ED-476

M.Sc. 2nd Semester
Examination, May-June 2021

COMPUTER SCIENCE

Paper - V

Numerical Analysis

Time : Three Hours] [*Maximum Marks* : 100

Note : Answer any **two** parts from each question. All questions carry equal marks.

Unit-I

1. (*a*) Perform three iterations of the bisection method to obtain the smallest root of the equation

$$f(x) = x^3 - 5x + 1 = 0$$

(*b*) Find the iterative formula for $\sqrt[k]{N}$ by Newton's method.

(*c*) Write the convergence of Regula falsi method.

Unit-II

2. (*a*) Apply Gauss-Jordan method to solve the equations

$$x + y + z = 9$$
$$2x - 3y + 4z = 13$$
$$3x + 4y + 5z = 40$$

(*b*) Using Cholesky method, solve the system of equations

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ 6 \\ -10 \end{bmatrix}$$

(*c*) Find the largest eigen value in modulus and the corresponding eigen vector of the matrix

$$A = \begin{bmatrix} -15 & 4 & 3 \\ 10 & -12 & 6 \\ 20 & -4 & 2 \end{bmatrix}$$

using power method.

Unit-III

3. (*a*) Given that $f(-1) = 9$, $f(0) = 5$, $f(2) = 3$ and $f(5) = 15$. By using Lagrange's interpolation formula, find unique polynomial of degree 3 or less. Hence, evaluate $f(7)$.

(*b*) Using Newton's divided difference formula evaluate $f(15)$, given :

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

(*c*) Find the least squares approximation of first degree for the discrete data :

x	–2	–1	0	1	2
$f(x)$	15	1	1	3	10

Evaluate $f(4)$.

Unit-IV

4. (*a*) Find first and second order derivatives of y with respect to x at $x = 1.1$ from the following table :

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.0	8.4	8.7	9.1	9.4	9.7	10.0

(*b*) A solid of revolution is formed by rotating about the x axis, the area between the x axis and lines $x = 0$ and $x = 1$ and curve through the points with the following co-ordinates.

x	0	0.25	0.5	0.75	1
$f(x)$	1	0.9896	0.9589	0.9080	0.8415

(*c*) Find solution of integration of function $\frac{1}{x}$ using Weddle's rule between limit $x = 1$ to $x = 2$.

Unit-V

5. (*a*) Use Milne's predictor-corrector method to obtain the solution of the equation

$$\frac{dy}{dx} = x - y^2$$

at $x = 0.5$ given that

x	0	0.2	0.4	0.6
$y(x)$	0.00	0.02	0.07	0.17

(*b*) Using Runge Kutta method of order 4, approximate the value of $y(0.2)$ with step size $h = 0.1$. Given that

$$\frac{dy}{dx} = 2xy^2 \quad \text{and} \quad y(0) = 1.$$

(*c*) Using Euler's method, find approximate value of y when $x = 0.6$ of

$$\frac{dy}{dx} = 1 - 2xy$$

given that $y = 0$ when $x = 0$ (take $h = 0.2$).

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