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

Question Paper Code: 44023

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

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. The χ^2 test should not be applied if *N* is
   (a) ≤ 50 (b) ≥ 50 (c) < 50 (d) > 50

2. The variable *t*-distribution ranges from
   (a) $-\infty \; to \; 0$ (b) $-\infty \; to \; \infty$ (c) $-1 \; to \; 1$ (d) $-1 \; to \; 0$

3. Mean square between the samples is given by
   (a) SSE/c-1 (b) SSE/n-c (c) SSC/c-1 (d) SSC/n-c

4. Latin square are most widely used in the field of
   (a) agriculture (b) industry (c) medicine (d) astronomy

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. The order of Convergence of Newton-Raphson's method is
   (a) 1 (b) 0 (c) 2 (d) 3

7. Newton's forward interpolation formula used only for _____ intervals.
   (a) equal (b) unequal (c) open (d) closed

8. The n^{th} degree divided differences of a polynomial of the n^{th} degree are
   (a) equal (b) unequal (c) constant (d) variable

9. Error in Simpson's rule is of order

(a) h (b) h^2 (c) h^3 (d) h^4

10. Two point Gaussian Quadrature formula is $\int_{-1}^{1} f(x)dx =$

(a) $f\left(-\frac{1}{\sqrt{3}}\right) + f\left(\frac{1}{\sqrt{3}}\right)$ (b) $f\left(-\sqrt{3}\right) + f\left(\sqrt{3}\right)$

(c) $f(-1) + f(1)$ (d) None of these

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 x 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	29	28	26	35	30	44	46		

Or

(b) (i) A sample of 26 bulbs gives a mean life of 990 hours with a standard deviation of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard? (8)

(ii) A sample of size 13 gave an estimated population variance of 3.0, while another sample of size 15 gave an estimate of 2.5, could both samples from populations with the same variance? (8)

17. (a) The following Latin square of a design when 4 varieties of seeds are being tested. Set up the analysis of variance table and state your conclusion. (16)

A 105 B 95 C 125 D 115
C 115 D 125 A 105 B 105
D 115 C 95 B 105 A 115
B 95 A 135 D 95 C 115

Or

(b) Analyze the following results of Latin square experiments

	1	2	3	4
1	A(12)	D(20)	C(16)	D(10)
2	D(18)	A(14)	B(11)	C(14)
3	B(12)	C(15)	D(19)	A(13)
4	C(16)	B(11)	A(15)	D(20)

The letters A, B, C, D denote the treatments and the figures in brackets denote the observations. (16)

.18 (a) (i) Find a root of $x \log_{10} x - 1.2 = 0$ by Newton Raphson method correct to three decimal places. (8)

(ii) Find the numerically largest eigen value of $A = \begin{pmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{pmatrix}$ by power method. (8)

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) (i) Using Lagrange's formula fit the polynomial. (8)

x	0	1	4	5
$y = f(x)$	4	3	24	39

(ii) A third degree polynomial passes through the points (0,-1), (1, 1), (2, 1) and (3,-2) Using Newton's forward interpolation formula, find the polynomial. Hence find the value at 1.5. (8)

Or

(b) Using Newton's divided difference , find f(2), f(8) and f(15)from the following data:

X	:	*4*	*5*	*7*	*10*	*11*	*13*
f(x)	:	*48*	*100*	*294*	*900*	*1210*	*2028*

(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)

X	:	*0*	*2*	*4*	*6*	*8*	*10*	*12*
V	:	*4*	*6*	*16*	*34*	*60*	*94*	*136*

Or

(b) Evaluate $\int_{1.2}^{1.4}\int_{2}^{2.4}\frac{1}{xy}dxdy$ using Trapezoidal and Simpson's rule. Verify your result by actual integration. (16)