Reg. No.: ....

Name: ....

W6751

University of Kerala

Third Semester Degree Examination, November 2025

Discipline Specific Core Course

STATISTICS

UK3DSCSTA209 - PROBABILITY AND DISTRIBUTIONS - I

Academic Level: 200-299

Time: 1 Hour 30 Minutes(90 Mins.) **Max. Marks: 42**

Part A. 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark Each.Answer all questions

Qn No.	Question	CL	CO
1	Write the expression for variance in terms of expectation	RE	3
2	Raw moments are generated from.......................... generating function.	RE	4
3	A random variable X take values 0 and 1 with probabilities ½ ,find E(X)?	UN	3
4	Describe the condition for the independence of two random variables.	UN	2
5	A discrete random variable is one that: Options : A)Can take any value in an interval B)Takes only a finite or countable number of values C) Is always normally distributed D)Has a probability of zero for all outcomes	UN	1
6	Define expectation of random variable.	UN	3

Part B.8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn No.	Question	CL	CO
7	Show by an example that the MGF of a random variable need not exist always.	UN	4
8	Define marginal distribution and Independent of random variable.	UN	2
9	Verify whether the function $p(x) = kx, x = 1, 2, 3$ is a valid pmf, and find k.	AP	1
10	If E(X)= 5, find E(X−2).	AP	3

Part C. 28 Marks.Time:60 Minutes (Cognitive Level:Apply(AP)/Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer.7 marks each.Answer all 4 Questions choosing among options * within each question

Qn No.	Question	CL	CO
11	A) A continuous random variable X has pdf $f(x) = 2x, 0 < x < 1$. Find its mean and variance. OR B) Show that V(aX + bY) = a^2 V(X) + b^2 V(Y) Where X and Y are independent.	AP	3, 2
12	A) Obtain the cumulant generating function of f(x)=1/2 e^-|x| , -∞ < x<∞ OR B) Let (X, Y) be a continuous random vector with joint pdf $f(x,y) = e^{-(x+y)}, x > 0, y > 0$ Define the transformation $U = X + Y, V = X/(X+Y)$ (a) Find the Jacobian of the transformation. (b) Derive the joint PDF of (U,V) (c) Comment on whether U and V are independent.	AN	4, 2
13	A) A random variable X has pmf $P(X = x) = 1/6, x = 1, 2, 3, 4, 5, 6$ (a) Compute E[X] and Var(X). (b) Evaluate whether this distribution represents a fair die. Give reasons. OR B) Suppose the joint probability density function of (X, Y) is given by f(x,y) = x + y, 0 < x < 1, 0 < y < 1; 0, otherwise. (a) Compute E(X), E(Y), and E(XY).	EV	3, 3

Qn No.	Question	CL	CO
	(b) Evaluate the independence of X and Y based on these results and justify your conclusion mathematically.		
14	A) Construct a continuous random variable with density function defined on [0,2] such that its mean is 1. Derive its variance and sketch the density function. OR B) Find the moment generating function of the random variable X with pdf f(x)= $f(x) = \frac{1}{2\theta} e^{-\frac{\lvert x-\theta \rvert}{\theta}}, x \in R$ Design a general procedure to extract the mean and variance of the random variable X.	CR	3, 3