

PAPER :- 3
COMPUTER -ORIENTED NUMERICAL
METHODS

Note : Q. No. 1 is compulsory. In addition to that attempt *four* more questions, selecting *one* question from each unit.
All questions carry equal marks.

(Compulsory Question)

1. (a) Perform following operations with normalized floating point numbers:
 - (i) Add $0.2315E2$ to $0.9543E2$
 - (ii) Subtract 0.29×10^3 from 0.4925×10^5
 - (iii) Multiply $0.5543E2$ and $0.4111E7$.
- (b) With reference to solution of a system of equation, discuss various possibilities of solutions.
- (c) Design the tables for forward differences and backward differences.
- (d) Write the formula for Simpson's 1/3 Rule. Also write the error in the rule.
- (e) Write the formula for approximation of function by Taylor Series. Also find the truncation error.
- (f) What do you understand by Illconditioned equations? 6×3

UNIT-I

2. (a) Discuss various measures of errors in numerical methods. 6
- (b) Calculate the value of $(x^2 - y^2) / (x + y)$ with $x = 0.4845$ and $y = 0.4800$, using normalized floating point arithmetic. Compare with value of $(x - y)$. Determine the relative error of the former. 8
- (c) Write a short note on significant figures. 4
3. (a) What is bisection method? Find a root of the equation $x^3 - x^2 - x - 3 = 0$ using bisection method correct to three decimal places. 9
- (b) Find the order of convergence of Regula-Falsi method. Also find a real root of the equation $x^3 - 4x + 1 = 0$ by the False Position method, correct to three decimal places. 10

UNIT-II

4. Write down the algorithm for Gauss-Seidel method. Solve the following system of equations using Gauss-Seidel method.

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

$$x + y + 54z = 110$$

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5. (a) Derive the formula for Euler's Method. Solve the

differential equation $\frac{dy}{dx} = -y$ with the initial condition y

$(0) = 1$ by Euler's Method. Find $y(0.04)$ where $n = 0.01$.

- (b) Given that $\frac{dy}{dx} = x + y$, $x = 0$ when $y = 1$. Find the value of y when $x = 0.1$ and $x = 0.2$ by Runge Kutta forth order method.

UNIT-III

6. (a) Derive the formula for Newton's Divided Difference Formula. By using this formula, find the values of $f(8)$ from the following table:

x	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

- (b) Given the following table :

x	30	35	40	45	50	
y	15.9	14.9	14.1	13.3	12.5	

Use the Lagrange's formula (inversly) to find the value of x for $y = 13.6$.

7. What do you mean by Chebyshev Polynomial? Find first five Chebyshev Polynomial. State and Prove the properties of Chebyshev Polynomials. 18

UNIT-IV

8. Find the values of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 2.03$ from the following data : 18

x	1.96	1.98	2.00	2.02	2.04
y	0.7825	0.7739	0.7651	0.7563	0.7473

9. (a) Evaluate by $\int_4^{5.2} \log x dx$ by

(i) Simpson's $\frac{1}{3}$ Rule.

(ii) Simpson's $\frac{3}{8}$ Rule 9

- (b) Evaluate $\int_{-2}^4 (2x^3 - 3x^2 + 1) dx$ by Gaussian Quadrature formula. 9