COMP 3 – 4 (RC)

S.E. (Comp.) (Semester – III) (RC) Examination, Nov./Dec. 2014
COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours   Total Marks : 100

Instruction : Attempt **any five** questions by selecting at least **one**
question from **each** Module.

MODULE – 1

1. a) i) Divide the numbers :
0.875000 E – 18 by 0.200000 E 95.
   ii) Multiply the nos.
0.350000 E 40 by 0.500000 E 70.   6

   b) State the difference between direct and iterative methods for solution of
linear algebraic equations.   4

   c) Draw a flow chart and write a program to solve the equation $x^3 - x - 3 = 0$ by
Newton-Raphson's method.   10

2. a) Using Gauss Elimination method by partial pivoting, solve the system of
equations.   10
$10x + 2y + z = 9$
$2x + 20y - 2z = -44$
$-2x + 3y + 10z = 22$

   b) Explain Newton Raphson's method. State advantages and disadvantages of
this method.   5

   c) Explain absolute and relative error. How can total error be minimised ?   5

MODULE – 2

3. a) Develop an algorithm, flow chart and write a program to solve the system of
'n' equations with 'n' unknowns using Jocobi method.   10

   b) What do you mean by a diagonally dominant matrix ? Give examples.   5

   c) Determine Eigen Values and the corresponding Eigen Vector for matrix

$A = \begin{bmatrix} 2 & \sqrt{2} \\ \sqrt{2} & 1 \end{bmatrix}$.   5

P.T.O.

4. a) Population of a town is as follows :

x	1941	1951	1961	1971	1981	1991
Population in lakhs	20	24	29	36	46	51

Using the appropriate Newton's interpolation formula estimate the population

increase during 1946, 1986.   7

b) Use Lagrange formula to find f(x) given.   7

x	0	2	3	6
f(x)	648	704	729	792

c) Define divided difference, derive Newton's divided difference interpolation

formula.   6

MODULE – 3

5. a) Use finite difference approach to solve $\frac{d^2y}{dx^2} = 6x + 4$, $y(0) = 2$, $y(1) = 5$ with

$\wedge x = 0.2$.   7

b) Write a program to implement Simpson's $1/3^{rd}$ rule.   7

c) Find the value of $\int_3^7 x^2 \log x \, dx$ by taking step size = 4.   6

6. a) Use Romberg's method to compute $\int_0^1 \frac{1}{1+x} dx$ with h = 0.5, 0.25, 0.125.   6

b) From the below table find out dy/dx at x = 2.2 and $\frac{dy}{dx}$ at x = 2.0.   10

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.71	3.32	4.05	4.95	6.04	7.38	9.02

c) Draw a flow chart to evaluate a definite integral by Trapezoidal rule.   4

MODULE – 4

7. a) State if the following piecewise polynomials are splines or not

$f_1(x) = x + 1$ $-1 < x \leq 0$

$f_2(x) = 2x + 1$ $0 < x < 1$

$f_3(x) = 4 - x$ $1 \leq x < 2$

         7

b) Write a program to implement RK method.

         7

c) Explain the steps in Euler's method and modified Euler's method.

         6

8. a) Given $\dfrac{dy}{dx} = 2e^x + y$ $y(0) = 2$ estimate $y(0.1)$ and $y(0.2)$ using Taylor's series. 7

b) What are parabolic equations ? Explain.

         6

c) Discuss the process of finite difference approach to derivatives.

         7