

Register Number	7	3	2	9	2	1	C	S	R	0	1	4
VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY												
(An Autonomous Institution, Affiliated to Anna University, Chennai)												
Continuous Assessment Test – 1			QP Set			1			Regulations -2018/19			
Programme:	B.E/B.TECH		Date:	13.03.2023		Max. Marks:	60		Duration	2 Hrs		
Class:21CS4A&B						Time: 10.30 am to 12.30pm						
Course Code & Title:			21MAT45 – PROBABILITY AND STATISTICS									
Knowledge Levels (KL)	K1 - Remembering			K3 - Applying			K5 - Evaluating					
	K2 - Understanding			K4 -Analyzing			K6 - Creating					

Part A - Answer ALL Questions.

12 × 2 = 24 Marks

No.	Question	CO	KL
	If the random variable X takes the values 1,2,3 and 4 such that	CO1	K3
1.	$2P(X = 1) = 3P(X = 2) = P(X = 3) = 5P(X = 4)$. Find the probability distribution.		
2.	A continuous random variable X takes the values between X=2 and X=5 has a density function given by $f(x) = k(1 + x)$. Find $P(X < 4)$	CO1	K3
3.	The probability function of an infinite discrete distribution is given by $P[X = j] = \frac{1}{2^j}, j = 1, 2, 3, \dots, \infty$. Find $P[X \text{ is even}]$	CO1	K3
4.	In a large consignment of electric bulbs 10% are defective, a random sample of 20 is taken, find the probability that atmost there are 3 defective bulbs	CO1	K3
5.	The mileage which car owners get with a certain kind of radial tyre is a random variable having an exponential distribution with mean 40,000km. Find the probabilities that one of these tyres will last atleast 20,000 km	CO1	K3
6.	If the joint density function of X and Y is given by $f(x, y) = \begin{cases} 2, & 0 < x < 1; 0 < y < x \\ 0, & \text{Otherwise.} \end{cases}$ Find the marginal density function of X	CO2	K3
7.	The joint pdf of (X, Y) is given by $f(x, y) = \begin{cases} kxye^{-(x^2+y^2)}, & x > 0, y > 0 \\ 0, & \text{otherwise} \end{cases}$. Find the value of k	CO2	K3
8.	The joint pdf of (X, Y) is given by $f(x, y) = \begin{cases} \frac{6}{5}(x + y^2), & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{otherwise} \end{cases}$ Find $P\left[\frac{1}{4} \leq y \leq \frac{3}{4}\right]$	CO2	K3
9.	Prove that the correlation coefficient lies between (-1,1)	CO2	K2
10.	In a partially destroyed lab record of an analysis of correlation data, the following results only are legible. The regression equations are $3x + 2y = 26$ and $6x + y = 31$. Find the correlation coefficient r_{xy}	CO2	K3

11. Define Critical region and Level of Significance

CO3 K1

12. Define Type I and Type II error.

CO3 K1

Part B - Answer ALL Questions.

3 × 12 = 36 Marks

No.

Question

Marks CO KL

13. a) (i) A Random variable x has the following probability function

8 CO1 K3

$X = x_i$	0	1	2	3	4	5	6	7
$P(X = x_i)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

i) Find k ii) Evaluate $P(X \geq 6)$, $P(X < 6)$

iii) If $P(X \leq C) > \frac{1}{2}$, then find the minimum value of C

iv) Evaluate $P[1.5 < X < 4.5/X > 2]$

v) Find $P(X < 2)$, $P(X > 3)$, $P(1 < X < 5)$

(ii) Derive the moment generating function of Poisson distribution and hence derive mean and variance.

4 CO1 K3

OR

b) (i) The density function of a random variable X is given by

6 CO1 K3

$f(x) = kx(2 - x)$, $0 \leq x \leq 2$. Find k , mean, variance and r^{th} moment

(ii) The savings bank account of a customer showed an average balance of Rs.150 and a standard deviation of Rs.50. assuming that the account balances are normally distributed i) What percentage of account is over Rs.200? ii) What percentage of account is between Rs.120 and Rs.170? iii) What percentage of account is less than Rs.75?

6 CO1 K3

14. a) (i) If X and Y two random variables having joint density function

6 CO2 K3

$$f(x, y) = \begin{cases} \frac{1}{8}(6 - x - y), & 0 < x < 2, 2 < y < 4 \\ 0, & \text{otherwise} \end{cases}$$

Find (i) $P(X < 1 \cap Y < 3)$ (ii) $P[X + Y < 3]$

(iii) $P[X < 1 / Y < 3]$

(ii) Obtain the equation of lines of regression for the following data, also estimate the value of (i) Y , when $X = 38$, and the value of (ii) X when $Y = 18$

6 CO2 K3

X	22	26	29	30	31	31	34	35
Y	20	20	21	29	27	24	27	31

OR

b) (i) The joint probability mass function of (X, Y) is given by $P(X, Y) = K(2X + 3Y)$, $X = 0, 1, 2$, $Y = 1, 2, 3$. Find the all marginal and conditional probability distributions. Also find $P[X + Y > 3]$. 6 CO2 K3

(ii) Two independent random variables X and Y are defined by $f(x) = \begin{cases} 4ax, & 0 < x < 1 \\ 0, & \text{Otherwise} \end{cases}$ and $f(y) = \begin{cases} 4by, & 0 < y < 1 \\ 0, & \text{Otherwise} \end{cases}$. Prove that $U = X + Y$ and $V = X - Y$ are uncorrelated. 6 CO2 K3

5. a) (i) The mean breaking strength of the cables supplied by a manufacturer is 1800 with a SD of 100. By a new technique in the manufacturing process it is claimed that the breaking strength of the cable has increased. In order to test this claim, a sample of 50 cables is tested and it is found that the mean breaking strength is 1850. Can we support the claim at 1 % LOS? 6 CO3 K3

(ii) Random samples drawn from two countries give the following data relating to the heights of adult males. Is the difference between standard deviation significant? 6 CO3 K3

	Country A	Country B
Mean Height(in inches)	67.42	67.25
SD(in inches)	2.58	2.50
Number in samples	1000	1200

OR

b) (i) A normal population has a mean of 6.48 and SD of 1.5. In a sample of 400 members mean is 6.75. Is the difference significance? 6 CO3 K3

(ii) A simple sample of heights of 6,400 Englishmen has a mean of 170 inches and a SD of 6.4 inches, while a simple sample of heights of 1600 Australians has a mean of 172 inches and a SD of 6.3 inches. Do the data indicate that Australians are on the average taller than Englishmen? 6 CO3 K3
