Con. 6569-13. **GS-6498**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Make suitable **assumptions** if required and **justify** the **same**.
(4) Write programs in C/C^{++}.

1. (a) Define Inherent, Truncation and Round-off error and give an example for each. **5**

(b) Calculate the absolute and relative errors in the following cases and comment on the result :— **5**

(i) True Value = 1×10^{-6}, Approximate Value = $0{\cdot}5 \times 10^{-6}$

(ii) True Value = 1×10^{6}, Approximate Value = $0{\cdot}99 \times 10^{6}$

(c) Show the $\mu = \frac{2+\Delta}{2\sqrt{1+\Delta}} = \frac{2-\nabla}{2\sqrt{1-\nabla}}$ **5**

(d) Derive Newton-Raphson formula. **5**

2. (a) From the following table, value of x and y obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x = 1·2 **10**

x	1·0	1·2	1·4	1·6	1·8	2·0	2·2
y	2·7183	3·3201	4·0552	4·9530	6·0496	7·3891	9·0250

(b) Evaluate the integral $I = \int_0^1 \frac{1}{1+x}dx$ with $h = \frac{1}{6}$ by using Simpson's $\frac{1}{3}$rd and **10**

$\frac{3}{8}$th rule and compare the results. Also comment on the results.

3. (a) Use least square approximation to fit a law $y = a + bx + cx^2$ to the following data : **10**

x_i	1	2	3	4	5
y_i	3·38	8·25	16·6	28·5	44·00

(b) Find the missing term in the data given below using Lagrange's formula : **10**

x	0	1	2	3	4
y	1	3	9	–	81

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4. (a) Use secant method to determine the root of following equation : **10**

$$f(x) = \cos x - x e^x = 0$$

Find the root correct upto 3 decimal places.

(b) Find the real root of the equation $x^3 - 2x - 5 = 0$ Using regular falsi method correct upto 3 decimal places. **10**

5. (a) Solve the following system of equations using matrix inversion method **10**

$$\begin{aligned} 3x + y + 2z &= 3 \\ 2x - 3y - z &= -3 \\ x + 2y + z &= 4 \end{aligned}$$

(b) Solve the following system of equations by using triangularization (LU decomposition) method **10**

$$\begin{aligned} 7x + 2y - 5z &= -18 \\ x + 5y - 3z &= -40 \\ 2x - y - 9z &= -26 \end{aligned}$$

6. (a) Explain the propagation of error. **5**

(b) Derive Newton cotes integration formula and also a program Simpson's $\frac{1}{3}$rd rule. **10**

(c) Write a short note on Golden Section Search. **5**

7. Write a short notes on the following :—
   (a) Linear Regression
   (b) Picards Method
   (c) Bracketing methods
   (d) Finite difference operators.