(c) Fit a curve of the form $y = ax^2+b$ to the given data 5

x :	0	1	2	3	4	5
y :	0.8	1.2	2.5	5.5	8.5	13

UNIT-V

9. (a) For a given data find dy/dx and d^2y/dx^2 at $x=1.1$ and 1.2 9

x :	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y :	7.989	8.403	8.781	9.129	9.451	9.750	10.031

(b) Use trapezoidal rule with $n=8$ to estimate. 5

$$\int_1^5 \sqrt{1+x^2}\,dx$$

10. (a) Derive Simpson's 1/3 rule. 5

(b) For the following data, find dy/dx and d^2y/dx^2 at $x=2.0$. 5

x :	1.5	2.0	2.5	3.0	3.5	4.0
y :	3.375	7.000	13.625	24.000	38.875	59.000

(c) Evaluate the integral. 4

$$y = \int_0^{\pi} \sin x\,dx \text{ taking } h = \pi/6$$

using (i) Simphon's 1/3rd rule.

(ii) Simphonson's 3/8th rule.

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UG/Integrated Even Semester Examination, 2025

COMPUTER SCIENCE

(2nd Semester)

Course No.: CS-DSC-152 / MCSC-204

(Numerical Methods)

Full Marks: 70

Pass Marks: 28

Time: 3 hours

The figures in the right margin indicate full marks for the question. Answer any five questions selecting one from each unit.

UNIT-I

1. (a) Calculate absolute error, relative error and percentage error of the following values. 3

(i) 6.7243, (ii) 34.732 (iii) 0.9023

(b) Find a real noot of the equation 5

$x^2 - \sin x - 0.$

on the interval [0,2] using bisection method with an accuracy of 10^{-2}.

(c) Find the root correct to 3 decimal places with Newton-Raphson method for equation $x - e^{-x} = 0$, given initial value $x_0 = 1$. 5

(d) What is the limilation of Newton-Raphson method. 1

2. (a) Eplain truncation errorand approximation error with suitable example. 4

(b) Find the root of the following equation applying regular-falsi method with an accuracy of 10^{-3}

x^3-5x+1 the root lies betwen 2&3. 5

(c) Write down the algorithm of Newton-Raphson method. 5

UNIT-II

3. (a) Derive the largange interpolation equation. 7

(b) Find the value of y for x=0.25 from the given observed data applying Newton formed interpolation. 7

x	0.1	0.2	0.3	0.4	0.5
y	1.40	1.56	1.76	2.00	2.28

4. (a) Write down the algorithm of Newton forward interpolation. 6

(b) Find y at x=1.45 using Newton backward interpolation from the given table. 7

x	1.0	1.1	1.2	1.3	1.4	1.5
y	0.841	0.891	0.932	0.964	0.968	1.015

(d) What is divided fifference table? 1

UNIT-III

5. (a) Solve the following system of equation by Gauss elimination with partial pivoting. 7

$$x_1 + 2x_2 + 3x_3 = 8$$
$$2x_1 + 3x_2 + 9x_3 = 8$$
$$4x_1 + 3x_2 + 2x_3 = 2$$

(b) Find the inverse of the matrix using Gaus-Jordan elimination techniqus. 7

$$\begin{bmatrix} 2 & 3 & 4 \\ 4 & 2 & 3 \\ 3 & 4 & 2 \end{bmatrix}$$

6. (a) Solve the following system of equation by Gauss-Jordan elimination method. 7

$$2x_1 + x_2 + x_3 = 7$$
$$4x_1 + 2x_2 + 3x_3 = 4$$
$$x_1 - x_2 + 3 = 0$$

(b) Solve the following system of equation of Gauss-Scidal iteration method. 7

$$2x_1 - x_2 - 2x_3 = 6$$
$$2x_1 - x_2 + x_3 = 3$$
$$x + 3x_2 - x_3 = 4$$

UNIT-IV

7. (a) Derive the normal equation of straight line uing least square method. 7

(b) Fit a least square parabola $y=a+bx+ex^2$ to the data. 7

x	0	1	2	3	4	5	6
y	71	89	67	43	31	18	9

8. (a) Define the principles of Least square. 4

(b) Derive the normal equation of exponential curve. 4