COMP – 3-4 (RC)

S.E. (Comp.) (Semester – III) (RC) Examination, Nov./Dec. 2012
COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours | Total Marks :100

Instructions : *i) Answer **any 5** questions, at least **one** from **each** Module.*
*ii) Assume **suitable** data **if** necessary.*

MODULE – I

1. a) What are numerical errors ? How do they arise ? **5**

   b) Find a real root of equation $3x + \sin x - e^x = 0$ by method of false position correct to 4 decimal places. Choose suitable initial approximations. Also write program in C language. **10**

   c) Derive Newton Raphson formula. **5**

2. a) Provide a difference between direct and iterative methods for solution of linear algebraic equations. **4**

   b) Solve the given system of equations by Gauss elimination method with partial pivoting.

   $$x_1 - 3x_2 + 2x_3 = 3$$
   $$2x_1 + 6x_2 + 8x_3 = -1$$
   $$4x_1 - 3x_2 + x_3 = 4.25$$

   8

   c) Use Gauss Jordan method to solve the following system of equations :

   $$x_1 + x_2 + x_3 = 1$$
   $$4x_1 + 3x_2 - x_3 = 6$$
   $$3x_1 + 5x_2 + 3x_3 = 4$$

   8

P.T.O.

MODULE – II

3. a) Compare Jacobi iteration and Gauss Seidel method. 4

b) Find Eigen values and corresponding vector for given matrix.

$$A = \begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix}$$ 6

c) Solve the following system of equations using Gauss Seidel method.

$3x - 2y = 5$
$-x + 2y - z = 0$
$-2y + z = -1$

Compare the solution with that of Jacobi iteration method. 10

4. a) Derive Newton Divided Difference interpolation polynomial. 6

b) By any suitable method, find y at x = 10, given the following table :

x :	5	6	11	21
y :	12	13	14	16

8

c) The following are the measurements t made on a curve recorded by oscillograph representing a change of current i due to change in conditions of electric current. 6

t :	1.2	2.0	2.5	3.0
i :	1.36	0.58	0.34	0.20

Using Lagranges formula, find i at t = 1.6.

MODULE – III

5. a) What is boundary value problem ?

Solve the boundary value problem.

$y'' - 64y + 10 = 0$ with $y(0) = y(1) = 0$ by finite difference method.

Compute value of y(0.5) and compare it with the true value. 10

b) The table below gives the result of an observation. θ is observed temperature in degrees centigrade of a vessel of cooling water, t is the time in minutes from beginning of observaltions :

t :	1	3	5	7	9
θ :	85.3	74.5	67.0	60.5	54.3

Find the approximate rate of cooling at t = 3 and t = 3.5. **10**

6. a) Derive Simpsons $\frac{1}{3}^{rd}$ rule for numerical integration. **6**

b) Compute $\int_0^1 \frac{x^2}{1+x^3} \cdot dx$ using Simpson's $\frac{3}{8}^{th}$ rule by dividing the range into 4 equal parts. **6**

c) Evaluate $\int_4^{5.2} \log_e x.dx$ using trapezoidal rule. Write an algorithm for trapezoidal rule. **8**

MODULE – IV

7. a) Given $\frac{dy}{dx} = \frac{(1-xy)}{x^2}$ and y(1) = 1.

Find y(1.1) by Runge Kutta method. **7**

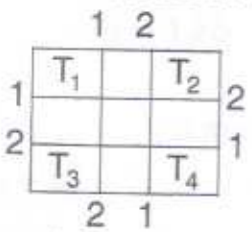
b) Given $\frac{dy}{dx} = \log(x+y)$ and y(0) = 2

Find y(0.1) and y(0.2) by Euler's method. **8**

c) What are parabolic equations ? Explain. **5**

8. a) What are differential equations ? Explain with examples. **5**

b) Solve $T_{xx} + T_{yy} = 0$ numerically for the following mesh with the boundary conditions as below : **8**



c) Solve $\frac{dy}{dx} = x^2y - y$ and y(0)= 1 using Picard's method. Estimate y at x=0.25 and x = 0.75. **7**