

Reg. No.

Question Paper Code

11020


SAI RAM INSTITUTE OF TECHNOLOGY

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B.E / B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2021

Fourth Semester

Information Technology

MA8391 - Probability and Statistics

(Regulations 2017)

(Use of Statistical Tables is permitted)

Duration: 3 Hours

Max. Marks 100

Answer ALL Questions

PART-A (10 × 2 = 20 Marks)

		K-Level	CO No.
1.	If X is uniformly distributed over (0,10) then find $P(3 < X < 8)$.	K3	CO2
2.	If a random variable X has the MGF $M_X(t) = \frac{2}{2-t}$ then find $\text{Var}(X)$.	K3	CO2
3.	The joint p.d.f of two-dimensional random variable (X, Y) is given by $f(x, y) = ke^{-(x+y)}$, $x, y \geq 0$ Find the value of K.	K3	CO2
4.	State Central Limit Theorem.	K1	CO2
5.	State the uses of χ^2 - test.	K1	CO4
6.	What is Type I and Type II errors?	K1	CO4
7.	What do you understand by Design of an experiment?	K1	CO5
8.	Why a 2*2 Latin square is not-possible?	K2	CO5
9.	State the advantages of Statistical Quality Control.	K1	CO6
10.	Ten units were inspected for non-confirming welds with the total no.of defects as 360. Find UCL and LCL.	K3	CO6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 - Create

PART – B (5 × 16 = 80 marks)

11. a) There are 4 candidates for the office of the highway commissioner. The
i) respective probabilities that they will be selected are 0.3, 0.2, 0.4 & 0.1 and the probabilities for a project's approval are 0.35, 0.85, 0.45 & 0.15, depending on which of the 4 candidates is selected. What is the probability of the project getting approval? 8 K3 CO1
- A machine manufacturing screws is known to produce 5% defective. In
ii) a random sample of 15 screws, what is the probability that there are (i) exactly 3 defectives (ii) at least 3 defectives? 8 K3 CO2

OR

- b) A random variable X has the following probability function
i)

x	0	1	2	3	4	5	6	7
$P(X = x)$	0	a	2a	2a	3a	a ²	2a ²	7a ² + a

8 K3 CO1

Find (i) a (ii) $P(X < 4)$ (iii) Find $P(1.5 < X < 4.5/X > 2)$

- ii) If the probability that an applicant for a driver's licence will pass the road test on any given trial is 0.8, what is the probability that he will finally pass the test (i) on the 4th trial (ii) in fewer than 4 trials? 8 K3 CO2

12. a) If the Joint PDF of (X,Y) is given by $f(x,y) = e^{-(x+y)}, x > 0, y > 0$
i) Prove that X and Y are uncorrelated. 8 K3 CO3

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

- ii) If find (i) $P(X < 1 \cap Y < 3)$ and (ii) $P(X < 1 / Y < 3)$. 8 K3 CO3

OR

- b) The lifetime of a certain brand of an electric bulb may be considered a
i) RV with mean 1200h and standard deviation 250h. Find the Probability, using central limit theorem, that the average lifetime of 60 bulbs exceeds 1250 h 8 K3 CO2
- ii) If X and Y are independent random variables with pdf $e^{-x}, x \geq 0$ and $e^{-y}, y \geq 0$ respectively, find the density functions of $U = \frac{X}{X+Y}$ and $V = X+Y$. Are U and V independent? 8 K3 CO3

13. a) The means of two large samples of 1000 and 2000 members are 67.5
i) inches and 68 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? 8 K3 CO4

- ii In 120 throws of single die, the following distribution of faces were observed 8 K3 CO4

Faces	1	2	3	4	5	6
Frequency	30	25	18	10	22	15

Can you say that the die is biased?

OR

- b) Two random samples drawn from normal populations are 8 K3 CO4

i

Sample I	20	16	26	27	23	22	18	24	25	19		
Sample II	27	33	42	35	32	34	38	28	41	43	30	37

Obtain estimates of the variances of the populations and test whether the two populations have the same variance

- ii When 10 oil tins are taken at random & automatic filling machine, the mean weight of ten tin is 15.8 kg and S.D is 0.5 kg. Thus, the sample mean differs significantly from the intended weight of 16 kg. 8 K3 CO4

14. a) Analyse the following by Latin square experiment. 16 K3 CO5

A12	D20	C16	B10
D18	A14	B11	C14
B12	C15	D19	A13
C16	B11	A15	D20

OR

- b) 16 K3 CO5

The following table shows the lives in hours of four brands of electric lamps brand.

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 and test the homogeneity of the mean of the four brands of lamps

15. a)

Sample	1	2	3	4	5	6	7	8	9	10
Mean	43	49	37	44	45	37	51	46	43	47
Range	5	6	5	7	7	4	8	6	4	6

16 K3 CO6

Draw the appropriate mean and range charts and each of size five.
Comment on the state of control of the process

OR

b) Construct a control chart for defectives for the following data:

Sample No.	1	2	3	4	5	6	7	8	9	10
No. Inspected	90	65	85	70	80	80	70	95	90	75
No. of Defectives	9	7	3	2	9	5	3	9	6	7

16 K3 CO6