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

Question Paper Code: 31402

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

Fourth Semester

Civil Engineering

01UMA422 – NUMERICAL METHODS

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

(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. What is the condition for Simpson’s 3/8 rule and state the formula?
9. What do you mean by curve fitting?
10. State the principle of least squares.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Find the positive root of the equation $3x^3 + 5x - 40 = 0$, correct to two decimals, using bisection method. (8)

(ii) Find the root of the equation $e^x = 2x + 1$, correct to four decimals, using Newton-Rapson method. (8)

Or

(b) (i) Find the root of the equation $\sin x - \cosh x + 1 = 0$, correct to four decimals, using Regula Falsi method. The root lies between 1 and 2. (8)

(ii) Discuss the advantages and disadvantages about some iterative methods. (8)

12. (a) (i) Solve the following system of equations by Gauss elimination method *10x-2y+3z=23, 2x+10y-5z= -33, 3x-4y+10z=41*. (8)

(ii) Find the numerically largest Eigen value of $\begin{pmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{pmatrix}$ by power method. (8)

Or

(b) (i) Solve the following equations by Gauss-Siedel method *4x+2y+z=14, x+5y-z=10, x+y+8z=20*. (8)

(ii) Using Gauss-Jordan method, find the inverse of the matrix $\begin{pmatrix} 2 & 2 & 3 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{pmatrix}$ (8)

13. (a) (i) Using Lagrange's interpolation formula, find the third degree polynomial *f*(x) satisfying the following data: (8)

x	1	3	5	7
y	24	120	336	720

(ii) From the following table, compute *y* (1.5) and *y'* (1) using cubic spline. (8)

x	1	2	3
y	-8	-1	18

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) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by Simpson's 3/8 rule and also check the result by actual integration. (8)

(ii) Evaluate $\int_0^2 \frac{dx}{x^2+4}$ using Romberg's method and hence obtain an approximate value for π. (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) Fit a straight line to the following data by the method of least squares: (8)

x	3.4	4.3	5.4	6.7	8.7	10.6
y	4.5	5.8	6.8	8.1	10.5	12.7

` (ii) The following table gives the boiling points (y) of several members of a homologous series of hydrocarbons with their molecular weights (x). Fit the curve of the form $y=ax^b$ by using method of group averages. (8)

x	58	72	86	100	114	128	142
y	0.6	36.2	69	94.8	124.6	150.6	174