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

Question Paper Code: 34022

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

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. When is the convergence of an iterative method for solving the equation *f(x) =0* said to be (i) linear (ii) quadratic.
2. State the condition of convergence of Newton-Rapson method.
3. Give two indirect methods to solve a system of linear equations.
4. What do you mean by 'diagonally dominant'?
5. Define interpolation.
6. State Lagrange's interpolation formula.
7. State trapezoidal rule to evaluate $\int_{x_0}^{x_n} f(x)dx$.
8. Using Trapezoidal rule, evaluate $\int_0^{\pi} sinx\ dx$ by dividing the range into 6 equal parts.
9. Write the normal equations for fitting a straight line by the method of least squares.
10. State the principle of least squares.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Find the positive real root of $3x - cosx - 1 = 0$ using Newton-Rapshon method. (8)

(ii) Solve the equation $x^3 + x^2 - 1 = 0$ for the positive root by iteration 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) Solve the following system of equation using Gaussian elimination method.
$28x + 4y - z = 32,\ x + 3y + 10z = 24, 2x + 17y + 4z = 35.$ (16)

Or

(b) (i) Solve the following system of equations by Gauss Seidel iteration method.
$20x + y - 2z = 17, 3x + 20y - z = -18, 2x - 3y + 20z = 25$ (8)

(ii) Using Jacobi method, find the eigen values and eigen vectors of $A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$. (8)

13. (a) Using Newton's backward formula find *f (7.5)* from the following table: (16)

X	1	2	3	4	5	6	7	8
f (x)	1	8	27	64	125	216	343	512

Or

(b) (i) Using Newton's divided difference formula, find *u*(3) given *u*(1)= -26, *u*(2)=12, *u*(4)=256, *u*(6)=844. (8)

(ii) Using Newton's forward interpolation formula, find the polynomial *f*(x) satisfying the following data and hence find *y*(5). (8)

x	4	6	8	10
y	1	3	8	10

14. (a) (i) Find the first two derivatives of $y = (x)^{1/3}$ at x = 50 & x = 56 given the table below.

x :	50	51	52	53	54	55	56
y :	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

(8)

(ii) Evaluate $\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} sin(x+y).dx.dy$ by using Trapezoidal rule and Simpson's rule.

(8)

Or

(b) (i) Compute first and second derivative of $f(3)$ for the following data using difference table (8)

x	3.0	3.2	3.4	3.6	3.8	4.0
f(x)	-14	-10.032	-5.296	-0.256	-6.672	14

(ii) Evaluate $\int_0^1 \int_1^2 \frac{2xy}{(1+x^2)(1+y^2)} dxdy$ using Trapezoidal rule with h=k=0.25. (8)

15. (a) (i) Find the equation of the best fitting straight line to the following data by method of group averages: (8)

x	0	5	10	15	20	25	30
y	10	14	19	25	31	36	39

(ii) Fit a curve of the form $y = ae^{-bx}$ for the following data by the method of moments.

(8)

x	0	2	4	6	8	10
y	65	58	52	47	42	37

Or

(b) (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) 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