Tribhuvan University
Institute of Science and Technology
2069

✡

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

Candidates are required to give their answers in their own words as far as practicable
The figures in the margin indicate full marks.
Assume suitable data if necessary.

Attempt all questions:

1. Derive the formula to solve nonlinear equation using secant method. Using your formula estimate a real root of following nonlinear equation using ... decimal places $x^2 + \ln x = 3$. (20)

2. Estimate $f(3)$ from the following data using Cubic Spline interpolation.

x	1	2.5	4	5.7
$f(x)$	-2.0	4.2	14.4	31.2

(8)

OR

Find the best fitting quadratic polynomial from following data using least square approximation.

x	-2	-1.2	0	1	1.2	2.5	3	4.5	6.5
$f(x)$	10.39	2.96	-2.0	-2.63	-2.46	0.83	3.1	12.8	30.4

3. (a) For the function $f(x) = e^x \sqrt{\sin x + \ln x}$ estimate: $f'(6.3)$ and $f''(6.3)$[*takeh* = 0.01] (4)

(b) Evaluate $\int_1^2 (\ln x + x^2 \sin x)\,dx$ using Gaussian integration 3 point formula. (4)

4. Solve the following set of equations using Gauss elimination or Gauss Jordan method.

$$3x_1 + 5x_2 - 3x_3 + x_4 = 16$$
$$2x_1 + x_2 + x_3 + 4x_4 = 9$$
$$3x_1 - 4x_2 - x_4 = 1$$
$$2x_1 + x_2 - 3x_3 + 9x_4 = 5$$

(5)

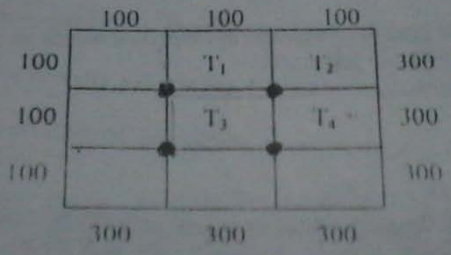
5. How can you solve higher order differential equation? Explain. Solve the following differential within $0 \le x \le 1$ using Heun's method. (3+5)

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2xy = 1 \text{ with } y(0) = 1 \text{ and } y'(0) = 1 (take h = 0.5)$$

CSC204-2069

6. (a) How can you obtain numerical solution of a partial differential equation? Explain. (3)

(b) The steady-state two-dimensional heat-flow in a metal plate is defined by $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$. Given the boundary conditions as shown in figure below, find the temperatures at interior points T_1, T_2, T_3 and T_4.



7. Write an algorithm and C-program code to solve non-linear equation using Newton's method. Your program should read an initial guess from keyboard and display the followings if the solution is obtained. (3+7)

- Estimated root of the equation
- Functional value at calculated root
- Required number of iterations