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

Question Paper Code: 31403

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

Fourth Semester

Mechanical Engineering

01UMA423 – STATISTICS AND NUMERICAL METHODS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Define type I and type II error?
2. What is meant by degrees of freedom?
3. Name the basic principles of experimental design.
4. Write any two difference between R.B.D and L.S.D.
5. Write the order and convergence condition of Newton's Raphson method?
6. Compare Gaussian elimination method and Gauss–Jordan method for solving a linear system.
7. Write the divided difference table for the following data:

x	2	5	10
y	5	29	109

8. State the Newton's forward interpolation formula.
9. What is the restriction on the number of intervals in Simpson's 1/3 and Simpson's 3/8 rule.
10. Evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$ using Gaussian 2-point formula.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) In a large city *A* , 20 percent of a random sample of 900 school boys had a slight physical defect. In another city *B*, 18.5 percent of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? (Use a level of significance of 0.05). (8)

(ii) Test the significance of the difference between the means of the samples, drawn from two normal populations with the same S.D. from the following data: (Use a level of significance of 0.05.) (8)

	Size	Mean	S.D
Sample I	100	61	4
Sample II	200	63	6

Or

(b) (i) Two independent samples of eight and seven items respectively had the following values of the variable. Do the two estimates of population variance differ significantly at 5% level of significance? (8)

Sample 1	9	11	13	11	15	9	12	14
Sample 2	10	12	10	14	9	8	10	6

(ii) The following table gives a classification of a sample of 160 plants of their flower colour and flatness of leaf. Test whether the flower colours is independent of the flatness of leaf at 5% level of significance? (8)

	Flat leaves	Curled leaves
White Flower	99	36
Red flower	20	5

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) A company appoints 4 salesmen *A, B, C* and *D* and observes their sales in 3 seasons: summer, winter and monsoon. The figures (in lakhs of Rs.) are given in the following table:

Seasons	Salesmen			
	A	B	C	D
Summer	45	40	38	37
Winter	43	41	45	38
Monsoon	39	39	41	41

Perform a two-way analysis of variance at 5% level. (16)

13. (a) (i) Using Newton's-Raphson method find the iterative formula for finding the value of $\frac{1}{N}$ where *N* is a real number. Hence evaluate $\frac{1}{26}$ correct to 4 decimal places. (8)

(ii) Solve the following equations by Gauss-Seidel method
20x+y-2z=17; 3x+20y-z =-18; 2x-3y+20z = 25 (8)

Or

(b) (i) Find the largest Eigen values of the matrix $A=\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ using power method.

(8)

(ii) Find the inverse of the matrix $\begin{pmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{pmatrix}$ using Gauss-Jordan Method. (8)

14. (a) (i) Apply Lagrange's formula to find *y (2)* form the following data *y (0)* = -12; *y (1)* = 0; *y (3)* = 6 and *y (4)* = 12. (8)

(ii) The population of a town is shown in the following table. Estimate the population in the year 1996 using Newton's backward interpolation formula.

Year (x)	1961	1971	1981	1991	2001
Population (1000s) y	46	66	81	93	101

(8)

Or

(b) (i) Find $y(1.5)$ using the cubic spline from the following data. (8)

x	1	2	3
y	-6	-1	16

(ii) Find the equation $y=f(x)$ of least degree and passing through the points (-1, -21), (1, 15), (2, 12), (3, 3). Also find y at x= 0 using Newton's divided difference. (8)

15. (a) (i) The table below gives the velocity v of a particle for 20 seconds at an interval of 5 seconds. Find the initial acceleration at time $t=0$. (8)

t(seconds)	0	5	10	15	20
v(m/s)	0	3	14	69	228

(ii) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Trapezoidal rule taking t=0.2. Hence determine the approximate value of π. (8)

Or

(b) (i) Evaluate $\int_0^1 \frac{\sin x}{x} dx$ by using Gaussian 3-point formula. (8)

` (ii) Evaluate $\int_0^1 \int_0^1 e^{x+y} dxdy$ by using Simpson's rule. (8)