# COMP 3 – 4 (RC)

## S.E. (Comp.) (Semester – III) (RC) Examination, May/June 2014
## COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours | Max. Marks : 100

***Instructions*** : *1) Answer **5 full** questions by selecting atleast **1 full** question from **each** Module.*
*2) **Assume** necessary details.*

MODULE – 1

1. a) Define absolute error, relative error and percentage errors in calculations. Give examples. **4**

   b) Using false position method, find a root of the function. **8**

   $f(x) = x^2 - x - 2$ in the range $1 < x < 3$.

   c) Write a algorithm to implement Bisection method of finding roots. Trace the algorithm. **8**

2. a) Explain Gauss elimination method of finding roots of simultaneous equations using suitable illustrations. **5**

   b) Solve the following system of equations by Gauss Jordan method. **8**

   $3x + 2y + z = 10$
   $2x + 3y + 2z = 14$
   $x + 2y + 3z = 14$

   c) Provide an appropriate algorithm for Gauss Elimination with partial pivoting and trace it. **7**

MODULE – 2

3. a) State and explain any two popular approaches of solving a system of linear eqns. Give highlights, pitfalls and limitations of each method. **5**

   b) Obtain the solution of the following system using Gauss-seidal iteration method. **5**

   $2x_1 + x_2 + x_3 = 5$
   $3x_1 + 5x_2 + 2x_3 = 15$
   $2x_1 + x_2 + 4x_3 = 8$.

   c) Provide a flowchart to illustrate Gauss seidal method and explain modifications needed in the same to obtain Jocobi method. **10**

P.T.O.

4. a) How is the Newton's Interpolation formula better than Lagrange's formula ? Explain. 4

   b) Find the Lagrange's interpolation polynomial to fit the following data : 8

| $x_i$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| $e^{xi}-1$ | 0 | 1.7183 | 6.3891 | 19.0855 |

   Use the polynomial the estimate value of $e^{1.5}$.

   c) Estimate the value of sin $\theta$ at $\theta = 25°$ using Newton Gregory Forward Formula : 8

| $\theta$ | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|
| $\sin\theta$ | 0.1736 | 0.3420 | 0.5000 | 0.6428 | 0.7660 |

MODULE – III

5. a) Explain Boundary value and Eigen value problems with suitable illustrations / examples. 5

   b) Explain applications of numerical differentiation in various fields. 5

   c) Provide a flow chart for finding derivative using numerical differentiation. 10

6. a) Derive Simpson's $^1/_3{}^{rd}$ Rule for integration and illustrate. 6

   b) Evaluate $\int_{-1}^{1} e^x \, dx$ using Simpson's $^1/_3$ Rule. 6

   c) Write algorithm to implement trapezoidal rule for integration trace your algorithm. 8

MODULE – IV

7. a) What is a differential equation. Provide applications of the same. 5

   b) Using Taylor's method, solve the following equation recursively

   $y' = x^2 + y^2, y(0) = 0$

   for the interval (0, 0.4) using two subintervals of size 0.2. 10

   c) What are parabolic equations ? Explain. 5

8. a) What are partial differential equations ? Explain with examples. 4

   b) Compare Elliptic and parabolic equations with examples. 6

   c) Discuss Euler's method for solution of ordinary differential equation. Draw on flow chart for the same and illustrate with suitable example. 10