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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 20008

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2026

Fourth Semester

Computer Science and Engineering

U23MA405 – PROBABILITY AND STATISTICS

(Common to IT & CST)

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

Statistical Tables and Chart Tables are Permitted

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	If two dice are rolled, what is the probability that the sum of the upturned faces will be equal to 7?	2	K2	CO1
2.	State Baye's theorem.	2	K1	CO1
3.	A continuous random variable X has the probability density function $f(x) = Kx, 0 < x < 1$. Find the value of K.	2	K2	CO2
4.	Find the mean of exponential distribution.	2	K1	CO2
5.	What are Type – I and Type – II errors?	2	K1	CO3
6.	Write the condition for the application of χ^2 - test.	2	K1	CO3
7.	What are the basic principles in the design of experiments?	2	K1	CO4
8.	Why a 2x2 Latin square is not possible? Explain.	2	K2	CO4
9.	Find the lower and upper control limits for the chart, when $\bar{c} = 6$.	2	K2	CO5
10.	What is meant by tolerance limits?	2	K1	CO5

PART – B

(5 x 16 = 80 Marks)

Q.No.	Questions	Marks	KL	CO																				
11. a)	i. Four persons are chosen at random from a group containing 3 men, 2 women and 4 children. Show that the chance that exactly two of them will be children is $\frac{10}{21}$.	8	K3	CO1																				
	ii. A box contains 4 bad and 6 good tubes. Two are drawn out from the box at a time. One of them is tested and found to be good. What is the probability that the other one is also good?	8	K3	CO1																				
(OR)																								
b)	i. There are 3 boxes containing respectively, 1 white, 2 red, 3 black balls; 2 white, 3 red, 1 black balls; 3 white, 1 red, 2 black balls. A box is chosen at random and from it two balls are drawn at random. The two balls are 1 red and 1 white. What is the probability that they came from second box?	8	K3	CO1																				
	ii. Two coins are tossed 500 times, and we get: Two heads: 105 times One head: 275 times No head: 120 times Find the probability of each event to occur.	8	K3	CO1																				
12. a)	i. A random variable X has the probability function given below	8	K4	CO2																				
	<table border="1" style="margin-left: 40px;"> <tr> <td>X</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> </tr> <tr> <td>P(X)</td> <td>a</td> <td>3a</td> <td>5a</td> <td>7a</td> <td>9a</td> <td>11a</td> <td>13a</td> <td>15a</td> <td>17a</td> </tr> </table>	X	0	1	2	3	4	5	6	7	8	P(X)	a	3a	5a	7a	9a	11a	13a	15a	17a			
X	0	1	2	3	4	5	6	7	8															
P(X)	a	3a	5a	7a	9a	11a	13a	15a	17a															
	1) Find The value of 'a'. 2) Determine $P(X < 3)$ and $P(0 < X < 5)$ 3) Find the distribution function of X.																							
	ii. State and prove the memory less property of exponential distribution.	8	K3	CO2																				
(OR)																								
b)	i. It is known that the probability of an item produced by a certain machine will be defective is 0.05. If the produced items are sent to the market in packets of 20, find the number of packets containing atleast, exactly and atmost 2 defective items in consignment of 1000 packets by using Binomial distribution.	8	K3	CO2																				
	ii. A pair of dice is tossed twice. Find the probability of scoring 7 points (a) once (b) atleast twice (c) twice.	8	K3	CO2																				
13. a)	i. A sample of 900 members has mean 3.4 cm and standard deviation 2.61cm. Is the sample from a large population of mean 3.25 cm and standard deviation of 2.61 cm? (Test at 5% level of significance).	8	K3	CO3																				

- ii. A random sample of 10 boys had the following I.Q's 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q of 100? Find a reasonable range in which most of mean I.Q values of samples of 10 boys lie.

8 K3 CO3

(OR)

- b) The nicotine contents in milligrams in two samples of tobacco were found to be as follows.
 Sample I : 24, 27, 26, 21, 25
 Sample II : 27, 30, 28, 31, 22, 36
 Can it be said that two samples come from normal population having the same mean?

16 K5 CO3

14. a) The following table shows the lives in hours of four brands of electric lamps.

16 K3 CO4

A	1610	1610	1650	1680	1700	1720	1800	
B	1580	1640	1640	1700	1750			
C	1460	1550	1600	1620	1640	1660	1740	1820
D	1510	1520	1530	1570	1600	1680		

Perform an analysis of variance test the homogeneity of the mean lives of the four brands of lamps.

(OR)

- b) An experiment was designed to study the performance of 4 different additives for cleaning fuel injectors. The experiment used 12 tanks of gas for 4 different detergents on 3 different models of engine. The following "cleanliness" data was collected.

16 K3 CO4

	Engine 1	Engine 2	Engine 3
Detergent A	45	43	51
Detergent B	47	46	52
Detergent C	48	50	55
Detergent D	42	37	49

Perform the ANOVA and test at 0.01 level of significance, whether there are differences in the detergents or in the engines?

15. a) The following are the sample means and ranges for ten samples, each of the size 5. Construct the control chart for means and range and comment on the nature of control.

16 K3 CO5

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean	12.8	13.1	13.5	12.9	13.2	14.1	12.1	15.5	13.9	14.2
Range	2.1	3.1	3.9	2.1	1.9	3.0	2.5	2.8	2.5	2.0

(OR)

- b) 20 pieces of cloth out of different rolls contained respectively 1, 4, 3, 2, 4, 5, 6, 7, 2, 3, 12, 5, 7, 6, 4, 5, 2, 1, 3 and 8 imperfections. Ascertain whether the process is a state of statistical

16 K3 CO5