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Question Paper Code: 31042

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

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. Find an iterative formula to find \sqrt{N} by Newton Raphson method?
2. What is the order of convergence of method of false position?
3. Solve $x + y = 2, 2x + 3y = 5$ by Gauss Elimination method.
4. Find the inverse of the coefficient matrix by Gauss-Jordan method. $3x - y = 5$ and $x + y = -1$.
5. State Newton's backward interpolation formula.
6. Write the divided difference with arguments a, b, c, if $f(x) = \frac{1}{x^2}$.
7. Why is Trapezoidal rule so called?
8. Using two point Gaussian quadrature formula, evaluate $\int_{-1}^1 (3x^2 + 5x^4) dx$.
9. State the principle of least squares.
10. Write the observation equations when the equation $y = ax + b$ is fit by the method of moments.

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) Solve the equation $x \tan x = -1$ by method of false position starting with $a = 2.5$ and $b = 3$ correct to 3 decimal places. (8)

(ii) Solve the equation $x^3 + x^2 - 1 = 0$ for positive root by iteration method. (8)

12. (a) (i) Apply Gauss-Seidel method to solve the system of equations:

$$30x - 2y + 3z = 75, \quad 2x + 2y + 18z = 30 \text{ and } x + 17y - 2z = 48 \quad (8)$$

(ii) Determine the largest eigen value and the corresponding eigenvector

of the matrix $\begin{pmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{pmatrix}$. (8)

Or

(b) Find the eigen values and eigen vectors of the matrix by Jacobi method.

$$\begin{pmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{pmatrix}. \quad (16)$$

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) Using cubic spline to the following data find $Y(1.5)$.

x	1	2	3	4
Y	1	2	5	11

(16)

14. (a) (i) Calculate $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 4$ from the data given below by Newton's backward differentiation formula. (8)

X	1.5	2.0	2.5	3.0	3.5	4.0
Y	3.37	7.0	13.625	24.0	38.875	59.0

- (ii) By dividing the range into 10 equal parts, evaluate $\int_0^\pi \sin x dx$ using Simpson's 1/3 rule. (8)

Or

- (b) Evaluate $\int_1^2 \int_1^2 \frac{dx dy}{x^2 + y^2}$ $h=0.2, k=0.25$ 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) From the table given below, find the best values of a and b in the law $y = ae^{bx}$ by the method of least squares. (8)

X	1	2	3	4
Y	60	30	20	15

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
