Q. Code:913359

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

MA22453 – STATISTICS AND NUMERICAL METHODS

(Civil Engineering)

(Regulation 2022)

Use of statistical tables are permitted

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	The student should be able to apply the concept of testing of hypothesis large and small samples to real life problems.	**3**
CO 2	The student should be able to apply the concept of classifications of design of experiments to real life problems.	**3**
CO 3	The student should be able to appreciate the numerical techniques of interpolation for various intervals.	**3**
CO 4	The student should be able to apply the numerical techniques of differentiation and integration for engineering problems.	**3**
CO 5	The student should be able to understand the knowledge of various techniques and methods for solving first order ordinary differential equations.	**3**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	A random variable X has the following probability distribution. | x | -2 | -1 | 0 | 1 | 2 | 3 | | $p(x)$ | 0.1 | k | 0.2 | $2k$ | 0.3 | $3k$ | Find k.	**1**	**2**
2.	A continuous random variable X that can assume any value between $x=2$ and $x=5$ has a density function given by $f(x)=\frac{2}{27}(1+x)$. Find $P(X<4)$.	**1**	**3**
3.	A stenographer claims that she can type at the rate of 120 words per minute. On the basis of 100 trails in which she demonstrates a mean of 116 words with a standard deviation of 15 words. Calculate Z- value.	**1**	**2**
4.	In a sample of 1000 people in Maharashtra, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance?	**1**	**2**
5.	When do you apply analysis of variance technique?	**2**	**2**
6.	What are the basic principles of experimental design?	**2**	**2**

7.	What do you mean by one-way classification in analysis of variance?	**2**	**2**
8.	Why a 2×2 Latin square design is not possible? Justify.	**2**	**2**
9.	What is Newton's algorithm to solve the equations $x^2 = 12$?	**3**	**3**
10.	Compare Gauss – Jordan method and Gauss – Seidel method for solving linear systems of the form $AX = B$.	**3**	**2**
11.	Solve by Gauss elimination method *x+2y=5, x-y= -1.*	**3**	**2**
12.	Apply Gauss Jordan method, solve $3x+4y=8;\ 4x+3y=7$	**3**	**2**
13.	What is the Lagrange's formula to find y if three sets of values $(x_0, y_0), (x_1, y_1)$, and (x_2, y_2) are given?	**4**	**2**
14.	Obtain the divided difference table for the following data:	**4**	**2**

x	-1	0	2	3
y	-8	3	1	12

15.	Form the difference table for the following data:	**4**	**2**

x	5	6	9	11
$f(x)$	12	13	15	18

16.	Evaluate $\int_0^1 \frac{1}{1+x} dx$ using Trapezoidal rule with $h = 0.25$.	**4**	**3**
17.	By Taylor's series method, find $y(1.1)$ given $y' = x + y, y(1) = 0$.	**5**	**2**
18.	Given $y' = -y$ and y (0) =1, determine the values of y at x= 0.01 by Euler method.	**5**	**2**
19.	Find the value of k_1 using R-K method of the fourth order with $h = 0.2$, given that $\frac{dy}{dx} = \sqrt{x^2 + y}\ ;\ y(0) = 0.8$.	**5**	**3**
20.	What is the condition to apply Adams or Milne Predictor- corrector method?	**5**	**2**

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21. (a)	The nicotine content in milligrams of two samples of tobacco was found to be as follows:	**(10)**	**1**	**3**

Sample A	24	27	26	21	25	-
Sample B	2	30	2	31	2	36

	7		8		2	

Can it be said that two samples come from normal populations having the same means?

(OR)

(b) Two random samples gave the following results. **(10) 1 3**

Sample	Size	Sample mean	Sum of squares of deviations from the mean
1	10	15	90
2	12	14	108

Can we conclude that the two samples have been drawn from the same normal population with equal means and equal variances?

22. **(a)** Three samples A, B, C have been obtained from normal populations with equal variances. Test whether the population means are equal at 5% level. **(10) 2 3**

Sample A	12	14	12	9	13
Sample B	9	9	5	7	10
Sample C	7	8	10	11	14

(OR)

(b) The following table gives the number of refrigerators sold by 4 salesman in three months: **(10) 2 3**

Month	Salesman			
	A	B	C	D
I	50	40	48	39
II	46	48	50	45
III	39	44	40	39

Is there a significant difference in the sale made by the four salesmen? Is there a significant difference in the sales made during different month?

23. (a)	Find the positive root of $x^4 - x = 10$ correct to three decimal places, using Newton Raphson method.	**(10)**	**3**	**3**

(OR)

(b)	Using Power method to find the dominant Eigenvalue and the corresponding Eigenvector of the matrix $A = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$.	**(10)**	**3**	**3**

24. (a)	Find the cubic function from the following table using Newton's divided difference formula and hence find $f(2), f'(2)$ and $f''(2)$.	**(10)**	**4**	**3**

x	0	1	3	4
$f(x)$	1	4	40	8 5

(OR)

(b)	Evaluate the integral $I = \int_1^2 \int_1^2 \frac{dxdy}{x+y}$ using the Trapezoidal rule and Simpson's rule with $h = k = 0.5$	**(10)**	**4**	**3**

25. (a)	Find the value of $y(1.1)$ using R-K method of the fourth order given that $\frac{dy}{dx} = y^2 + xy, y(1) = 1.$	**(10)**	**5**	**3**

(OR)

(b)	Given $\frac{dy}{dx} = x^2(1+y)$ and $y(1) = 1, y(1.1) = 1.233,$ $y(1.2) = 1.542, y(1.3) = 1.979,$ evaluate $y(1.4)$ by Adam's method.	**(10)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	The following table gives the number of air-craft accidents that occurred during the various days of a week. Test whether the accidents are uniformly distributed over the week.	**(10)**	**1**	**3**

Day	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents	15	19	13	12	16	15

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