Seat No. : _______________

LD-126

April-2014

S.Y. M.Sc. (CA & IT) Sem.-IV (Integrated)

Computer Oriented Numerical Methods

Time : 3 Hours] **[Max. Marks : 100**

1. (A) Attempt any **two** : **14**

(1) Solve the following system of equations using Gauss Elimination method :

$2x + y + 4z = 12$

$8x - 3y - 2z = 20$

$4x + 11y - z = 33$

(2) Solve the following system of equations using Gauss-Jacobi's method upto 4 significant digits :

$10x - 2y + z = 12$

$x + 9y - z = 10$

$2x - y + 11z = 20$

(3) Solve the following system of equations using Gauss-Seidel's method upto 4 significant digits :

$20x_1 + 5x_2 - 2x_3 = 14$

$3x_1 + 10x_2 + x_3 = 17$

$x_1 - 4x_2 + 10x_3 = 23$

(B) Attempt any **three :** **6**

(1) Convert 250.125 into binary.

(2) What are algebraic and transcendental numbers ?

(3) Explain an ill-conditioned system of equations.

(4) True or False :

(i) Convergence in Gauss-Seidel method is faster than Gauss-Jacobi method.

(ii) It is necessary to check the condition for convergence at the time of solving linear systems by Gauss Elimination method.

2. (A) Attempt any **two :** **14**

(1) Fit a straight line to the following data :

x	2	4	6	8	10	12
y	7.32	8.24	9.20	10.19	11.01	12.05

(2) Fit a parabola to the given data :

x	–2	–1	0	1	2
y	0.17	0.53	0.57	0.58	0.33

(3) Fit a curve of the form $y = ae^{bx}$ for the data :

x	0.2	0.3	0.4	0.5	0.6	0.7	0.8
y	3.16	2.38	1.75	1.34	1.00	0.74	0.56

(B) Attempt any **two** : **6**

(1) Define error.

Find absolute and relative error when 0.00934725 is rounded off to three decimal digits.

(2) Use the Descartes Rules of Signs to determine the number of positive and negative zeros of the polynomial

$$P(x) = 9x^6 - 3x^5 + 33x^4 - 11x^3 + 18x^2 - 6x$$

(3) (i) Add 0.6432E5 to 0.5738E2

(ii) Subtract 0.8916E8 from 0.3122E11

(iii) Divide 0.7816E7 by 0.3821E4

3. (1) Solve using Regula Falsi method **10**

$f(x) = \cos x - xe^{x} = 0$

Correct to three decimal positions. Root lies between 0.5000 and 0.75.

(2) The distance(s) covered as a function of time (t) by an athlete during his/her run for the 50 mtr. race is given in the following table : **10**

Time (sec)	0	1	2	3	4	5	6
Distance (mtr)	0	2.5	8.5	15.5	24.5	36.5	50

Find the speed of the athlete at t = 4.5 seconds.

4. (A) Attempt any **two :** **14**

(1) Find the value of y at $x = 32$ using the given values :

x	30	35	40	45	50	55
y	0.5000	0.5736	0.6428	0.7071	0.7660	0.8192

(2) Derive Newton's Forward Difference Formula.

(3) Using Newton's Divided Difference Formula, find f(9) from the following table :

x	5	7	11	13	17
y	150	392	1452	2366	5202

(B) Attempt any **two :** **6**

(1) Derive the operator relation

$\mu\delta = \frac{1}{2} \Delta E^{-1} + \frac{1}{2} \Delta$

(2) Evaluate the following interval of differencing being h :

(i) $\Delta^{n} e^{x}$

(ii) $\Delta^{n} a^{cx+d}$

(3) Find a polynomial fitting the data :

x	0	1	2	3
y	–1	1	1	–2

5. (A) Attempt both : **2 × 5 = 10**

(1) Evaluate $\int_{1}^{2} e^{-\frac{1}{2}x} dx$ using four intervals using trapezoidal rule.

(2) The function f(x) is given as follows :

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	1.001	1.008	1.027	1.064	1.125	1.216	1.343	1.512	1.729	2.0

Compute the integral of f(x) between x = 0.1 and x = 1.0 using Simpson's $3/8^{th}$ rule.

(B) Solve the following : **10**

Given dy/dx = xy with y(1) = 5. Find the solution correct to three decimal position in the interval [1, 1.5] using step size h = 0.1 using Runga Kutta's second order method.