frac{1}{2}\right)$.	**20**	**CO3**