

2025**(Session : 2022-26)***Time : 3 hours**Full Marks : 75*

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from both the Groups as directed.

Group – A

1. Answer all questions : 1×5 = 5
- (a) Define absolute error.
 - (b) What is the relation among the operators Δ , E and D ?
 - (c) State the fundamental theorem of the difference calculus.
 - (d) Write the Picard's nth approximation formula.
 - (e) Write the trapezoidal rule of integration.
2. Find a real root of the equation $x \log_{10} x = 1.2$ using bisection method, correct to three decimal places. 5

3. Factorize the matrix $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix}$ into the I. U.

form.

5

Group - B

Answer any four questions of the following :

4. (a) Find a real root of $x^3 - 2x - 5 = 0$ using false position method, correct upto five decimal places. *Regular* 7

(b) Using secant method find a real root of the equation $xe^x - 1 = 0$, correct to four decimal places. 8

5. (a) Solve the system $6x + y + z = 20$, $x + 4y - z = 6$, $x - y + 5z = 7$ using Gauss-Seidel Method. *2nd* 7

(b) Solve the system $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$ using Jacobi's iteration method. *1st* 8

6. (a) Derive the Lagrange's interpolation formula for unequal length. 7

(b) Given $\log_{10} 654 = 2.8156$, $\log_{10} 658 = 2.8182$, $\log_{10} 659 = 2.8189$, $\log_{10} 661 = 2.8202$. Find $\log_{10} 656$. 8

HD - 95/3

(2)

Contd.

7. (a) Four equidistant values u_{-1} , u_0 , u_1 and u_2 being given, a value is interpolated by Lagrange's formula ; show that it may be

written in the form $u_x = yu_0 + xu_1 + \frac{y(y^2-1)}{3!}$

$\Delta^2 u_{-1} + \frac{x(x^2-1)}{3!} \Delta^2 u_0$ where $x + y = 1$. 7

(b) Obtain the cubic spline for the following data : 8

X	Y
0	2
1	-6
2	-8
3	2

8. (a) Find the first, second and third derivatives of the function tabulated below, at the point $x = 1.5$: 7

X	f(x)
1.5	3.375
2.0	7.000
2.5	13.625
3.0	24.000
3.5	38.875
4.0	59.000

$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$

HD - 95/3

(3)

(Turn over)

27-6-5 (76)

(b) Find $f'(5)$ from the following table : 8

X	f(x)
0	4
2	26
3	58
4	112
7	466
9	922

9. (a) Derive Simpson's one-third rule of integration. 7

(b) Evaluate $\int_4^{5.2} \log_e x dx$ by Weddle's rule. 8

8-4-5

$$h \left[y_0 + \frac{(n-1) \cdot h}{2} + (n-1)(n-1)(n-2) \right]$$

$$\frac{3h}{10} \left[y_0 + 5y_1 + y_2 + 6y_3 + y_4 + 5y_5 + 2y_6 + 5y_7 + \dots \right]$$

HD - 95/3 (1,000)

(4)

FYU-ESUE(VI) —
Math (MJ - 15)

$\frac{27625 + 2856}{2}$