

7. State the modified Euler formula to find $y(x_1)$ for solving $\frac{dy}{dx} = f(x, y)$, $Y(x_0) = y_0$.
8. How many prior values are required in predictor-corrector formulae?
9. Write down the diagonal five point formula to solve the Laplace's Equation $\nabla^2 u(x, y) = 0$.
10. Write down the explicit formula to solve the hyperbolic equation $u_{tt} = 9u_{xx}$ when $\Delta x = 0.25$ and $\Delta t = 1/16$.

PART - B

(5×16=80 Marks)

11. a) i) Find the smallest positive root of $x^3 - 2x - 5 = 0$ by the fixed point iteration method, correct to three decimal places. (8)
- ii) Find the inverse of the matrix $A = \begin{pmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{pmatrix}$ by Gauss-Jordan method. (8)

(OR)

- b) i) Solve the following system of equations by Gauss-Seidel method, correct to three decimal places:
 $28x + 4y - z = 32$; $x + 3y + 10z = 24$ and $2x + 17y + 4z = 35$. (8)
- ii) Find, by power method, the largest eigenvalue and the corresponding

eigenvector of a matrix $A = \begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$ starting with initial vector $X^{(0)} = (1 \ 0 \ 0)^T$. (8)

12. a) i) Find the interpolation polynomial $f(x)$ by Lagrange's formula and hence find $f(3)$ for $(0, 2)$, $(1, 3)$, $(2, 12)$ and $(5, 147)$. (8)
- ii) Find the interpolation polynomial $f(x)$ by using Newton's forward difference interpolation formula and hence find the value of $f(5)$ for

x : 4 6 8 10
 $f(x)$: 1 3 8 16

(8)

(OR)

- b) Find the cubic spline approximation for the function given below.

x : 0 1 2 3
 $f(x)$: 1 2 33 244

Assume that $M(0) = 0 = M(3)$. Hence find the value of $f(2.5)$. (16)

13. a) i) Find the first and second derivatives of y with respect to x at $x = 10$ from the following data: (8)
- | | | | | | |
|-------|----|----|----|----|----|
| x : | 3 | 5 | 7 | 9 | 11 |
| y : | 31 | 43 | 57 | 41 | 27 |
- ii) Evaluate $\int_0^2 \int_0^2 f(x, y) dx dy$ by Trapezoidal rule for the following data, correct to three decimal places:

x	0	0.5	1	1.5	2
y	0	2	3	4	5
	1	3	4	6	9
	2	4	6	8	11
				11	14

(OR)

- b) i) The following data give the corresponding values for pressure (p) and specific volume (v) of a superheated steam. Find the rate of change of pressure with respect to volume when $v = 2$. (8)
- | | | | | | |
|-------|-----|------|------|------|------|
| v : | 2 | 4 | 6 | 8 | 10 |
| p : | 105 | 42.7 | 25.3 | 16.7 | 13.0 |
- ii) Using Simpson's one-third rule, evaluate $\int_0^{0.6} e^{-x^2} dx$ correct to three decimal places by step-size = 0.1. (8)
14. a) Given $dy/dx = xy + y^2$, $y(0) = 1$, $y(0.1) = 1.1169$ and $y(0.2) = 1.2773$, find
- i) $y(0.3)$ by R-K method of fourth order and
- ii) $y(0.4)$ by Milne's method. (16)

(OR)

- b) i) Use Taylor series method to find y at $x = 0.1$, given $dy/dx = x^2 - y$, $y(0) = 1$, correct to 4 decimal places. (8)
- ii) Using Adam's method, find $y(0.4)$, given $dy/dx = (xy)/2$, $y(0) = 1$, $y(0.1) = 1.01$, $y(0.2) = 1.002$ and $y(0.3) = 1.023$. (8)