Seat No. : _____

# DL-110

**December-2025**

## 5th Year Integrated M.Sc. (CS), Sem.-III

## Computer Oriented Numerical Methods

## (Computer Science)

**Time : 2:00 Hours]** **[Max. Marks : 25**

**Instruction :** Scientific calculator is allowed.

1. (a) For vectors $a = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$, $b = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$, find **4**

   (i) a + b

   (ii) b – 2a

   (iii) a·b

   (iv) draw vector AB

   (b) For $A = \begin{bmatrix} 1 & 3 & 0 \\ 2 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$ **6**

   (i) All minors

   (ii) All co-factors

   (iii) Co-factor Matrix

   (iv) Adjoint

   (v) Determinant

   (vi) Inverse

**OR**

1. (a) Find the root using Birge Vieta Method $x^4 + 2x^3 - x - 10 = 0$ starting with $x_0 = 1$, $\epsilon = 0.1$. **3**

   (b) Find the root between 1 and 2 and $\epsilon = 0.01$ using Method of False Position $x^3 - 2x^2 + 3x - 5 = 0$. **3**

   (c) For $f(x) = x^4 - 3x^3 + x - 10 = 0$ **4**

   (i) Find an interval of unit length which contains this root.

   (ii) Perform 3 iterations of the bisection method.

2. (a) Evaluate $\int_{0.6}^{2} y dx$ using a suitable integration formula, where y is given by the following table : **2**

| **X** | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |
|---|---|---|---|---|---|---|---|---|
| **Y** | 1.23 | 1.58 | 2.03 | 4.32 | 6.25 | 8.36 | 10.23 | 12.45 |

(b) Use multiple regression to fit the data **5**

| **X** | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| **Y** | 13 | 17 | 19 | 21 | 26 |
| **Z** | 1 | 2 | 3 | 4 | 5 |

(c) Evaluate the following integral $\int_{1}^{3} (2x^3 - 3x^2 + 4x - 1)dx$ by taking n = 4 and using Simpson's one-third rule. **3**

**OR**

2. (a) Solve the following using Cramer's Rule : **3**

$x - 2y + z = 1, \quad 2x + y - 2z = 3, \quad -x + 3y + 4z = -2$

(b) Solve the following using Gauss Elimination **7**

$$x_2 + 2x_3 = 3$$
$$2x_1 + 4x_2 + 8x_3 + 2x_4 = 4$$
$$x_1 + 2x_2 + 4x_3 + 2x_4 = 2$$
$$x_1 + 3x_2 + 6x_3 + 4x_4 = 5$$

3. Attempt any **five** : **5**

(a) What is identity matrix ?

(b) Explain Diagonal Dominance.

(c) State the necessary condition for using Simpson's 3/8 rule.

(d) If $u = \begin{bmatrix} 1 \\ -3 \\ 2 \end{bmatrix}$, find $\| u \|$

(e) Mention any one stopping criterion for root finding methods.

(f) Explain Row Echelon Form.

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