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Question Paper Code: 44023

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 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. Null Hypothesis is denoted by
 - (a) H_0 (b) H_1 (c) 0 (d) None of these
- 2. _____ test is used to test the significance of discrepancy between experimental values and theoretical values obtained under some theory of hypothesis.

(a) F-test (b) X^2 -test (c) T-Test (d) None of these

- 3. Completely Randomised Block design is a _____ classification.
 (a) One way (b) Two way (c) Three way (d) None of these
- 4. What is main advantage of Latin square design over Randomized Block Design
 - (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. The order of Convergence of Newton-Raphson's method is
 - (a) 1 (b) 0 (c) 2 (d) 3

7. _____ formula is used to find the unknown values of 'y' for some x which lies at the end of the tabular values

(a) Newton's Forward	(b) Lagrange's
(c) Newton's divided difference	(d) Newton's Backward

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(a) Newton's Forward	(b) Lagrange's
(c) Newton's divided difference	(d) Newton's Backward

9. Simpson's 1/3rd rule is used only when the number of ordinates must be
(a) Even
(b) odd
(c) Multiple of three
(d) None of these

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 Type-I error and Type-II error.
- 12. Write the differences between RBD and LSD.
- 13. Solve the following system of equations, using Gauss Jordan elimination method 2x + y = 3, x 2y = -1.
- 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) A real estate agency wants to compare the appraised values of single-family homes in two cities in Michigan. A sample of 60 listings in Lansing and 99 listings in Grand Rapids yields the following results (in thousands of dollars):

	Lansing	Big Rapids
\overline{X}	191.33	172.34
S	32.60	16.92
n	60	99

Is there evidence of a significant difference in the average appraised values for singlefamily homes in the two Michigan cities? Use 0.05 level of significance. (16)

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- (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?
- 17. (a) Five doctors, each test five treatments for a certain disease and observe the number of days each patient takes to recover. The results are as follows:Given Recovery time in days.

	Treatments				
Doctors	1	2	3	4	5
А	10	14	23	19	20
В	11	15	24	17	21
С	9	12	20	16	19
D	8	13	17	17	20
Е	12	15	19	15	22

Discuss the significant difference between (i) doctors (ii) treatments.

(16)

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) Using Newton Raphson method, solve $x \log_{10} x = 12.34$ taking the initial value x_0 as 10. (8)
 - (ii) Solve by Gauss elimination method the following system 3x + 4y + 5z = 18; 2x - y + 8z = 13; 5x - 2y + 7z = 20. (8)

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- ((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)

(b) (i) Using Lagrange's interpolation formula, find y(10) from the following table. (8)

х	5	6	9	11
У	12	13	14	16

(ii) Using Cubic Spline, find y(0.5) and y'(1) given $M_0 = M_2 = 0$ and the table (8)

Х	0	1	2
У	-5	-4	3

20. (a) (i) By dividing the range into 10 equal parts, evaluate $\int_{0}^{\pi} \sin x \, dx$ by Trapezoidal rule.(8)

(ii) Evaluate
$$\int_{-1}^{1} \frac{x^2}{1+x^4} dx$$
 by using three points Gauss quadrature formula. (8)

Or

(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)