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

Question Paper Code: 34022

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

Fourth Semester

Civil Engineering

01UMA422 - NUMERICAL METHODS

(Common to EEE, EIE and ICE)

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State the condition for convergence of iterative method.

2. Define truncation error.

3. State condition for the convergence of iterative methods of solving system of linear algebraic equations.

4. Find the dominant Eigen value of A= $\begin{pmatrix} 1, 2 \\ 3, 4 \end{pmatrix}$ by power method.

5. State Newton's backward interpolation formula.

6. State the conditions required for a natural cubic spline.

7. Using Newton's backward difference formula, write the formula for the first and second order derivatives at the end values at $x=x_n$.

8. State Romberg's integration formula to find the value of $I = \int_a^b f(x).dx$ for first two intervals.

9. Write the normal equations for fitting a straight line by the method of least squares.

10. How will you fit a curve of the form $y=ax^b$.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Find a positive root of $2x - \log_{10} x - 6 = 0$ using Newton Raphson method. (8)

(ii) Find a positive root of $x - \cos x = 0$ by Bisection method. (8)

Or

(b) (i) Using the secant method find a real root of the equation $f(x) = xe^x - 1 = 0$. (8)

(ii) Find the real positive root of $3x - cosx - 1 = 0$ by Newton Raphson method correct to 6 decimal places. (8)

12. (a) (i) Solve the system of equations by Gauss - Jordan method.

$$x + 2y + z = 3$$
$$2x + 3y + 3z = 10$$
$$3x - y + 2z = 13$$ (8)

(ii) Find the numerically largest Eigen value of $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ and the corresponding Eigen Vector. (8)

Or

(b) (i) Solve the system of equations by using Gauss-Seidel method.

$$8x - 3y + 2z = 20$$
$$4x + 11y - z = 33$$
$$6x + 3y + 12z = 35.$$ (8)

(ii) Find the Eigen values and Eigen Vectors of the real symmetric matrix

$A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$ by Jacobi's method. (8)

13. (a) (i) Find the number of students who obtain marks between 40 and 45 using Newton's formula. (8)

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	31	42	51	35	31

(ii) Estimate x when $y = 20$ from the following table using Lagrange's method. (8)

x	1	2	3	4
y	1	8	27	64

Or

(b) (i) Using cubic spline to the following data find *Y (1.5)*. (8)

x	1	2	3	4
Y	1	2	5	11

(ii) Estimate x when $y = 20$ from the following table using Lagrange's method (8)

x	1	2	3	4
y	1	8	27	64

14. (a) (i) Find $\frac{dy}{dx}$ at $x = 0.5$ and $x = 0.7$ from the following data: (8)

x	0.4	0.5	0.6	0.7	0.8
y	1.5836	1.7974	2.0442	2.3275	2.6511

(ii) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by dividing into 6 equal parts using Simpson's one-third rule and three eighth rules. (8)

Or

(b) Evaluate $\int_1^2 \int_1^2 \frac{dxdy}{x^2+y^2}$ h=0.2, k=0.25 by both trapezoidal and Simpson's rule. (16)

15. (a) (i) Find a straight line fit of the form $y = a + bx$ by the method of group averages for the following data. (8)

x :	0	5	10	15	20	25
y :	12	15	17	22	24	30

(ii) Fit a curve of the form $y = ax^b$ to the data. (8)

x :	1	2	3	4	5	6
y :	1200	900	600	200	110	50

Or

(b) (i) By the method of least squares, find the best fitting straight line to the data given below. (8)

X	5	10	15	20	25
Y	15	19	23	26	30

(ii) By the method of moments, fit a straight line to the data. (8)

x	1	2	3	4
Y	1.7	1.8	2.3	3.2