2304E312

Candidate's Seat No :________

IMSc (CA & IT) Sem.-4 Examination

Computer Oriented Numerical Methods

April-2025

Time : 2-30 Hours] **[Max. Marks : 70**

Instruction: Use of non-programmable scientific calculator is allowed.

Q-1 (a) Attempt any **two.** 10

(1) Solve the following system of linear equations using Gauss Elimination method

$$2x + 8y + 2z = 14$$
$$x + 6y - z = 13$$
$$2x - y + 2z = 5$$

(2) Find the approximate solution of the following system of linear equations after fourth iteration using Gauss-Siedel method

$$10x + y + 2z = 44$$
$$2x + 10y + z = 51$$
$$x + 2y + 10z = 61$$

(3) Find the approximate solution of the following system of linear equations after fourth iteration using Gauss-Jacobi method

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

(b) Attempt **all.** 04

(1) Find a solution of an equation $3x + y = 1$.

(2) Define: error

(3) Convert into binary: $(27)_{10}$

(4) How many solutions does an equation $x - y = 0$ have?

Q-2 (a) Attempt any **one.** 10

(1) State and prove the quadratic equations for a quadratic fitting.

(2) Fit a straight line to the following data:

x	1	2	3	4	5	6
y	3	4	5	6	8	10

P.T.O.

(b) Attempt **all**. 04

(1) Without using graph paper, draw a graph of $y = x^2$.

(2) Define: extrapolation.

(3) Define: Interpolation.

(4) Find a curve passing through (1, 1) and (2, 2).

Q-3 (a) Attempt any **two.** 10

(1) Using False position method calculate the root of an equation $\cos(x) = xe^x$ correct up to three decimal places.

(2) Using Newton Raphson method, calculate the value of $\sqrt[4]{27}$ after fourth iteration.

(3) Obtain the estimate of missing terms in the following table using forward difference formula:

X	1	2	3	4	5	6	7	8
Y	3	5	7	-	32	-	128	256

(b) Attempt **all.** 04

(1) If $f(x) = e^2$ then $f'(x) =$ ______.

(2) The value of $\sqrt[6]{41}$ is ________.

(3) What are disadvantages of Bisection method?

(4) Determine one of the roots of $f(x) = x^3 - 3x + 2 = 0$.

Q-4 (a) Attempt any **two.** 10

(1) Use an appropriate interpolation to evaluate y for x = 0.05 using the following table

x	0.00	0.10	0.20	0.30	0.40
y	1.000	1.2214	1..4918	1.8221	2.255

(2) Using Lagrange's interpolation formula, find a polynomial p(x) such that p (2) = -3, p (4) = 9, p (6) = 92 and p (8) = 132. Also, evaluate p (5).

(3) Using Newton's forward interpolation formula, find a polynomial p(x) satisfying p (3) = 1, p (6) =3, p (9) = 8 and p (12) = 16.

(b) Attempt **all.** 04

(1) Prove that $\Delta\, logf(x) = log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$.

(2) Prove that $\Delta = (E - 1)$.

Q-5 (a) Attempt any **one.** 10

(1) Apply the modified Euler's method to solve the initial value problem $y' = 1 - y,\ \ y(0) = 0$ by taking step size 0.1. Find the value of y when the value of $x = 0.2$.

(2) Using the Runge-Kutta third order and fourth order, solve the ordinary differential equation $y' = x + y, y(0) = 1$ at $x = 0.2$ by taking $h = 0.1$.

(b) Attempt any **one.** 04

(1) Use Trapezoidal rule to determine the area bounded by the given Curve and the X-axis between x =7.47 and x = 7.52 with the help of following tabular values:

X	7.47	7.48	7.49	7.50	7.51	7.52
Y	1.93	1.95	1.98	2.01	2.03	2.06

(2) Evaluate $\int_0^1 e^{-x^2} dx$ by using Gaussian quadrature formula with n = 3.