A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U1M03

B.E./B.Tech. DEGREE EXAMINATION, APRIL/ MAY 2025

First Semester

Computer Science and Business systems

21UMA103- PROBABILITY AND INFERENTIAL STATISTICAL TECHNIQUES

(Regulations 2021)

(Statistical Tables may be permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. What is the probability of getting a sum 9 from two throws of a dice? CO1- App

   (a) 1/6 (b) 1/8 (c) 1/9 (d) 1/12

2. If A and B are mutually exclusive events, then P(A or B) is CO6 -U

   (a) P(A).P(B) (b) P(A) – P(B) (c) P(A) + P(B) (d) None of these

3. The probability of binomial variate is B(5, ½). Then Mean is CO2 - App

   (a) 11/2 (b) 9/2 (c)5/2 (d) None of the above

4. Which of the following discrete distributions follow memory less property: CO6 -U

   (a) Geometric (b) Gamma (c) Normal (d) None of these

5. The joint probability density function is $f(x, y) = k$, $0 < x < 2$, $0 < y < 1$. CO3 - App
   Estimate K =
   a) 4 b) 1 c) ½ d) 2

6. Var (2X + 3) = _____ CO3 - App

   (a) 4Var (X) + 9Var (Y) (b) 4Var (X) (c) 9Var (Y) (d) 0

7. The range of 16, 18, 18, 16, 18, 20, 17, 19, 16, 24. CO4 -App

   (a) 12 (b) 8 (c) 9 (d) 10

8. Find the median for the following data 4, 6, 9, 4, 2, 8, 10 CO4 -App

(a) 12 (b) 8 (c) 6 (d) 10

9. The degrees of freedom for chi square tests to fitting a binomial distribution CO6 – U

(a) n – 1 (b) n – 2 (c) n – 3 (d) n – 4

10. Small sample size is _____ CO6 - U

(a) 30 (b) > 30 (c) < 30 (d) None of these

PART – B (5 x 2= 10Marks)

11. A coin is tossed thrice. Find the probability that there will appear exactly two tails? CO1 - App

12. For Binomial distribution mean is 10 and variance is 4, Find $P(X = x)$ CO2 – App

13. If X and Y are independent random variables with variance 2 and 3, find the variance CO3 – App

of 3X + 4Y

14. If the values of mean and median are 53.6 and 55.81, what will be the value of mode? CO4 – App

15. What are the parameters and statistics in sampling? CO6 – U

PART – C (5 x 16= 80Marks)

16. (a) (i) A R.V. X has the following distribution CO1 – App (8)

x	0	1	2	3	4	5	6
P(X)	a	2a	2a	3a	3a	6a	8a

i) Find $P(X \geq 2)$ and $E(X)$, (ii) Find $Var(X)$

(ii) If the density function of a continuous r.v X is given by CO1 – App (8)

$$f(x) = \begin{cases} ax & 0 \leq x \leq 1 \\ a & 1 \leq x \leq 2 \\ 3a - ax & 2 \leq x \leq 3 \\ 0 & otherwise \end{cases}$$

(i) find the value of "a" (ii) Find the c.d.f of X

Or

(b) (i) A R.V X has the PDF CO1 – App (8)

$$f(x) = \begin{cases} \frac{1}{3} e^{-\frac{x}{3}} & , x \geq 0 \\ 0 & , x < 0 \end{cases}$$

Find

(i) $P[X > 3]$

(ii) mean and variance.

(ii) For the following density function CO1 – App (8)

$f(x) = a e^{|-x|}$, $-\infty < x < \infty$

(i) Find the value of 'a'

(ii) Find mean and variance

17. (a) (i) Explain M.G.F of uniform distribution and hence find mean and variance CO2 –App (8)

(ii) Establish the memoryless property of Geometric distribution. CO2 –App (8)

Or

(b) (i) Four coins are tossed simultaneously. What is the probability of getting (i) 2 heads (ii) atleast 2 heads (iii) atmost 2 heads. CO2 –App (8)

(ii) Explain M.G.F of Exponential distribution and hence find mean and variance. CO2 –App (8)

18. (a) (i) The two dimensional RV (X,Y) has the density function CO3 –App (8)

$f(x,y) = \frac{x + 2y}{27}$ x = 0, 1, 2; y = 0, 1, 2.

Find (i) The Marginal distribution function of X and Y

(ii) Find the Conditional distribution of Y for X = 1

(ii) Obtain the Correlation coefficient for the following data CO3 –App (8)

X	12	15	17	18	23	16	25	27
Y	110	120	124	130	136	122	140	143

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 marginal distribution function and conditional distribution. CO3 –App (8)

(ii) The joint pdf CO3 –App (8)

$$f(x,y) = \begin{cases} \frac{8xy}{9}, & 0 \le x \le y \le 2 \\ 0 & otherwise \end{cases}.$$

Find

$(i)\ f_X(x)$

$(ii)\ f_Y(y)$

(iii) conditional density function of X given Y.

19. (a) (i) Calculate the arithmetic mean of the following table: CO4 –App (8)

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of students	12	18	27	20	17	6

(ii) Calculate the Variance of the following data: CO4 –App (8)

Marks	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
No. of students	5	20	14	10	8	5

Or

(b) (i) Find the value of x , when mode is 67 CO4 –App (8)

Marks	40-50	50-60	60-70	70-80	80-90
No. of students	5	X	15	12	7

(ii) Compute the Variance of the following data: CO4 –App (8)

Marks	0 -5	5 - 10	10 -15	15 - 20	20 - 25	25 - 30
No. of students	5	12	21	22	13	10

20. (a) (i) The Theory predicts the proportion of beans, in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the number in the four groups were 882, 313, 287and 118. Investigate the Experimental result support the theory? CO5 –App (8)

(ii) From the following information state identify the condition of the child is associated with the condition of the house. CO5 –App (8)

Condition of Child	Condition of House		Total
	Clean	Dirty	
Clean	69	51	120
Fairly Clean	81	20	101
Dirty	35	44	79
Total	185	115	300

Or

(b) (i) Two independent samples of sizes 9 and 7 from a normal population had the following values of the variables. CO5 –App (8)

Sample I	18	13	12	15	12	14	16	14	15
Sample II	16	19	13	16	18	13	15	-	-

Investigate the estimates of the population variance differ significantly at 5% level?

(ii) In one sample of 10 observations, the sum of the squares of the deviations of the sample values from the sample mean was 120 and in another sample of 12 observations it was 314. Ensure that the test whether this difference is significant at 5% level of significance. CO5 –App (8)