Duration: 3hrs **[Max Marks: 80]**

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any **FOUR** **[20]**

a If x = 5.5436 find the values of absolute and relative error if,

I. x is truncated to three decimal places
II. x is rounded to three decimal places

b Solve the following system of equations using the Gauss elimination method.

2x + 3y + 4z = 11

9x + 2y - 8z = 1.9

15x - 8y + 6z = 14.7

c Find the real root of $x \log_{10} x = 1.2$ correct to four decimal places using Newton-Raphson method.

d Evaluate $I = \int_0^{\pi/2} \sqrt{\sin x}\, dx$ using Simpson's 1/3 rule with $h = {}^{\pi}/_{12}$

e Consider an infinite string of linear density, m = 0.1 kg/m under a tension of T = 2.5N. Determine the wave speed when a small transverse displacement is set-up in the string.

f Construct a histogram using a range from 7.5 to 11.5 with intervals of 1.0 for the data given below:

8.8	9.5	9.8	9.4	10.0
9.4	10.1	9.2	11.3	9.4
10.0	10.4	7.9	10.4	9.8
9.8	9.5	8.9	8.8	10.6
10.1	9.5	9.6	10.2	8.9

2 a Find a root of the equation $e^x cosx - 1.2sinx - 0.5 = 0$ by Regula Falsi method take $x_1 = 0$, and $x_2 = 1$. **[10]**

b Fit a straight line for the following data: **[10]**

x	1	2	3	4	5	6	7
y	0.5	2.3	2.1	4.2	3.6	5.8	5.5

And evaluate value of y at x = 4.5

3 a The velocity distribution of a fluid near a flat surface is given below **[10]**

x	0.1	0.3	0.5	0.7	0.9
y	0.72	1.81	2.73	3.47	3.98

x is the distance from the surface (cm) and y is the velocity (cm/sec). Using Newton's forward difference method obtain the velocity at x = 0.2, 0.4, 0.6, and 0.8

b Solve the following set of equations by using the LU decomposition method: **[10]**

$2x_1 + x_2 + x_3 = 7$

$X_1 + 2x_2 + x_3 = 8$

$X_1 + x_2 + 2x_3 = 9$

4 a Solve the following differential equation by Adams-Moulton method, from t = 0 to 2 with h = 0.50. Obtain y (2). **[10]**

dy/dt = -10y, y(0)=1

b Explain Fuzzy Logic Systems architecture **[10]**

5 a Apply Euler's method to solve $y' = - xy^2$, y(0) = 2 computing up to x = 1 with h = 0.1 **[10]**

b Given the points (0, 0), (π/2, 0) and (π, 0) satisfying the function: **[10]**

$$y = \sin x\,, (0 \le x \le \pi)$$

Determine the value of y(π/6) using the cubic spline approximation.

6 a Obtain the numerical solution of 1-Dimensional wave equation using Crank Nicolson method. **[10]**

b The differential equation $y' = x^2 + y^2 - 2$ satisfies the following data: **[05]**

x	- 0.1	0	0.1	0.2
y	1.0900	1.0000	0.8900	0.7605

Use Milne's method to obtain the value of y(0.3)

c Explain Error Propagation. **[05]**