Tribhuvan University
Institute of Science and Technology
2070

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 for as practicable.
The figures in the margin indicate full marks.
Assume suitable data if necessary.

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 up to 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 formula evaluate

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

(4+4)

What is piveting? Why is it necessary? Explain. Solve the following set of equations us
Gauss elimination or Gauss Seidel method.

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

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

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

(3+

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

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

(4+4)

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

$$x_1 + 10x_2 + x_3 = 24$$
$$10x_1 + x_2 + x_3 = 15$$
$$x_1 + x_2 + 10x_3 = 33$$

(3+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.

$$\frac{dy}{dx} + 2x^2 y = 1, \text{ with } y(1) = 0 \quad (\text{Take } h = 0.25).$$

(4+8)

OR

ICSc. 204-2070

Solve the following boundary value problem using shooting method.

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

(8)

6. Solve the equation $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 3x^2 y$ over the square domain $0 \le x \le 1.5$ and $0 \le y \le 1.5$ 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)