Tribhuvan University Institute of Science and Technology 2079

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Bachelor Level / Second Year/ Third Semester/ Science

Computer Science and Information Technology (CSc. 207)

(Numerical Method)

(NEW COURSE)

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.

Section A

Attempt any TWO questions:

 $(2 \times 10 = 20)$

1. How secant method can approximate the root of a non-linear equation? Explain with necessary derivation. Estimate a real root of following equation using secant method. Assume error precision of 0.01.

$$x^3 + 2x - \cos(x) = 4$$

How spline interpolation differs with the Lagrange's interpolation? Estimate the value of f(0) and f(4) using cubic spline interpolation from the following data.

\boldsymbol{x}	-1 0	1	3 4	5
f(x)	-10	-2	14	86

What is pivoting? Why is it necessary? Write an algorithm and program to solve the set of n linear equations using Gaussian elimination method.

Section B

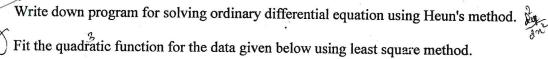
Attempt any EIGHT questions:

 $(8 \times 5 = 40)$

Calculate a real root of the following function using bisection method corrrect up to 3 significant figures.

$$x^2 - e^{-x} = 3$$

5. What is fixed point iteration method? How can it converge to the root of a non-linear equation? Also explain the diverging cases with suitable examples.



\boldsymbol{x}	1.0	1.5	2.0	2.5	3.0	3.5	4.0
					11.2		

Estimate the integral value of following function from x = 1.2 to x = 2.4 using Simpson's 1/3 rule.

x 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 f(x) 1.53 2.25 3.18 4.32 5.67 7.23 8.98 10.94 13.08	_		·	7-1	101	49	1/2	214	NE	19	-
f(x) 1.53 2.25 3.18 4.32 5.67 7.23 8.98 10.94 13.08		x	1.0	1.2	1.4		1.8	2.0	2.2	2.4	2.6
		f(x)	1.53	2.25	3.18	4.32	1 70/ 1	1 12	8.98	10.94	13.08

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9 What is Gaussian integration formula? Evaluate the following integration using Gaussian integration three ordinate formula.

$$\int_{0}^{1} \frac{\sin x}{x} dx$$

30. Solve the following set of equations using Gauss Seidel method.

$$x + 2y + 3z = 4$$

$$6x + 4y + 5z = 16$$

$$5x + 2y + 3z = 12$$

Solve the following differential equation for $0 \le x \le 1$, taking h = 0.5 using Runge Kutta 4th order method.

$$y'(x) + y = 3x$$
, with $y(0) = 2$

12. Solve the Poisson's equation $\nabla^2 f = 3x^2y$ over the square domain $0 \le x \le 3$, $0 \le y \le 3$ with f = 0 on the boundary and h = 1.

