S.E. (Comp.) Semester III (RC) Examination, Nov./Dec. 2010
COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours | Total Marks : 100

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

MODULE– I

1. a) Explain Round off errors and Truncation errors with an example of each. **4**

   b) Use Regula Falsi method to solve $x^3 - 4x - 9 = 0$, result should be correct up to 3- significant digits. **6**

   c) Develop an alogorithm and write C\C++ program to implement Bisection method. **10**

2. a) By using Gauss elimination method find inverse of the matrix $A = \begin{bmatrix} 2 & 3 & 2 \\ 3 & 2 & 1 \\ 1 & 4 & 2 \end{bmatrix}$. **6**

   b) Solve the following system of equations by using Gauss - elimination method with partial pivoting. **8**

   $a - b + 3c - 3d = 3$

   $5a - 2b + 5c - 4d = 5$

   $3a + 4b - 7c - 2d = -7$

   $2a + 3b + c - 11d = 1$

   c) By using Gauss - Jordan method solve the following system of equation :

   $2x + 3y + 4z = 1$

   $4x + 2y + 3z = 2$

   $3x + 4y + 2z = 1$ **6**

MODULE – II

3. a) Develop an algorithm and write C\C++ program to solve a system of n - linear equations in n - unknowns using Gauss - Seidal method. **10**

b) Determine eigen values and corresponding eigen vectors for the following matrix.

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

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

$30x + 2y + 4z = 6$

$2x + 28y + 3z = 5$

$-x + 4y + 25z = 4$ 5

4. a) The population of a town is as follows :

Year : x	1941	1951	1961	1971	1981	1991
Poulation in Lachs : y	20	24	29	36	46	51

Using appropriate Newton's interpolation formula estimate the populatin increase during the period 1946, 1986. 7

b) From the following table using Stirling's formula estimate value of tan 16 given :

x	0°	5°	10°	15°	20°	25°	30°
y = tan x	: 0.0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

7

c) Using Newton's divided distance interpolation formula compute y at x = 5.2, given :

x	:	1	2	4	6	7
y	:	32	64	98	115	132

6

MODULE – III

5. a) Using Shooting method to solve the following differential equation :

$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - \frac{y}{2} - 2.5 = 0$$

$y(0) = 10,\ y(10) = 6$ 7

b) Use the finite difference approach to solve

$$\frac{d^2y}{dx^2} = 6x + 4$$

y (0) = 2, y (1) = 5

with $\Delta x = 0.2$. **7**

c) Find largest eigen value and the corresponding eigen vector of the following matrix using the power method :

$$A = \begin{bmatrix} -1 & 0 & 0 \\ 1 & -2 & 3 \\ 0 & 2 & -3 \end{bmatrix}$$ **6**

6. a) Evaluate the first derivative at x = –3 and x = 0 of the following table function.

x :	– 3	– 2	– 1	0	1	2	3
y :	– 33	– 12	– 3	0	3	12	33

6

b) The table below shows the speed of a car at various intervals of time. Find the distance travelled by the car at the end of two hours.

Time / hr. :	0	0.5	1.0	1.5	2.0	2.5
Speed in km / hr. :	0	40	60	50	45	65

6

c) Write a C\C++ program to implement Simpson's ⅓ rule. **8**

MODULE – IV

7. a) Solve using Picard's method and estimate y at x = 0.25, 0.50,

given $\frac{dy}{dx} = x^2y^2$, y (1) = 0. **7**

b) Use the classical Runge-Kutta method to estimate y at x = 0.5, given

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

c) Write C\C++ program to implement Euler's method. . **7**

8\. a) Given the equation $\frac{dy}{dx} = \frac{2y}{x}$ with y (1) = 2,

estimate y at x = 2 using Euler's Predictor – Correction method. **6**

b) Solve the following initial value problem for x = 1, using the Fourth order Milne's method $\frac{dy}{dx} = y - x^2$, y (0) = 1, use a step size of 0.25 and Fourth order Runge-Kutta method to predict starting values. **11**

c) Determine which of the following equations are elliptic, parabolic and hyperbolic.

i) $3\frac{\partial^2 f}{\partial x^2} + 4 \cdot \frac{\partial^2 yf}{\partial y^2} = 0$

ii) $\frac{\partial^2 f}{\partial x^2} - \frac{\partial^2 f}{\partial y^2} = 0$

iii) $\frac{\partial^2 f}{\partial x2} - 2\frac{\partial^2 f}{\partial x \partial y} + 2 \cdot \frac{\partial^2 f}{\partial y2} = 2x + 5y$. **3**
