

# **Question Paper Code: 41403**

### B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Fourth Semester

#### Mechanical Engineering

#### 14UMA423 - STATISTICS AND NUMERICAL METHODS

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

(Statistical Tables are permitted)

PART A - (10 x 1 = 10 Marks)

- 1. What is the essential difference between confidence limits and tolerance limits?
  - (a) Population Parameters & Certain Proportion
  - (b) Proportion of population
  - (c) Distribution of Values
  - (d) Sampling error and variance in the population
- 2. The chi-square goodness-of-fit test can be used to test for

(a) significance of sample statistics	(b) difference between population means
(c) normality	(d) probability

- 3. In t-test say about sample size n
  - (a) n < 30(b) n>30 (c) n < 50(d) n > 50
- What is main advantage of Latin square design over Randomized Block Design 4.
  - (a) Controls the effect of one extraneous variables
  - (b) Controls the effect of two extraneous variables
  - (c) No control over the variables
  - (d) Limited Control over the variables
- 5. 2x2 Latin square is not possible. Why?
  - (a) Comparison is not possible
- (b) One Comparison is not possible
- (c) Mean Squared Error possible (d) Sum of Square is possible

6.	What is the order of c	onvergence of N-R m	nethod	
	(a) 1	(b) 3	(c) 2	(d) none of these
7.	As soon as a new va following equations .		found by iteration i	t is used immediately in the
	(a) Gauss -Seidel	method	(b) Gauss -Jor	rdan method
	(c) Gauss –Jacobi	method	(d) Gauss -Eli	imination method
8.	Interpolation is used t	o find		
	(a) Missed data		(b) Assembled	d data
	(c) Repeated data		(d) None of th	nese
9.	Newton's forward inte	erpolation formula us	ed only for	intervals.
	(a) Un equal inte	rvals	(b) In-Equidi	stance intervals
	(c) Equidistance i	ntervals	(d) Anisometr	ric Intervals
10.	Simpson's rule will gi	ve exact result, if the	e entire curve $y = f(x)$	) is itself a
	(a) Ellipse	(b) Parabola	(c) Hyperbola	a (d) Straight Line

PART - B (5 x 
$$2 = 10$$
 Marks)

- 11. Define student's t-test for difference of means of two samples.
- 12. What is the aim of the design of experiments?
- 13. State the principle used in Gauss Jordan method.
- 14. What is the assumption we make when Lagrange's formula is used?
- 15. Find the area under the curve passing through the points (0, 0), (1, 2), (2, 2.5), (3, 2.3), (4, 2) (5,1.7) and (6, 1.5).

PART - C (
$$5 \times 16 = 80$$
 Marks)

16. (a) Two types of Manure were applied to 16 one hectare plots, other conditions remaining the same. The yield in quintals are given below. Is there any significant difference between the mean yield? Use 5% level of significance. (16)

Manure I 8	20	36	50	49	36	34	49	41
Manure II 2	9 28	26	35	30	44	46		

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(b) Before an increase in excise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increase in duty, 800 people were tea drinkers in a sample of 1200 people. Using standard error of proportion, state whether there is a significant decrease in the consumption of tea after the increase in excise duty? ( $Z_{\alpha}$  at 5% level 1.645, 1% level 2.33). (16)

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17. (a) The following data represent the number of units of production per day turned out by different workers using 4 different types of machines.

		Machine Type			
		Α	В	С	D
Workers	1	4	3	4	3 6
		4	8	7	6
	2	4	4	5	4
		6	0	2	3
	3	3	36	4	3
		4	6	4	2
	4	4	3	4	3
		3	8	4 6	3
	5	3	4	4	3
		8	2	9	9

- (i) Test whether the five men differ with respect to mean productivity and
- (ii) Test whether the mean productivity is the same for the four different machine types. (16)

Or

- (b) Compare and contrast the Latin square design with the Randomised Block Design. (16)
- 18. (a) Compute the real root of xlog10x=1.2 correct to three decimal places using Newton's Raphson Method. (16)

Or

- (b) Solve the following system of equations using Gauss Seidel iterative method: 27x + 6y - z = 85, 6x + 15y + 2z = 72, x + y + 54z = 110. (16)
- 19. (a) Using Newton's forward interpolation formula, find the polynomial f(x) satisfying the following data. Hence evaluate f(x) at x = 5. (16)  $x : 4 \ 6 \ 8 \ 10$

- Or
- (b) Using Lagrange's method, find the value of f(3) from the following table:

(16)

20. (a) The table given below gives the velocity V of a moving particle at time t seconds. Find the distance covered by the particle in 12 seconds and also the acceleration at t = 2 seconds using Simpson's rule. (16)

(b) Evaluate  $\int_{1.2}^{1.4} \int_2^{2.4} \frac{1}{xy} dx dy$  using Trapezoidal and Simpson's rule. Verify your result by actual integration. (16)