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Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of Mathematics

Continuous Assessment Test – I

Question Paper

Degree & Branch	B.E. CSE A & B, B.Tech IT A & B				**Semester**	IV
Subject Code & Name	UMA2476 – Probability & Statistics				**Regulation: 2021**	
Academic Year	2022-2023	**Batch**	2021-2022	**Date**	17.04.2023	FN
Time: 90 Minutes	**Answer All Questions**				**Maximum: 50 Marks**	

Part – A (4×2 = 8 Marks)

		KL	CO	PI
1	If X represents the outcome, when fair die is tossed, find the MGF of X and hence find $E(X)$	K2	CO1	1.1.1
2.	A continuous random variable X has probability density function $f(x) = kxe^{\frac{-x}{2}}, x > 0$, find k. 1/4	K2	CO1	1.1.1
3.	Let X be a random variable with $E(X) = 1$ and $E(X(X-1)) = 4$, find $var\left(\frac{X}{2}\right)$. = 1	K2	CO1	1.1.1
4	If X is normal random variable with mean zero and variance σ^2. Find the pdf of $y = e^x$.	K2	CO1	2.1.3

Part – B (3×6 = 18 Marks)

		KL	CO	PI
5.	Find the mean, variance and the mgf of Exponential distribution	K2	CO1	1.1.1
6.	State and Prove Memory less property for Geometric distribution	K2	CO1	1.1.1
7.	Buses arrive at a specified bus stop at 15 minutes intervals starting at 7am. If a passenger arrives at the bus stop at a random time which is uniformly distributed between 7 and 7.30 am. Find the probability that he waits (a) less than 5 minutes (b) at least 12 minutes for a bus. 1/b 2/5	K3	CO1	2.1.3

Part – C (2×12 = 24 Marks)

		KL	CO	PI
8.	(a) Prove that the sum of two independent Poisson variates is Poisson but the difference is not. (b) If X and Y are independent Poisson random variables. Prove that the conditional distribution of X given $X+Y$ is Binomial	K3	CO1	2.1.3
	(Or)			

9.	(a) If the cumulative distribution function of a random variable X is $F(x) = \begin{cases} 1 - \frac{4}{x^2} & x > 2 \\ 0 & x \le 2 \end{cases}$, $f(x)$ find pdf and hence find $P(4 < X < 5)$. (b) In a distribution exactly normal, 7% of the items are under 35 and 89% are under 63. Find the mean and S.D of the distribution.	K3	CO1	2.1.3

From the normal table:	
Area = 0.19, Z = 0.5	Area = 0.41, Z = 1.35
Area = 0.29, Z = 0.81	Area = 0.42, Z = 1.4
Area = 0.39, Z = 1.23	Area = 0.43, Z = 1.48

10.	If the density function of a continuous random variable X is given by $f(x) = \begin{cases} ax & 0 \le x < 1 \\ a & 1 \le x < 2 \\ 3a - ax & 2 \le x < 3 \\ 0 & otherwise \end{cases}$ (a) Find the value of a (b) Find the cumulative distribution function of X.	K3	CO1	2.1.3
	(Or)			
11.	The joint probability function of two discrete random variables X and Y is given by $f(x, y) = c(2x + y)$ where x and y can assume all integers such that $0 \le x \le 2$ and $0 \le y \le 3$ (i) find the value of c $1/41$ (ii) find the marginal distributions of X and Y $\frac{24}{42}$. (iii) find $P(X \ge 1, Y \le 2)$	K3	CO2	2.1.3

CO1: Identify standard distributions and apply them. 100%.

CO2: Solve problems in two dimension random variables and find the correlation between them 25%.

$M_x(t) = \frac{\lambda}{\lambda - t}$

$\frac{2}{\lambda^2} - \left(\frac{1}{\lambda}\right)^2 = \frac{2}{\lambda^2} - \frac{1}{\lambda^2} = \frac{1}{\lambda^2}$

$= \frac{0() - [(\lambda)(0-1)]}{(\lambda - t)^2} = \frac{\lambda}{(\lambda - t)^2}$

$= \frac{0 - [(\lambda)[2(\lambda - t)(0-1)]]}{(\lambda - t)^4} = \frac{-[\lambda[-2\lambda + 2t]]}{(\lambda - t)^4}$

$= \frac{2\lambda^2 - 2\lambda t}{(\lambda - t)^4} = \frac{2\lambda(\lambda - t)}{(\lambda - t)^3} = \frac{2\lambda}{(\lambda - t)^3}$

$= \frac{2\lambda}{\lambda^3} = \boxed{\frac{2}{\lambda^2}}$