Reg. No. :

Question Paper Code: 41402

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

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. What is the condition for the convergence of the fixed point iteration 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. State Newton's forward formula to find $\dfrac{dy}{dx}, \dfrac{d^2 y}{dx^2}$ & $\dfrac{d^3 y}{dx^3}$ at $x = x_0$

8. State Simpson's rule for evaluating $\int_a^b \int_c^d f(x,y)dxdy$.

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.

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) Find the Positive root of $x^3 = 2x + 5$ by False position method. (8)

    (ii) Find the root of $x^3 = 6x - 4$ that root lies between 0 and1 by Newton-Raphson's method. (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) Using Jacobi method, find the Eigen values and Eigen vectors of $A = \begin{pmatrix} 2 & 0 & -1 \\ 0 & 2 & 0 \\ -1 & 0 & 2 \end{pmatrix}$. (8)

    (ii) Solve the equations by Gauss-Seidal method
$27x + 6y - z = 85, \ 6x + 15y + 2z = 72, \ x + y + 54z = 110.$ (8)

13. (a) (i) From the following table of Half - Yearly Premium for policies maturing at different ages, estimate the Premium for policies maturing at age 46 and 63.

Age x:	45	50	55	60	65
Premium y:	114.84	96.16	83.32	74.48	68.48

(8)

(ii) Using Lagrange's Interpolation formula, find $y(10)$ from the following table.

x:	5	6	9	11
y:	12	13	14	16

(8)

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) 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) 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.

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

(8)

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

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

(8)

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<div align="center">Or</div>

(b) (i) Fit a parabola of the pattern $y = ax^2 + bx + c$ to the data given below.

x	20	40	60	80	100	120
y	5.5	9.1	14.9	22.8	33.3	46

(8)

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

x	1	2	3	4
y	0.30	0.64	1.32	5.40

(8)

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