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

Question Paper Code: 41002

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

Fourth Semester

Civil Engineering

01UMA422 - NUMERICAL METHODS

(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

(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. Write the iterative formula of Newton - Raphson's method.
3. State condition for the convergence of iterative methods of solving system of linear algebraic equations.
4. How will you find the smallest Eigen value of a square matrix numerically by using the power method?
5. State Newton's backward interpolation formula.
6. Write the divided difference table for the given data.

x :	2	4	7
y :	1	9	36

7. State Newton's forward formula to find $\frac{dy}{dx}, \frac{d^2y}{dx^2} \& \frac{d^3y}{dx^3}$ at $x = x_0$

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

9. State the principle of least squares.

10. What is the disadvantage of the method of moments, when compared with the method of group averages and least squares?

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Find the positive root of $x - cosx = 0$ by bisection method. (8)

(ii) Using Ramanujan's method ,find the root of $x\,e^x = 1$. (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 &1 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) 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) From the following table of Half - Yearly Premium for policies maturing at different ages, estimate the Premium for policies maturing at age 46 & 63. (8)

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

(ii) Using Lagrange's Interpolation formula, find $y(10)$ from the following table. (8)

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

Or

(b) (i) From the following table find $f(x)$ and hence find $f(6)$ using Newton's divided difference interpolation formula. (8)

x:	1	2	7	8
$f(x)$:	1	5	5	4

(ii) Using cubic spline, find $y(0.5)$ & $y'(1)$ given $M_0 = M_2 = 0$ from the table. (8)

x:	0	1	2
y:	-5	-4	3

14. (a) (i) Find the first two derivatives of $y = (x)^{1/3}$ at x = 50 & x = 56 given the table below. (8)

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

(ii) Evaluate $\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} sin(x+y).dx.dy$ by using Trapezoidal rule & Simpson's rule. (8)

Or

(b) (i) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Romberg's method, and hence obtain approximate value for π. (6)

(ii) Using Gaussians three-point formula to evaluate $\int_{-1}^{1}(3x^2 + 5x^4).dx$. (4)

(iii) Evaluate $\int_0^1 e^x.dx$ by simpson's one-third rule correct to three decimal places. (6)

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) Fit a Parabola, by the method of least squares to the following data, also estimate *y* at *x* = 6. (8)

x :	1	2	3	4	5
y :	5	12	26	60	97

(ii) By using the method of moments, obtain a second degree curve which fits best to the following data. (8)

x :	1	2	3	4
y :	0.30	0.64	1.32	5.40