5122114   Seat No. _____

D.C.S.A. (Sem. II) Examination

April / May – 2003

Computer Oriented Numerical Methods

Time : **3** Hours]   [Total Marks : **50**

Instructions:

    (i)There are two sections in the question paper. In section-I Q.1 is compulsory & attempt any two from Q.2 to Q.4. In section –II Q.5 is compulsory & attempt any two from Q.6 to Q.8.

    (ii)Attempt the two sections in separate answer books.

    (iii)Use of electronic calculator is allowed provided they are silent and battery operated.

    (iv)While using calculator every intermediate step's result must be shown.

SECTION-I

1 (a) Explain the secant method to find a real root of the equation $f(x)=0$. Also compare it with the Newton-Raphson method. [5]

    (b) Explain the convergence in the method of fixed-point iteration geometrically Solve the equation $xe^x = 4$ which lies between 1 and 2 by the fixed point iteration method correct to four decimal places. [4]

2 (a) Solve the following system of nonlinear equations by Newton-Raphson method correct to three decimal places.

        $x^2 + y^2 = 5$, $x^2 - y^2 = 1$ taking $x_0 = 1$, $y_0 = 1$. [4]

    (b) State Budan's theorem for finding roots of a polynomial.

    Estimate the number of roots of the polynomial equation given below.

    $p(x) = 2 + 3x - 5x^2 + x^4 - 4x^3 = 0$ in $[-1,0]$ and $[0,1]$.

    Also determine how many positive and negative roots can it have in $[-1,1]$ without solving the equation. [4]

3 (a) Explain the Gauss-Seidel iteration method for solving system of linear equations. Also state the condition for convergence. [4]

    (b) Solve the following system of linear equations by Gauss-Seidel method [4] correct to three decimal places

        $2X_1 + 10X_2 + X_3 = 51$

        $X_1 + 2X_2 + 10X_3 = 61$

        $10X_1 + X_2 + 2X_3 = 44$

4 (a) What is interpolation? Obtain the Newton's forward interpolation formula for equispaced arguments. [4]

(b) Compute the value of f (0.4) from the following table using Newton's forward interpolation formula: [4]

X	0	1	2	3
f(x)	1	2	11	34

SECTION-II

5 (a) Obtain the Newton's divided interpolation formula for unequispaced arguments. [3]

(b) Find the value of f(1.5) using Newton's divided interpolation formula from the following table: [3]

x	-1	0	1	2
f(x)	1	1	1	-3

(c) Calculate mean, median and mode for the following frequency distribution. [3]

Class	Frequency
0-10	32
10-20	65
20-30	100
30-40	184
40-50	288
50-60	167
60-70	98
70-80	46
80-90	20

6 (a) The following table shows the distance travelled by a particle at different time. Determine its velocity at the time t = 5 hr. [4]

Time (t) hrs.	5	6	7	8	9
Distance d =f(t) km	10.0	14.5	19.5	25.5	32.0

(b) Find x when f(x)=37 using the following table: [4]

x	2	4	7	9
f(x)	10	26	65	101

7 (a) Obtain the Simpson's 1/3 rule for numerical integration and also obtain its composite form. [4]

(b) Compute the value of $\int_{1}^{2} \frac{1}{2x+3} dx$ using Simpson's 1/3 rule by taking n =12 sub-intervals. Also compare the value of the integral with the true value and find the error. [4]

8 (a) Solve the I.V.P $\frac{dy}{dx} = x + y$, y (0) =1 at x =0.1 using the Runge-Kutta method of order four. [4]

(b) The following table shows the heights (h) and weights (w) of 8 persons.

h(cm)	175	165	160	180	150	170	155	185
w(kg)	68	58	59	71	51	62	53	68

Assuming the linear relationship between the height and weight obtain the regression line for the given data and estimate the weight of persons with the heights 145 cm. [4]