**DECEMBER 2024** **U/ID 32503/URM1A**

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer any TEN questions.

1. Short note on Gauss Jordan method.

2. What are the another names of Court's method?

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

4. Evaluate $\Delta^3\left(e^{ax+b}\right)$.

5. Express $f(x) = x^2 + x + 1$ into factorial polynomial.

6. Define interpolation.

7. Using the method of proportional parts, find $y$ at $x = 0.5$, from the following table :

| | | | | |
|---|---|---|---|---|
| $x$ : | 0 | 1 | 2 | 5 |
| $y$ : | 2 | 3 | 12 | 147 |

8. Write error in Newton's forward interpolation formula.

9. What is meant by divided difference?

10. Using Lagrange's interpolation formula find the form of the function $f(x)$ given that

| $x$ : | 0 | 2 | 3 | 6 |
|---|---|---|---|---|
| $f(x)$ : | 659 | 705 | 729 | 804 |

11. Define Numerical differentiation.

12. Write Lagrange's inverse interpolation formula.

PART B — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

13. Solve the following system by Gauss elimination method. $28x + 4y - z = 32$; $x + 3y + 10z = 24$; $2x + 17y + 4z = 35$.

14. Find the 7th term of the sequence 2, 9, 28, 65, 126, 217 and also find the general term.

15. Show that $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{\delta^2}{4}}$.

16. Find the value of $y$ at $x = 21$ and $x = 28$ from the following data :

| $x$ : | 20 | 23 | 26 | 29 |
|---|---|---|---|---|
| $y$ : | 0.3420 | 0.3907 | 0.4384 | 0.4848 |

17. Find the missing value of the following table :

| $x$ : | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| $y$ : | 1 | 2 | 4 | – | 16 |

18. Use Lagrange's interpolation formula, find the value corresponding to $x = 10$, from the following table :

| $x$ : | 5 | 6 | 9 | 11 |
|---|---|---|---|---|
| $y$ : | 12 | 13 | 14 | 18 |

19. Find the value of $x$ corresponding to $y = 100$ from the table :

| $x$ : | 3 | 5 | 7 | 9 | 11 |
|---|---|---|---|---|---|
| $y$ : | 6 | 24 | 58 | 108 | 174 |

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

20. Solve the system of equations $2x + y + z = 4$, $x + 2y + z = 4$, $x + y + 2z = 4$ using Gauss Seidal method.

21. Find $f(x)$ from the table below. Also find $f(7)$ :

| $x$ : | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| $f(x)$ : | –1 | 3 | 19 | 53 | 111 | 199 | 323 |

22. From the following table, find the value of 45°15'.

| $x°$ : | 45 | 46 | 47 | 48 | 49 | 50 |
|---|---|---|---|---|---|---|
| tan $x°$ : | 1.00000 | 1.03553 | 1.07237 | 1.11061 | 1.15037 | 1.19175 |

23. The elevation above adatum line of seven points of a road are give below :

| $x$ : | 0 | 300 | 600 | 900 | 1200 | 1500 | 1800 |
|---|---|---|---|---|---|---|---|
| $y$ : | 135 | 149 | 157 | 183 | 201 | 205 | 193 |

Find the gradient of the road at the middle point.

24. Find the value of $x$ when $y = 85$ using Lagrange's formula from the following table :

| $x$ : | 2 | 5 | 8 | 14 |
|---|---|---|---|---|
| $y$ : | 94.8 | 57.9 | 81.3 | 68.7 |

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