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

Question Paper Code:R1M03

B B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

First Semester

Computer Science and Business Systems

R21UMA103- PROBABILITY AND INFERENTIAL STATISTICAL TECHNIQUES

(Regulations R2021)

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. Three unbiased coins are tossed. What is the probability of getting at most two heads? CO1-App

   (a) ¾ (b) ¼ (c) 3/8 (d) 7/8

3. Which of the following continuous distributions follow memoryless property: CO6 - U

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

4. A random variable X is uniformly distributed between 3 and 11. Find the mean of X. CO2 - App

   (a) 12 (b)9 (c)7 (d) 8

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

   (a) 4 (b) 1 (c) ½ (d) 2

6. If E denotes the expectation the variance of a random variable X is denoted as? CO6 -U

   (a) $(E(X))^2$ (b) $E(X^2) - (E(X))^2$ (c) $E(X^2)$ (d) 2E(X)

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 variable of t – distribution ranges from…… CO6 - U

(a) > 0 (b)-∞ to ∞ (c)-∞ to 0 (d) None of these

10. F – test is used to test for equality of _____ CO6 - U

(a) Mean (b) Variance (c)Both (a) & (b) (d) None of these

PART – B (5 x 2= 10 Marks)

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

12. If Moment generating function $M_x(t) = \frac{2}{2-t}$, find the mean value CO2- App

13. Joint PDF of a bivariate Random variable is given by $f(x,y) = \begin{cases} Kxy, & 0 < x < 1,\ 0 < y < 1 \\ 0, & otherwise \end{cases}$ find K. CO3 -App

14. If the values of mean and mode are respectively 30 and 15, then calculate the value of median. CO4 - App

15. What are the parameters and statistics in sampling? CO5 -App

PART – C (5 x 16= 80Marks)

16. (a) (i) A RV X has the following distribution CO1 - App (8)

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

(i) Find the value of 'k'

(ii) Find c.d.f. and find $P(X < 6)$, $P[1.5 < X < 4.5 / X > 2]$

(ii) There are three identical cards except that both the sides of the first card is coloured red, both sides of the second card is coloured blue and for the third card one side is coloured red and the other side is blue. One card is randomly selected among these three cards and put down, visible side of the card is red. What is the probability that the other side is blue? CO1 - App (8)

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) The probability function of an infinite discrete distribution is given by $P[X = j] = \frac{1}{2^j}, j = 1,2,3,.....\infty$ Find the probability of CO1 - App (8)

(i) Multiples of 5, (ii) even number and mean

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

(ii) Establish the memory less 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) Obtain the Correlation coefficient for the following heights (in inches) of fathers X and their sons Y. CO3 -App (8)

X	55	56	57	57	58	50	60	62
Y	67	68	65	68	72	72	69	75

(ii) Three balls are drawn at random without replacement from a box containing 2 white, 3 red and 4 black balls. If X denotes the number of white balls drawn and Y denotes the number of red balls drawn, find the probability distribution of (X, Y). CO3 -App (8)

Or

(b) Obtain the Correlation coefficient for the following data: CO3 -App (16)

X	12	15	17	18	23	16	25	27
Y	11	10	14	13	16	22	14	15

And also find Regression Equations x on y & y on x

19. (a) (i) Compute the Median of the following table: CO4 -App (8)

Marks	0 – 6	6-12	12-18	18-24	24-30	30-36
No. of students	12	17	20	25	14	6

(ii) Derive the Mode of the following table: CO4 -App (8)

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of students	21	26	22	13	17	10

Or

(b) (i) 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	20	25	27	13	17	10

(ii) Derive the Mode of the following table: CO4 -App (8)

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of students	20	25	27	13	17	10

20. (a) (i) The following data are collected on two characters. CO5 -App (8)

	Smokers	Non Smokers
Literates	83	57
Illiterates	45	68

Using chi-square test to find is there any relation between smoking and literacy.

(ii) 4 coins were tossed 160 times and the following results were obtained: CO5 -App (8)

No. of heads:	0	1	2	3	4
Observed frequencies:	17	52	54	31	6

Under the assumption that the coins are unbiased, find the expected frequencies of getting 0, 1, 2, 3, 4 heads and test the goodness of fit.

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)