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Question Paper Code: U3029

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

Third Semester

Artificial Intelligence and Machine learning

21UMA329 COMPUTATIONAL STATISTICS AND NUMERICAL METHODS

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10 x 1 = 10 Marks)

- For a set of five bivariate data(x, y) covariance is 10. Variance of x and y are 25 and 16 respectively. The Karl Pearson coefficient of correlation is
(a) 1 (b) -1 (c) $\frac{1}{2}$ (d) $\frac{1}{4}$ CO6- U
- The Regression coefficient y on x is
(a) $\gamma \frac{\sigma_x}{\sigma_y}$ (b) $\gamma \frac{\sigma_y}{\sigma_x}$ (c) $\frac{\sigma_x}{\sigma_y}$ (d) $\frac{\sigma_x}{\gamma \sigma_y}$ CO6- U
- t-test is used to test for equality of _____
(a) Mean (b) Variance (c) ratio (d) all the above CO6- U
- Choose the F-test
(a) $F = S_1^2 / S_2^2, S_1 > S_2$ (b) $F = S_2^2 / S_1^2, S_1 > S_2$ (c) $F = 0$ (d) None of the above CO6- U
- _____ number of normal equations are required to fit a parabolic curve in method of least squares
(a) 1 (b) 2 (c) 3 (d) 4 CO6- U
- In method of moments, the second moment is denoted by
(a) $\Delta y \Sigma xy^2$ (b) $\Delta x \Sigma xy$ (c) $\Delta x \Sigma x^2 y$ (d) $\Delta y \Sigma xy^2$ CO6- U
- _____ prior values are required to predict the next value in Milne's method
(a) 1 (b) 2 (c) 3 (d) 4 CO6- U

8. The Fourth order Runge-Kutta methods are used widely in _____ solution to differential equations CO6- U
 (a) abstract (b) graphical (c) numerical (d) None of these
9. PDE of second order, if $B^2 - 4AC > 0$ then CO6- U
 (a) parabolic (b) elliptic (c) hyperbolic (d) None of these
10. $u_{xx} + u_{yy} = f(x, y)$ is a _____ equation CO6- U
 (a) elliptic (b) parabolic (c) hyperbolic (d) Non homogeneous

PART – B (5 x 2= 10 Marks)

11. The two variable x and y have the Regression lines $6x + y - 31 = 0$ & $3x + 2y - 26 = 0$ Find Mean values of x and y CO1- App
12. What are the parameters and statistics in sampling? CO6-U
13. Distinguish between point and interval estimate. CO6- U
14. Using Taylor's series method find $y(0.1)$ given $y' = 1 + y$ with $y(0) = 1$ CO4 -App
15. Classify $u_{xx} - 2u_{xy} + u_{yy} = 0$ CO5 -App

PART – C (5 x 16= 80 Marks)

16. (a) (i) Calculate the coefficient of correlation of the following data CO1- App (8)

X	100	200	300	400	500	600	700
Y	30	50	60	80	100	110	130

- (ii) Calculate the Correlation coefficient between X and Y from following table CO1- App (8)

X Y	18	19	20	21
200-250	4	4	2	1
250-300	3	5	4	2
300-350	2	6	8	5
350-400	1	4	6	10

Or

- (b) (i) Calculate the rank correlation coefficient of the following data CO1- App (8)

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	62	45	81	60	68	48	50	70

- (ii) Calculate the Regression equation between the marks in X and Y CO1- App (8)

X	12	15	17	18	23	16	25	29
Y	110	120	124	130	136	122	140	143

17. (a) (i) The following data are collected on two characters. Using chi-square test to find is there any relation between smoking and Non Smokers CO2- Ana (8)

	Smokers	Non Smokers
Literates	460	140
Illiterates	240	160

- (ii) The theory predicts the population of beans in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? CO2- Ana (8)

Or

- (b) (i) Two researchers A and B adopted different techniques while rating the students level. Can you say that the techniques adopted by them are significant? CO2- Ana (8)

Researchers	Below Average	Average	Above Average	Genius	Total
A	40	33	25	2	100
B	86	60	44	10	200
Total	126	93	69	12	300

- (ii) To verify whether a course in accounting improved performance, a similar test was given to 12 participants both before and after the course. The marks are: Was the course was useful? CO2- Ana (8)

Before	44	40	61	52	32	44	70	41	67	72	53	72
After	53	38	69	57	46	39	73	48	73	74	60	78

18. (a) (i) Applying least square method techniques fit a straight line $y = ax + b$ CO3- App (8)

X	5	10	15	20	25
Y	16	19	23	26	30

- (ii) Applying method of moments fit a straight line $y = ax + b$ CO3- App (8)

X	2	4	6	8	10	12	14
Y	20.3	18.5	17	14.8	13	11.2	9.4

Or

- (b) (i) Fit a straight line fit of the form $y = a + bx$ CO3- App (8)

X	0	5	10	15	20	25
Y	12	15	17	22	24	30

- (ii) By Applying group average method, obtain a second degree curve which fits best in the following data CO3- App (8)

X	87.5	84.0	77.8	63.7	46.7	36.9
Y	292	283	270	235	197	181

19. (a) Given $\frac{dy}{dx} = 1 + y^2$, $y(0) = 0$, $y(0.2) = 0.2027$, $y(0.4) = 0.4228$, CO4- App (16)

$y(0.6) = 0.6841$ evaluate $y(0.8)$ by Adams – Bash forth method.

Or

- (b) (i) Using R-K method of fourth order, find $y(0.1)$ for the initial value CO4- App (8)

problem $\frac{dy}{dx} = x + y^2$ with $y(0) = 1$

- (ii) Using Taylor's series method find $y(1.1)$ given $y' = x + y$ with CO4- App (8)
 $h=0.1$ & $y(1) = 0$

20. (a) (i) Solve $\frac{\partial^2 u}{\partial x^2} = 32 \frac{\partial u}{\partial t}$, $u(0,t) = 0$, $u(1,t) = t$, $u(x,0) = 0$. Take

CO5- App (8)

$h = 0.25$ and find the values of u up to $t = 5$ using Bender-Schmidt's difference equation.

(ii) Using Crank-Nicholson's difference equation to solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$

CO5- App (8)

$u(0,t) = 0$, $u(1,t) = t$, $u(x,0) = 0$. compute u for one time step function with $h=0.25$.

Or

(b) Solve the Laplace equation $u_{xx} + u_{yy} = 0$ at the nine mesh points of the square given below. The values of u at the boundary are specified in the figure

CO5- App (16)

0	11.1	17	19.7	18.6
0	u_1	u_2	u_3	21.9
0	u_4	u_5	u_6	21.0
0	u_7	u_8	u_9	17.0
0	8.7	12.1	12.8	9.0

