(3 Hours) **Total Marks: 80**

Note:
(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 In the evaluation of the expression $x^3 - 2.5x^2 + 3x - 1.8$ at x = 1.183 Estimate the maximum error assuming that all decimals are subjected to maximum roundoff error.

b Solve the following set of simultaneous equations using the Gauss-Seidel Method. The answer should be correct to one significant digit.
$x + 10y - 4z = 6$;
$2x - 4y + 10z = -15$;
$9x + 2y + 4z = 20$.

c Obtain root of the equation $-0.9x^2 + 1.7x + 2.5 = f(x)$ by using the bisection method for up to three iterations. Take initial guesses are: $x_1 = 2.8$ and $x_2 = 3$.

d What is Fuzzy Logic? Explain Fuzzy logic Systems Architecture.

e Solve $\frac{dy}{dx} = x - y^2$, for the given boundary condition that at x= 0, y = 1 find y at x =4, and take step size h = 1 using Euler's method up to 3 iterations.

f Solve the heat conduction problem

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

Subject to the conditions u (x, 0) = 0, u(0,t) = 0 and u(1,t) = t . Using Crank-Nicolson scheme find the value of u (1/2, 1/8) taking h = 1/4, l = 1/8. Compare the results obtained with the exact value of u (1/2, 1/8) = 0.01878

2 a Solve the following system of equations using the LU decomposition method: **[10]**
$2x + y + 4z = 12$
$8x - 3y + 2z = 20$
$4x + 11y - z = 33$

b Obtain the line of regression for y on x for the data given below. **[10]**

X	1.53	1.78	2.6	2.95	3.42
$y_i = f(x_i)$	33.5	36.3	40	45.8	53.5

3 a Use the fixed point iteration method (Successive approximation method) to determine the root of the following equation **[10]**
f (x) = $x^2 - 8x + 6 = 0$ with accuracy of 0.01

b With the help of the Gauss Elimination method find the solution to the following system of linear equations. **[10]**

$2x + 4y - 6z = -4$

$x + 5y + 3z = 10$

$x + 3y + 2z = 5$

4 a A set of values of x and y are given below using Newton's forward interpolation formula, find y (1.105). **[10]**

X	1	1.1	1.2	1.3	1.4	1.5	1.6
Y	0	0.331	0.728	1.207	1.744	2.375	3.096

b Classify different types of errors on the basis of the source of their generation and also explain how these errors are going to propagate. **[10]**

5 a Evaluate the integration $\int_0^{1.2} e^x dx$ taking n=6 using Simpson's 1/3 rule and Simpson's 3/8 rule **[10]**

c Use the False position method to determine the roots of the equation **[10]**
$xe^x \cos 3x - 0.5 = 0$.
Two initial guess values being $x_0 = 0$ and $x_1 = 1$ with an accuracy of 0.01.

6 a Obtain the numerical solution of 1-Dimensional wave equation using Crank the 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 the term Significant figures. Round the following numbers to two decimal places. (i) 38.46235 (ii) 0.0029 (iii) 0.0022218 **[05]**

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