

1. Explain Newton-Raphson Method.
2. Write down steps about Regula-Falsi Method.
3. Define Piecewise interpolation
4. Write any two iterative methods
5. Define Spline fitting.
6. Define Periodic Spline.
7. Write down truncation error in Simpson's Method.
8. Write down the formula for Gauss-Legendre three point formula.
9. Define discretization error.
10. Define Lotkin's bound.

PART - B

5x5 = 25

11a. Use Secant and Regula-Falsi method to determine root of Equation $\cos x - x e^x = 0$ take $x_0 = 0, x_1 = 1$
(Om)

b) Perform two iterations of Bairstow method to extract a quadratic factor
take $p_0 = -0.9, q_0 = 0.9$
 $P_3(x) = x^3 + x^2 - x + 2 = 0$

12a. Find inverse of the Matrix $A = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 3 & 3 \\ 1 & 2 & 2 \end{pmatrix}$
(Om)

b) Solve the equation using Gauss elimination method

$$\begin{aligned} x_1 + x_2 + x_3 &= 6 \\ 3x_1 + 3x_2 + 4x_3 &= 30 \\ 2x_1 + x_2 + 3x_3 &= 13 \end{aligned}$$

13 a) obtain piecewise linear interpolation polynomials $f(x)$ defined by data

x	1	2	4	8
$f(x)$	3	7	21	73

(or)
b) Explain Algorithm of Piecewise Quadratic interpolation.

14 a) Find Jacobian Matrix for system of equations
 $f_1(x, y) = x^2 + y^2 - x = 0$, $f_2(x, y) = x^2 - y^2 - y = 0$ at
 $(1, 1)$ using $\left(\frac{\partial f}{\partial x}\right) = \frac{f_{i+1, j} - f_{i-1, j}}{2h}$

(or)
b) The following table values is given

x	-1	1	2	3	4	5	7
$f(x)$	1	1	16	81	256	625	2401

using $f'(x) = \frac{f(x_2) - f(x_0)}{2}$ and Richardson extrapolation find $f'(3)$

15 a) using implicit method $u_{j+1} = u_j + k_1$, $k_1 = hf(t_j + \frac{1}{2}h)$
 Find solution of initial value problem $u' = 2tu^2$,
 $u(0) = 1$; $0 \leq t \leq 0.4$, $h = 0.2$

(or)
b) Solve initial value problem $u = (1+t^2)u$, $u(0) = 1$,
 $u(0) = 0$, $t \in [0, 0.4]$ by R-K method $h = 0.2$.

PART - C (3 × 10 = 30)

16. Perform two iterations of Birge-Vieta method
 $P_3(x) = 2x^3 - 5x + 1 = 0$ use $P_0 = 0.5$.

17. For the Matrix $A = \begin{pmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix}$ find all eigen values and corresponding Eigen Vectors.

18. Obtain Piecewise Quadratic Interpolation Polynomials for the eqns

x	-3	-2	-1	1	3	6	7
$f(x)$	369	222	171	165	207	990	1779

Here find approximate value $f(-2.5)$ & $f(6.5)$

19. Explain optimum choice of step-length.

20. Explain stability analysis of fourth order Runge-Kutta method in detail.