[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 1805   C   Roll No.............

Unique Paper Code   : 251401

Name of the Course   : B.Sc. (Hons.) Electronics

Name of the Paper   : Numerical Techniques : ELHT-401

Semester   : IV

Duration   : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Answer **five** questions in all including Q. No. 1 which is compulsory.

3. Only non-programmable scientific calculator is to be used.

1. (a) Find the percentage relative error if the number $x = 0.004997$ is

 (i) chopped off up to 3 decimal places

 (ii) rounded off up to 3 decimal places   (3)

 (b) If $a = 0.5665e1$, $b = 0.5556e-1$, $c = 0.5644e1$. Show $(a + b) - c \neq (a - c) + b$ using 4 digit mantissa in computer arithmetic.   (3)

 (c) Give the formula for dy/dx at $x = x_0$ using Newton's forward difference formula.   (3)

 (d) What is the error formula for order of the error in the Heun's method for solution of first order differential equation ?   (3)

 (e) Find the root of the equation $x^3 - 4x + 9 = 0$ using bisection method at the end of 3 iterations using four significant figures in each step.   (3)

2. (a) Explain graphically the Regula-Falsi method to solve an algebraic and transcendental equation.   (5)

 (b) Discuss and derive the rate of convergence for Regula- Falsi method.   (5)

 (c) Find the real root of the equation $3x = \cos x + 1$ by Newton Raphson Method correct up to 4 decimal places.   (5)

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3.   (a)   Derive the formula for Newton's forward interpolation formula.   (7)

    (b)   Using Lagrange's formula express the function $(3 \times 2 + x + 1)/[(x-1)(x-2)(x-3)]$ as a sum of partial fractions.   (8)

4.   (a)   Derive the Simpson's 1/3 rule of integration for n intervals and estimate the error involved in it.   (10)

    (b)   Evaluate the integral $\int_0^1 dx/(1 + x)$ using Trapezoidal Rule for h = 0.125.   (5)

5.   (a)   Derive the Euler's Cauchy method for the solution of first order differential equation graphically.   (4)

    (b)   Given $dy/dx = y - x$ where $y(0) = 2$. Find $y(0.2)$ using h = 0.1 using Heun's Method.   (5)

    (c)   Using Runga- Kutta IVth order method, solve $dy/dx = (y^2 - x^2)/y^2 + x^2)$ with $y(0) = 1$ at x = 0.2 in single step.   (6)

6.   (a)   Solve the following equations using LU decomposition

$$2x + 3y + z = 9$$
$$x + 2y + 3z - 6$$
$$3x + y + 2z = 8$$

      (7)

    (b)   Apply Gauss Siedel iteration method to solve the following equations with at least 5 iterations

$$20x + y \quad 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

      (8)

7.   (a)   Find the largest eigen value and the corresponding eigen vector in the following matrix using power method   (7)

$$\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

    (b)   Fit a parabola $p(x) = b_0 + b_1 x + b_2 x^2$ to the given points by the method of least squares (0.0, 1.0), (1.0, 6.0), (2.0, 17.0), (3.0, 24.0).   (8)