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

Question Paper Code: 41042

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Fourth Semester

Civil Engineering

14UMA422 - NUMERICAL METHODS

(Common to EEE, EIE and ICE Branches)

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Bisection method is also called
   (a) Newton Raphson method (b) False position method
   (c) Secant method (d) BOLZANO's method

2. Condition for convergence in iteration method is
   (a) $|\emptyset'(x)| < 1$ (b) $|\emptyset'(x)| > 1$ (c) $|\emptyset'(x)| \leq 1$ (d) $|\emptyset'(x)| \geq 1$

3. As soon as a new value of a variable is found by iteration, it is used immediately in the following equations this method is called
   (a) Gauss jordan (b) Gauss seidal (c) Gauss jacobi (d) Relaxation

4. If the eigen values of A are -3,1,2 then dominant eigen value is
   (a) 3 (b) -3 (c) 2 (d) 1

5. Forward interpolation formula is used to interpolate value of y for
   (a) $0 < p < 1$ (b) $-1 < p < 0$ (c) $0 < p < -\alpha$ (d) $-\alpha < p < 1$

6. The n^{th} divided difference of a polynomial of degree n is
   (a) Zero (b) a constant (c) a variable (d) none of these

7. Condition for maxima point for the function is
   (a) $y' = 0, y'' < 0$ (b) $y' = 0, y'' > 0$ (c) $y' < 0, y'' = 0$ (d) $y' > 0, y'' < 0$

8. The number of equal sub intervals required to apply both Simpson's 1/3 rule and Simpson's 3/8 rule to evaluate an integral is

(a) Any number (b) Any multiple of 2

(c) Any multiple of 6 (d) Any multiple of 3

9. The method of group averages is based on the assumption that the sum of the residuals is

(a) 0 (b) 1 (c) 2 (d) 3

10. If $y = 2x + 5$ is the best fit for 8 pairs of values $(x, y)$by the method of least squares and $\sum Y = 120$,the $\sum X =$

(a) 35 (b) 40 (c) 45 (d) 30

PART - B (5 x 2 = 10 Marks)

11. Find an iterative formula for finding $\sqrt{N}$ where N is a real number, using Newton-Raphson formula.

12. Compare Gaussian elimination & Gauss-Jordan methods in solving system $[A]\{X\} = \{B\}$.

13. Using Lagrange's interpolation, find the polynomial through $(0, 0)$ $(1, 1)$ and $(2, 2)$.

14. State the formula for three Point Gaussian-quadrature.

15. By method of least squares find the normal equations to fit straight line.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Find the real root of the equation $x^3 - 2x - 5 = 0$ using false position method correct to three decimal places. (8)

(ii) Find the root of the equation $cosx = 3x - 1$ using iteration method. (8)

Or

(b) (i) Using NRM to solve $Xlog_{10}X = 12.34$ start with $x_0 = 10$. (8)

(ii) Find the positive root of $x^3 - x = 1$ using bisection method. (8)

17. (a) (i) Solve by Gauss-Seidal method:
$27x + 6y - z = 85, x + y + 54z = 110, 6x + 15y + 2z = 72$. (8)

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

Or

(b) (i) Find by power method, the largest eigen value and the eigen vector of the matrix $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ (16)

18. (a) From the following table find $f(x)$ and hence $f(15)$ using Newton's interpolation formula: (16)

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

Or

(b) The population of a town is as follows:

Year x	1941	1951	1961	1971	1981	1991
Population in Lakhs y	20	24	29	36	46	51

Estimate the population increase during the period 1946 to 1976. (16)

19. (a) Evaluate $\int_0^1 \int_0^1 \frac{dx\ dy}{x+y+1}$ by using Trapezoidal rule taking $h = 0.5$ and $k = 0.25$. (16)

Or

(b) Use Romberg's rule, evaluate $\int_0^1 \frac{dx}{1+x}$ correct to three decimal places by taking $h = 0.5, 0.25 and\ 0.125$. (16)

20. (a) By the method of least squares, find the best fitting straight line to the data given below. (16)

x	5	10	15	20	25
y	15	19	23	26	30

Or

(b) 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. (16)

x	0	5	8	12	20
y	3	1.5	1	0.55	0.18