Computer - Oriented Numerical Methods

Time : Three Hours] [Maximum Marks : 90

(Compulsory Question)

1. (a) List all the types of errors which occur in number representation.
   (b) Differentiate Integration and Differentiation.
   (c) How will you categorise arithmetic operations in computer?
   (d) Define Numerical Methods.
   (e) Distinguish between Accuracy and Precision.
   (f) Define Numerical Analysis.
   (g) What do you mean by interation method? List out various iterative methods you know.
   (h) What do you mean by Pivoting? Distinguish between Partial Pivoting and Complete Pivoting.
   (i) Define Chebyshev polynomial.
   (j) What are pitfalls in differentiation? 18

UNIT - I

2. (a) Discuss floating point representation of numbers and perform following using normalized floating of arithmetic.:
   (i) $.1234 \times 10^{+3} + .4567 \times 10^{+2}$
   (ii) $.4567 \times 10^{8} - .1234 \times 10^{7}$
   (iii) .55432* .4111E7
   (iv) .9380 ES by . 3500 E2. 9

(b) Write algorithm of Bisection Method. 9

3. (a) Discuss the concept of convergence in all iterative method.

(b) Find the roots of following equations :

(i) $y = x2 + x - 2$ using Bisection Method.

(ii) $y = x2 - x - 2$ where $Kx < 3$ using regulafalse method.

(iii) $f(x) = x2 - 3x + 2$ using Newton - Raphson method.

UNIT - II

4. (a) What is ill conditioned eduation ? Explain with example and also discuss refinement of solution.

(b) Solve the following equation using the Gauss-Seidal iteration method :

(i) $2x_1 + x_2 + x_3 = 5$

(ii) $3x_1 + 5x_2 + 2x_3 = 15$

(iii) $2x_1 + x_2 + 4x_3 = 8$ 9

5. (a) What is Euler's modified method? Discuss and solve the following equation using it.

$$\frac{dy}{dx} = 1 - y$$ when $y = 0,\ x = 0$

$0 \leq x \leq 0.2$ when $h = 0.1$ 9

(b) Discuss the Runga Kutta method with both its orders. Prove

$$\frac{dy}{dx} = x + y$$ when $x_0 = 0$ and $y_0 = 1$. 9

UNIT - III

6. (a) Define Interpolation and Inverse Interpolation. Explain Newton's Formulae for forward and backward interpolation. 9

(b) What approximation? Explain approximation of exponential curve and trigonometrical functions. 9

7. (a) Discuss Chebyshev polynomial along with all its propertie. 9

(b) From the data below find by Lagrange interpolation formula the value of function, when $x = 102$ and the value of x when $f(x) = 13.5$

x	93.0	96.2	100.0	104.2	108.7
f(x)	11.38	12.80	14.70	17.07	19.91

UNIT - IV

8. Discuss Simpson's Rules for Integration along with derivations. 18

(a) Find the Ist, IInd and IIIrd derivatives of the functions tabulated below at point x = 1.5

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.00	13.625	24.00	38.875	59.000

(b) Evaluate $\int_0^1 \sqrt{Sin\,x + Cosx}\,dx$

Correct it to two decimal places using seven ordinates.