Con. 6500-13. **LJ - 10385**

(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.
(3) Make **suitable** assumptions if **required** and **justify** the **same**.

1. (a) Volume of a certain solid V is calculated using formula $V = 64\frac{xy^4}{z^2}$ where x, y & z denote three dimensions. If maximum possible errors in the x, y & z is limited to plus minus 0.001. Estimate the maximum probable error in the calculation of volume if the normal dimension x, y & z are equal to unity. 5

(b) Define the operators $\Delta, \nabla, \delta, \mu$ & E. Prove that 5

i) $2\mu\delta = \Delta + \nabla$ ii) $E = 1 + \Delta$

(c) Using Picard's method solve 5

$$\frac{dy}{dx} = 1 + xy \text{ such that } y = 0 \text{ when } x = 0.$$

(d) Derive the equation for Regula – falsi method using geometrical interpretation. 5

2. (a) List the bracketing methods and open methods and find the real root of the equation $x \sin x + \cos x = 0$ using Newton Raphson method correct to three decimal places. 10

(b) Solve the following equations by Gauss - Seidel method. 10
$27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$.

3. (a) From the following table find the number of students who obtained marks less than 45. 10

Marks	30-40	40-50	50-60	60-70
No. of students	31	42	51	35

(b) Using Newton's divided difference formula, find the value of **f(9)** from the following table. 10

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

4. (a) Write a program for Lagrange's interpolation method and using this formula, find the value of y when $x = 10$ from the following table. 10

x	5	6	9	11
y	12	13	14	16

(b) Fit a second degree parabola to the following data: 10

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

5. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal, Simpson's $\frac{1}{3}^{rd}$ and Simpson's $\frac{3}{8}^{th}$ rule. 10

(b) Solve $\frac{dy}{dx} = x + y$ with $x_0 = 0$, $y_0 = 1$ by Euler's modified formula find the value of y when $x = 0.5$ taking $h = 0.25$. 10

6. (a) Solve $\frac{dy}{dx} = x^2 + y$ with initial conditions $y(1) = 2$ and find y at $x = 1.2$, $x = 1.4$ by Runge - Kutta Method of Fourth Order taking $h = 0.2$. 10

(b) Solve the following set of equations using Gauss Elimination method. 10

$$2x + y + z = 10, \quad 3x + 2y + 3z = 18, \quad x + 4y + 9z = 16.$$

7. (a) Explain the propagation of errors. 5

(b) Using Adams – Bashforth method, obtain the solution of $\frac{dy}{dx} = x - y^2$ at $y(0.8)$, given values 10

x	0	0.2	0.4	0.6
y	0	0.0200	0.0795	0.1762

(c) Write a short note on Golden section search. 5