

COMPUTER ORIENTED NUMERICAL METHODS

Time Allowed : 3 Hours

Maximum Marks : 80

Note : Attempt five questions in all, selecting **one** question from each unit in addition to compulsory

Question No. 1. All questions carry equal marks.

Compulsory Question

1. (a) Translunize the Matrix :

$$\begin{pmatrix} 1 & 3 & 8 \\ 2 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}$$

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- (b) Differentiate Runge Kutta second order formula and Runge Kutta fourth order formula for solving differential equation. 4
- (c) Determine the order of convergence of False position method. 3
- (d) Explain inherent error and round off error with example. 3

- (e) Write necessary condition for convergence of Gauss Seidal method for solving simultaneous equations. 3

UNIT-I

2. (a) Using bisection method, to find a real root of the equation $f(x) = x^3 - 5x - 4 = 0$ upto four decimal places. 8
- (b) Use Newton Raphson's method to find a root of the equation $f(x) = x^2 - x - 1 = 0$ for accuracy upto four decimal places. 8
3. (a) Explain normalized floating point representation of real numbers ? Determine and minimum value of a floating point number of 4 bytes. 8
- (b) Use false position method, determine the real root of the function $f(x) = x^2 + 7x^2 + 9 = 0$ upto four decimal places. 8

UNIT-II

4. (a) Use Gauss Seidal method, to solve the following simultaneous equations :
 $10 X_1 - 5X_2 - 2X_3 = 3$
 $-4 X_1 - 10X_2 - 2X_3 = 3$
 $- X_1 - 6X_2 - 10X_3 = 3$
 Iterate three times with initial value $X_0 = 0$ 8
- (b) Differentiate partial pivoting and complete pivoting with example. 8
5. (a) Use Euler's modified method to find $y(0.2)$, taking $h = 0.1$, given differential equation :

$$\frac{dy}{dx} = x^2 + \sqrt{y}; y = 1 \text{ when } x = 1. \quad 8$$

- (b) Solve differential equation $\frac{dy}{dx} = 1 + y^2$; where $y = 1$ when $x = 0$ taking $R = .1$ find $y(0.2)$ using Runge Kutta 4th order formula. 8

UNIT-III

6. (a) Determine the function $f(x)$ when $x = 2$ using Lagrange's formula of unequal interval of table :

x	0	1	4	6
f(x)	9	15	27	46

8

- (b) Use Taylor's series expansion, find the appropriate polynomial and also find the range

upto 4 decimal places for differential $\frac{dy}{dx} = 0.1$

$(x^3 + y^3)$; where $y = 1$ if $x = 0$.

7. (a) Use Newton's interpolation formula for equal interval to find y when $x = 23.4$ for the table

x	19	20	21	22	23	24	25
y	91	100.25	110	120.25	131.0	142.25	154.0

UNIT-IV

8. Solve the integral $\int_0^1 \frac{dx}{1+x^2}$ taking $h = 1$ by using

- (a) Trapezoidal's rule

8

- (b) Simpson's $\frac{3}{8}$ th rule

8

9. (a) Find $y'(1.5)$ and $y''(1.5)$ using numerical differentiation for the table

x	1.0	1.5	2.0	2.5	3.0
y	1.729	1.691	1.505	1.416	1.311

8

- (b) Use Gauss Legendre's integral formula to

evaluate $\int_1^2 \frac{1}{x} dx$.

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