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

Question Paper Code: 54003

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fourth Semester

Mechanical Engineering

15UMA423 - STATISTICS AND NUMERICAL METHODS

(Regulation 2015)

(Statistical tables may be permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Sample size for Large sample

   (a) <30 (b) = 30 (c) ≥ 30 (d) none

2. t-test is for testing means in

   (a) small sample (b) large sample (c) universe (d) all the above

3. The conclusion of ANOVA based on

   (a) F-test (b) t-test (c) chi-square test (d) none

4. SSL/degree of freedom =

   (a) MSR (b) MSC (c) MSE (d) MSL

5. What is the order of convergence of Newton-Raphson method

   (a) 4 (b) 2 (c) 6 (d) 0

6. If the eigen values of A are -4, 3, 1 then the dominant eigen value of A is

   (a) 1 (b) 3 (c) 4 (d) -4

7. Newton forward interpolation formula is used only for _____ used.

   (a) unequal intervals (b) equal intervals (c) both (d) none

8. In a cubic spline polynomial, M denotes

   (a) y (b) $y^{/}$ (c) $y^{//}$ (d) 0

9. What is the order of error in Simpson's rule?

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

10. Three point Gaussian quadrature formula is exact for polynomials upto degree

(a) 2 (b) 3 (c) 5 (d) 1

PART - B (5 x 2 = 10 Marks)

11. Define large sample and small sample.

12. Write the ANOVA table for Latin square design.

13. Find the inverse of the coefficient matrix by Gauss Jordan method 5x-2y=10, 3x+4y=12.

14. What is a cubic spline?

15. Apply two point formula to evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$

PART - C (5 x 16 = 80 Marks)

16. (a) (i) The mean lifetime of a sample of 100 light tubes produced by a company is found to be 1580 hours with S.D of 90 hours. Test the hypothesis that the mean lifetime of the tubes produced by the company is 1600 hrs. (8)

(ii) In a large city A, 20% of a random sample of 900 school boys had a slight physical defect. In another large city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between proportions significant. (8)

Or

(b) A certain injection administered to each of 12 patients resulted in the following increase of blood pressure: 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4. Can it be concluded that the injection will be in general accompanied by an increase in B.P.? (16)

17. (a) Three samples each of size 5, were drawn from three uncorrelated normal populations with equal variances. Test the hypothesis that the population means are equal at 5% level.

A	10	12	9	6	13
B	9	7	12	11	11
C	14	11	15	14	16

(16)

Or

(b) The following data relate to the results of a Latin Square experiment on four varieties of paddy A, B, C and D.

B 17.6	A 20.9	D 22.5	C 15.4
A 21.2	B 15.8	C 14.7	D 24.7
C 13.3	D 21.8	A 20	B 16.9
D 22.4	C 14.6	B 17.4	A 20.1

Analyse the results and give your comments. (16)

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

(ii) Solve the system of equations by Gauss-Elimination method and Gauss Jordan Method $x+2y+z=3,\ \ 2x+3y+3z=10,\ 3x-y+2z=13$. (8)

Or

(b) (i) Solve the given system of equations by using Gauss Seidel iteration method

$20x+y-2z=17,\ \ 3x+20y-z=-18,\ \ 2x-3y+20z=25$. (8)

(ii) Determine the largest eigen value and the corresponding eigen vector of the Matrix $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$ by power method. (8)

19. (a) Find f(8) by Newton's divided difference formula for the data

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

(16)

Or

(b) 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
f(x)	1	3	8	10

20. (a) Evaluate $\int_{-3}^{3} x^4 dx$ using (i) trapezoidal (ii) Simpson's rule verify your results by actual integration. (16)

Or

(b) (i) Using Romberg's method evaluate $\int_{0}^{1} \frac{dx}{1+x}$ correct to three places of decimals. (8)

(ii) Evaluate $\int_{0}^{2} \frac{x^2 + 2x + 1}{1 + (x+1)^4} dx$ by Gaussian three point formula. (8)
