COMP 3 – 4 (RC)

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

Duration: 3 Hours | Total Marks: 100

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

MODULE – 1

1. a) Explain different types of numerical errors. How can they be reduced ? **6**

   b) Find the root of equation $e^{-x} - \sin x = 0$ using bisection method, correct upto 3 decimal places. **8**

   c) Derive formula for Newton-Raphson method. **6**

2. a) Use Gauss elimination method to solve the following system of equations : **8**
   $5x - 2y + z = 4$
   $7x + y - 5z = 8$
   $3x + 7y + 4z = 10$

   b) Solve the following system using Gauss Jordan method. **8**
   $2p + q + r = 10$
   $3p + 2q + 3r = 18$
   $p + 4q + 9r = 16$

   c) Explain the basic concept used in Gauss-elimination approach. **4**

MODULE – 2

3. a) Derive Lagrange's interpolation formula. **6**

   b) Apply Stirling's formula to compute f(1.22) from the following table : **7**

x:	1.0	1.1	1.2	1.3	1.4
f(x):	0.841	0.891	0.932	0.963	0.985

   c) The population of a town in decennial census were as under. Estimate the population for the year 1955. **7**

Year	1921	1931	1941	1951	1961
Population (in thousands)	46	66	81	93	101

P.T.O.

4. a) Solve the set of equations by Jacobi method. Find 3rd iterated solution taking initial value (0, 0, 0)

$3x_1 - 6x_2 + 2x_3 = 15$

$4x_1 - x_2 + x_3 = 2$

$x_1 - 3x_2 + 7x_3 = 22$ **7**

b) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$. **6**

c) Discuss Gauss Seidal method for solution of linear systems iterative scheme. **7**

MODULE – 3

5. Evaluate $\int_{-2}^{2} \frac{t}{5+2t} . dt$ using trapezoidal rule. **6**

b) Use Simpson's rule with h = 0.1 to show that $\int_{0}^{1} \frac{\log_e (1+x^2)}{1+x^2} . dx = 0.173$. **8**

c) Derive Simpson's $\frac{1}{3}^{rd}$ rule. **6**

6. a) Solve the boundary value problem **10**

$y''(x) = y(x)$

$y(0) = 0$ and $y(1) = 1.1752$

by shooting method. Take $m_0 = 0.8$ and $m_1 = 0.9$.

b) Find the 1st and 2nd derivative of the function tabulated below at x = 0.6 and x = 0.8. **10**

x :	0.4	0.5	0.6	0.7	0.8
y :	1.5836	1.7974	2.0442	2.3275	2.6511

MODULE – 4

7. a) Find an approximate value of y(0.1) to 3 places of decimal using Picard's method, given

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

b) Using Runge-Kutta method, compute y(0.1) given that,

$$\frac{dy}{dx} = \frac{1}{2}(x + y^2 + 1),\ y(0) = 2.$$ 8

c) Solve $\frac{dy}{dx} + 2y = 0,\ y(0) = 1$ using Euler's method. Take h = 0.1 and obtain y(0.1). 6

8. a) Use Predictor-corrector method to solve the initial value problem $\frac{dy}{dx} = x + 3y^2,\ y(0) = 1$ at x = 0.2 with h = 0.1. Find the solution correct to 2 decimal places. 10

b) Discuss the process of finite difference approximation to derivatives. 6

c) What are parabolic equations ? Explain. 4