Reg. No. :

Question Paper Code: 31043

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

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. Write down the formula of test statistic 't' to test the significance of difference between the means(large samples)?

2. Write any two properties of the F distribution.

3. What is the aim of the design of experiments?

4. Explain Randomized Block Design briefly?

5. State the condition for convergence of Newton's method.

6. Solve the system of equations $x - 2y = 0$; $2x + y = 5$ by Gaussian Elimination method.

7. If $f(x) = \frac{1}{x^2}$, find the divided difference $f(a, b)$..

8. State Lagrange's Interpolation formula.

9. Write down the formulae $\frac{dy}{dx}$ & $\frac{d^2y}{dx^2}$ at $x = x_0$ in terms of Newton's forward differences.

10. Write the formula to compute $\frac{dy}{dx}$ at $x = x_0 + ph$ for a given data (x_i, y_i) $i = 0,1,2…..n$.

11. (a) (i) A simple sample of heights of 6400 Englishmen has a mass of 67.85 inches and a standard deviation of 2.56 inches, while a simple sample of heights of 1600 Australians has a mean of 68.55 inches and a standard deviation of 2.52 inches. Do the data indicate the Australians are on the average taller than Englishmen? (8)

(ii) A manufacturer of ball pens claims that a certain pen be manufacturers has a mean writing life of 400 pages with a standard deviation of 20 pages. A purchasing agent selects a sample of 100 pens and puts them for test. The means writing life for the sample was 390 pages. Should the purchasing agent reject the manufactures claim at 5% level? The table value of Z at 5% level is 1.96 for two tail test and 1.64 approximately for one tail test. (8)

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) A completely randomized design experiment with 10 plots and 3 treatments gave the following results. Analysis the CRD design. (16)

Plots no	1	2	3	4	5	6	7	8	9	10
Treatments	A	B	C	A	C	C	A	B	A	B
Yield	5	4	3	7	5	1	3	4	1	7

Or

(b) The following is a Latin square of a design when 4 varieties of seeds are being tested. Analyse the LSD design. (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

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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 real positive root of $3x - \cos x - 1 = 0$ by Newton's method correct to 6 decimal places. (8)

Or

(b) (i) Solve the following system of equation by Gauss Seidel method.
$27x + 6y - z = 65$; $x + y + 54z = 110$; $6x + 15y + 2z = 72$. (8)

(ii) Using power method, find the numerically largest Eigen value of

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}.$$ (8)

14. (a) (i) Using Lagrange's interpolation formula, find $f(4)$ given that
$f(0) = 2, f(1) = 3, f(2) = 12, f(15) = 3587$. (8)

(ii) Using Newton's forward interpolation formula, find the polynomial $f(x)$ satisfying the following data. Hence, evaluate y at $x = 5$. (8)

x	4	6	8	10
y	1	3	8	10

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)

Or

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(ii) By dividing the range into ten equal parts evaluate $\int_0^\pi sinx\ dx$ by using Trapezoidal. Verify your answer with integration. (8)

(ii) Evaluate $\int_1^{1.4} \int_2^{2.4} \frac{dxdy}{xy}$, using Trapezoidal and Simpson's rule. Verify your result by actual integration. (8)

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