

Tribhuvan University
Institute of Science and Technology
2068
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Bachelor Level/ Second Year/ Third Semester/Science — Full Marks: 60
Computer Science and Information Technology (CSc 204) — Pass Marks: 24
(Numerical Method) — 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. Define the types of errors in numerical calculations. Derive the formula for secant method and illustrate the method by figure. **(4+4)**

2. Define the linear least squares approximations. Give the data set (x_i, y_i) as (20.5, 765), (32.7, 826), (51.0, 873), (73.2, 942), (95.7, 1032) find the linear least square to fit given data. **(2+6)**

3. Evaluate $I = \int_0^1 e^{-x^2}\,dx$ using trapezoidal rule with n = 10. Also evaluate the same integral using Grossion 3 point formula and compare the result. **(4+4)**

4. Solve the following system of linear equations using Gauss-elimination method (use partial pivoting if necessary);

$$2x_2 + x_4 = 0$$
$$2x_1 + 2x_2 + 3x_3 + 2x_4 = -2$$
$$4x_1 - 3x_2 + x_4 = -7$$
$$6x_1 + x_2 - 6x_3 - 5x_4 = 6$$

(8)

OR

What do you mean by eigen-value eigen-vector problems? Find the largest eigen value correct to two significant digits and corresponding eigen vectors of the following matrix using power method.

$$A = \begin{bmatrix} 2 & 4 & 1 \\ 0 & 1 & 3 \\ 1 & 0 & 3 \end{bmatrix}$$

(2+6)

5. Write an algorithm and program to solve system of linear equations using Gauss-Jordan method. **(4+8)**

6. Apply Runge Kutta method of second order and fourth order to find an approximate value of y when x = 0.2 given that

$$\frac{\partial y}{\partial x} = x + y \; and \; y(0) = 1.$$

(8)

7. How can you solve Laplace's equation? Explain. The steady-state two dimensional heat flow in a metal plate is defined by $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$.

   A steel plate of size 30 x 30cm is given. Two adjacent sides are placed at 100ºC and other side at held at 0ºC. Find the temperature at interior points, assuming the grid size of 10 x 10cm.

(3+5)

