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

Question Paper Code: 41003

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2015.

Fourth Semester

Mechanical Engineering

01UMA423 - STATISTICS AND NUMERICAL METHODS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

(Statistical tables may be permitted)

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Define Null hypothesis and Alternative hypothesis.
2. Write any two properties of the *F* distribution.
3. What is ANOVA?
4. What are basic principles of the design of experiments?
5. What is the order of convergence of Newton-Raphson method and convergence condition for Newton method?
6. State the condition for convergence of Gauss - Seidal method.
7. When we will use Newton's forward and Newton's backward interpolation formula?
8. State the properties of cubic spline.
9. State Simpson's 1/3 and 3/8 rule of numerical integration formula.
10. Write the formula to compute $\frac{dy}{dx}$ at $x = x_0 + ph$ for a given data (x_i, y_i) $i = 0,1,2\ldots..$n.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) 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. (8)

(ii) In a investigation into the health and nutrition of two groups of children of different social status, the following results are got. Discuss the relation between health and their social status. (8)

Social status health	Poor	Rich	Total
Below normal	130	20	150
Normal	102	108	210
Above normal	24	96	120
Total	256	224	480

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 tea company appoints four salesman A, B, C and D and observes their sales in three seasons summer, winter and monsoon. The figures (in lakhs) are given in the following table.

Seasons	Salesman			
	A	B	C	D
Summer	36	36	21	35
winter	28	29	31	32
Monsoon	26	28	29	29

i. Do the Salesman significantly differ in performance?

ii. Is there significant difference between the seasons? (16)

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

13. (a) (i) Find the root of the equation $\sin x = 1 + x^3$ between (-2,-1) by Newton-Raphson method correct to three decimal. (8)

(ii) Using power method to find the dominant eigen value and eigen vector of the matrix $\begin{bmatrix} 15 & -4 & -3 \\ -10 & 12 & -6 \\ -20 & 4 & -2 \end{bmatrix}$ correct to three decimal. (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) (i) Evaluate f(1.8) from the following table correct to three decimal. Using Lagrange's formula (8)

x	0	0.5	1	1.5	2
$f(x)$	0.398	0.3521	0.2420	0.1295	0.0540

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

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

Or

(b) Obtain the cubic spline approximation for the function tabulated as follows

x	0	1	2	3
y	1	2	33	244

Assume $M(0) = 0$ and $M(3) = 0$. Hence find an estimate of $f(2.5)$. (16)

15. (a) (i) 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. (8)

(ii) Find $\int_0^{\frac{\pi}{2}} \sin x \, dx$ by two and three point Gaussian quadrature formula. (8)

Or

(b) Evaluate $\int_1^{1.4} \int_2^{2.4} \frac{dxdy}{xy}$ using Trapezoidal rule and Simpson's rule. (16)