S.E. (Comp.) Semester – III (RC) Examination, May 2010
COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours Total Marks : 100

Instructions : *1) Attempt **5** questions atleast **one** from **each** Module.*
*2) Assume **suitable** data if necessary.*

MODULE – I

1. a) Explain procedural errors, relative errors and absolute error with examples. **6**

   b) Use Bisection method to find a +ve root of the equation $e^x - 3x = 0$. The root should be correct upto three significant digits. **7**

   c) Write C/C^{++} program to implement Newton Raphson Method to solve equation $f(x) = 0$. **7**

2. a) Solve following system of linear equations by using Basic Gauss-Elimination method. **7**

   $x - y + z = 1$
   $-3x + 2y - 3z = -6$
   $2x - 5y + 4z = 5$

   b) Explain Gauss Elimination Method with partial pivoting. **6**

   c) Find inverse of $A=\begin{bmatrix} 2 & 3 & 4 \\ 4 & 2 & 3 \\ 3 & 4 & 2 \end{bmatrix}$

   using Gauss – Jordan Method. **7**

MODULE – II

3. a) Use Newton's forward difference formula to compute y at x = 16 from the given table.

x :	5	10	15	20	25
y :	26.782	19.951	14.001	8.762	4.163.

   7

   b) Develop an algorithm to implement Lagrange's Method of Interpolation. **6**

c) Use Newton's Divided difference formula to find a polynomial of degree 3, from the following data : 7

x :	2	4	5	6
y :	22	44	59	68

and hence find y at x = 4.3.

4. a) Using Stirlings formula find the value of y at x = 35, given. 6

x :	20	30	40	50
y :	512	439	346	243

b) Solve the following system of linear equations by Gauss-Seidal Method. Obtain the solution correct to 3-decimal places. 7

$x + 3y + 10z = 24$

$28x + 4y - z = 32$

$2x + 17y + 4z = 35$

c) Determine largest eigen value and corresponding eigen vector of the matrix 7

$$A=\begin{bmatrix}1 & 6 & 1\\ 1 & 2 & 0\\ 0 & 0 & 3\end{bmatrix}, \text{ Take initial vector as } \begin{bmatrix}1\\0\\0\end{bmatrix}$$

MODULE – III

5. a) Solve the following differential equation using shooting method : 7

$$\frac{d^2y}{dx^2} = 6x+4,\ y(0) = 2,\ y(1) = 5.$$

b) From the following table of values of x and y, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x =1.2 7

x :	1.0	1.2	1.4	1.6	1.8	2.0
y :	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891

c) Draw a flow chart and write C/C ++ program to implement Trapezoidal rule for numerical integration. 6

6. a) Write a C/C ++ program to implement Simpson's 1/3rd rule. 7

b) Using Simpson's 3/8th rule to evaluate $\int_1^3 \frac{x}{\sin x + e^x} dx$, taking 6 intervals. 6

c) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ numerically. Using Trapezoidal rule by taking h = 0.5 and 0.25 and use Romberg's Method to improve the result. 7

MODULE – IV

7. a) Develop an algorithm and write C/C ++ program to implement Euler's Predictor-Corrector Method. 12

b) Find y(0.25), y(0.5) using Runge-Kutta Method of 4th order. Given $\frac{dy}{dx} = \frac{x^2}{1+y^2}$, y(0) = 0. 8

8. a) Solve $\frac{dy}{dx} = x + y^2 + 1$, y(0) = 0 using Picard's Method and hence compute y at x = 0.1, 0.2 7

b) Compute y(0.3), y(0.4) using Euler's Predictor-Corrector method. Given $\frac{dy}{dx} = y - \frac{2x}{y}$, y(0) = 1. 7

c) Draw a flow chart to implement Runge-Kutta Method of 4th order. 6
