DECEMBER 2022 **U/ID 32503/URM1A**

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer any TEN questions.

1. Write the formula for finding an approximate root of $f(x) = 0$ by Newton-Raphson's method.

2. Write the formula for finding an approximate root of $f(x) = 0$ by Regula falsi method.

3. Briefly discuss Gauss-Jordan method.

4. Discuss Crout's method.

5. Prove that $E = 1 + \Delta$.

6. Prove that $E\nabla = \Delta$.

7. Evaluate $\Delta\left[e^x\right]$.

8. Write the Newton's forward formula.

9. State Stirling's formula.

10. State Bessel's formula.

11. Find the third divided difference with arguments 2, 4, 9, 10 of the function $f(x) = x^3 - 2x$.

12. State Lagrange's interpolation formula.

SECTION B — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

13. Find the smallest positive root of $x^3 - 5x + 1 = 0$ by using Newton-Raphson's method.

14. Solve the following system of equations by Gauss elimination method.

$$x_1 + x_2 + x_3 = 6$$
$$3x_1 + 3x_2 + 4x_3 = 20$$
$$2x_1 + x_2 + 3x_3 = 13$$

15. Find the inverse of the matrix $A = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 2 \end{pmatrix}$ using Crout's method.

16. Evaluate $\Delta^2 e^x$ by taking $h = 2$.

17. Obtain the function whose first difference is $x^3 + 3x^2 + 5x + 12$.

18. Find $f(x)$ from the following table.

x	0	1	2	3
f(x)	1	0	1	10

19. Find $f(x)$ from the following table.

x	0	1	2	5
f(x)	2	3	12	147

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

20. Use Regula-falsi method to determine a root of $\cos x - xe^x = 0$ by taking the initial approximation as $x_0 = 0$.

21. Apply Gauss-Jordan method to solve

$$x + y + z = 6$$
$$2x - 3y + 2z = 2$$
$$5x + y - 2z = 1$$

22. Find $\Delta^{-1} \dfrac{1}{x(x+1)(x+2)}$.

23. Use Gauss forward formula to find the value of $f(x)$ when $x = 337.5$, given that

x	310	320	330	340	350
f(x)	2.4914	2.5052	2.5185	2.5315	2.5414

24. Use Lagrange's interpolation formula to find y_{10} from the following table.

x	5	6	9	11
y_x	12	13	14	16