

**A Reg. No. :**

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**Question Paper Code:U1M03**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER2023

First Semester

Computer Science and Business System

R21UMA103- PROBABILITY AND INFERENTIAL STATISTICAL TECHNIQUES

(Regulations 2021)

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) $\frac{3}{4}$	(b) $\frac{1}{4}$	(c) $\frac{3}{8}$	(d) $\frac{7}{8}$
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) $\frac{1}{2}$	(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) $-\infty$ to $\infty$	(c) $-\infty$ 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= 10Marks)																						
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 $f(x, y) = \begin{cases} Kxy, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$ 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																		
		<table border="1" style="margin-left: auto; margin-right: auto;"> <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> </tr> <tr> <td>P(X)</td> <td>0</td> <td>K</td> <td>2k</td> <td>2k</td> <td>3k</td> <td><math>k^2</math></td> <td><math>2k^2</math></td> <td><math>7k^2+k</math></td> </tr> </table>		X	0	1	2	3	4	5	6	7	P(X)	0	K	2k	2k	3k	$k^2$	$2k^2$	$7k^2+k$	(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																		
		Or																				
	(b)	(i) A R.V X has the PDF $f(x) = \begin{cases} \frac{1}{3} e^{-\frac{x}{3}}, & x \geq 0 \\ 0, & x < 0 \end{cases}$		CO1 - App																		
				(8)																		

		Find (i) $P[X > 3]$ (ii) mean and variance.																				
		(ii) The probability function of an infinite discrete distribution is given by $P[X = j] = \frac{1}{2^j}, j = 1, 2, 3, \dots, \infty$ Find the probability of (i) Multiples of 5, (ii) even number and mean	CO1 - App	(8)																		
17.	(a)	(i) Explain M.G.F of uniform distribution and hence find mean and variance (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. (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. <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>55</td> <td>56</td> <td>57</td> <td>57</td> <td>58</td> <td>50</td> <td>60</td> <td>62</td> </tr> <tr> <td>Y</td> <td>67</td> <td>68</td> <td>65</td> <td>68</td> <td>72</td> <td>72</td> <td>69</td> <td>75</td> </tr> </table>	X	55	56	57	57	58	50	60	62	Y	67	68	65	68	72	72	69	75	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: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>12</td> <td>15</td> <td>17</td> <td>18</td> <td>23</td> <td>16</td> <td>25</td> <td>27</td> </tr> <tr> <td>Y</td> <td>11</td> <td>10</td> <td>14</td> <td>13</td> <td>16</td> <td>22</td> <td>14</td> <td>15</td> </tr> </table> And also find Regression Equations x on y & y on x	X	12	15	17	18	23	16	25	27	Y	11	10	14	13	16	22	14	15	CO3 -App	(16)
X	12	15	17	18	23	16	25	27														
Y	11	10	14	13	16	22	14	15														
19.	(a)	(i) Compute the Median of the following table: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Marks</td> <td>0 – 6</td> <td>6-12</td> <td>12-18</td> <td>18-24</td> <td>24-30</td> <td>30-36</td> </tr> <tr> <td>No. of students</td> <td>12</td> <td>17</td> <td>20</td> <td>25</td> <td>14</td> <td>6</td> </tr> </table>	Marks	0 – 6	6-12	12-18	18-24	24-30	30-36	No. of students	12	17	20	25	14	6	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: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Marks</td> <td>0 – 10</td> <td>10 – 20</td> <td>20 – 30</td> <td>30 – 40</td> <td>40 – 50</td> <td>50 – 60</td> </tr> <tr> <td>No. of students</td> <td>21</td> <td>26</td> <td>22</td> <td>13</td> <td>17</td> <td>10</td> </tr> </table>	Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	No. of students	21	26	22	13	17	10	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: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Marks</td> <td>0 – 5</td> <td>5 – 10</td> <td>10 – 15</td> <td>15 – 20</td> <td>20 – 25</td> <td>25 – 30</td> </tr> </table>	Marks	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	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	1 8	13	12	15	1 2	1 4	1 6	1 4	1 5
		Sample II	1 6	19	13	16	1 8	1 3	1 5	-	-
		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)	