

Tribhuvan University
Institute of Science and Technology

2070

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Bachelor Level/ Second Year/ Third Semester/Science
Computer Science and Information Technology (CSc 204)
(Numerical Method)

Full Marks: 60
Pass Marks: 24
Time: 3 Hours

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all questions:

1. What is bracketing and non-bracketing method? Explain with the help of example. Estimate a real root of following nonlinear equation using bisection method correct upto two significant figures.

$$x^2 \sin x + e^{-x} = 3$$

(3+5)

2. Define interpolation. Find the functional value at $x = 3.6$ from the following data using forward difference table.

x	2	2.5	3	3.5	4	4.5
f(x)	1.43	1.03	0.76	0.6	0.48	0.39

(2+6)

3. Derive Simpson's 1/3 rule to evaluate numerical integration. Using this formulae evaluate

$$\int_{0.2}^{1.2} (x^2 + \ln x - \sin x) dx \text{ (take } h = 0.1)$$

(4+4)

4. What is pivoting? Why is it necessary? Explain. Solve the following set of equations using Gauss elimination or Gauss Seidal method.

$$x_1 + 10x_2 + x_3 = 24$$

$$10x_1 + x_2 + x_3 = 15$$

$$x_1 + x_2 + 10x_3 = 33$$

(3+5)

5. Compare Euler's method with Heun's method for solving differential equation. Obtain $y(1.5)$ from given differential equation using Runge-Kutta 4th order method.

$$\frac{dy}{dx} + 2x^2y = 1 \text{ with } y(1) = 0 \text{ [take } h = 0.25]$$

(4+4)

OR

Solve the following boundary value problem using shooting method.

$$\frac{d^2y}{dx^2} - 2x^2y = 1, \text{ with } y(0) = 1 \text{ and } y(1) = 1 \text{ (take } h = 0.5)$$

(8)

6. Solve the equation $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 3x^2y$ over the square domain $0 \leq x \leq 1.5$ and $0 \leq y \leq 1.5$ with $f = 0$ on the boundary. (take $h = 0.5$).

(8)

7. Write an algorithm and C-program to approximate the functional value at any given x from given n no. of data using Lagrange's interpolation.

(5+7)