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Question Paper Code: 34023

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Fourth Semester

Mechanical Engineering

01UMA423 - STATISTICS AND NUMERICAL METHODS

(Regulation 2013)

(Statistical tables may be permitted)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. What do you mean by critical region and acceptance region?

2. Write any two properties of the *F* distribution.

3. Write any two differences between randomized block design and Latin square design.

4. What are the basic principles of experimental design?

5. What is the order of convergence of Newton-Raphson method and convergence condition for Newton method?

6. Compare Gaussian elimination method and Gauss–Jordan method for solving a linear system.

7. Find the second degree polynomial through the points (0, 2), (2, 1) and (1, 0) using Lagrange's interpolation formula.

8. State the properties of cubic spline.

9. State Simpson's 1/3 and 3/8 rule of numerical integration formula.

10. Evaluate $\int_{-1}^{1} \dfrac{dx}{1+x^2}$ using Gaussian 2-point formula.

11. (a) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same, at 5% level. (16)

Or

(b) Two random samples gave the following results.

Sample	Size	Sample mean	Sum of squares of deviation from mean
I	10	15	90
II	12	14	108

Test whether the samples could have come from the same normal population. (16)

12. (a) The table below shows the yields per hectare of a certain variety of paddy in a particular type of soil treated with manures *A*, *B* and *C*. Analyze the results for manure effects. (16)

A	49	50	48	49
B	48	48	49	47
C	50	50	51	49

Or

(b) The following is a Latin Square of a design when four varieties of seeds are being tested. Set up the analysis of variance table and state your conclusions. You may carry out suitable change of origin and scale. (16)

D	122	A	121	C	123	B	122
B	124	B	123	A	122	D	125
A	120	C	119	D	120	C	121
C	122	D	123	B	121	A	122

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13. (a) (i) Find the real positive root of $3x - \cos x - 1 = 0$ by Newton-Raphson method correct to 6 decimal places. (8)

    (ii) Find the largest Eigen value and the corresponding Eigen vector of

$$A = \begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}.$$ (8)

Or

(b) (i) Solve the equations $8x - 3y + 2z = 20, 4x + 11y - z = 33, 6x + 3y + 12z = 35$ by using Gauss - Seidal method correct to three decimal. (8)

    (ii) Find the inverse of the matrix $\begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ by Gauss Jordan method. (8)

14. (a) Using Newton's divided difference formula, find the value of $f(8)$ using the following data;

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

(16)

Or

(b) Obtain the cubic spline approximation for the function $y = f(x)$ from the following data, given that $y_0'' = y_3'' = 0$ (16)

x	-1	0	1	2
y	-1	1	3	35

15. (a) A rod is rotating in a plane. The angle θ (in radians) through which the rod has turned for various values of time t (seconds) are given below.

t	0	0.2	0.4	0.6	0.8	1	1.2
θ	0	0.122	0.493	1.123	2.022	3.220	4.666

Find the angular velocity and angular acceleration of the rod when $t = 0.6$ seconds. (16)

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(b) Evaluate $\int_{1}^{1.4} \int_{2}^{2.4} \dfrac{dxdy}{xy}$ using Trapezoidal rule and Simpson's rule.　　(16)

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