COMP – 3-4 (RC)

S.E. (Comp.) (Sem. – III) Examination, Nov./Dec. 2009
COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours Total Marks : 100

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

MODULE – I

1. a) i) Distinguish between round off errors and truncation errors.
   ii) Find the absolute and relative errors in evaluating the following expression $\sqrt{x^2 + y^2}$, assume x = 1.25, y = 2.16. (4+4)

   b) Derive secant formula. How is it different from the false-position formula. 7

   c) Compute a root of the following equation using Newton-Raphson Method
   $x^3 - 1.2x^2 + 2x - 2.4 = 0$. 5

2. a) Solve the following system of equations by Simple Gauss-elimination Method
   $2x + 3y + 4z = 5$
   $3x + 4y + 5z = 6$
   $4x + 5y + 6z = 7$. 6

   b) Find the inverse of the following matrix using Gauss-Jordan elimination technique.
   $$A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 4 & -6 \\ -1 & -2 & 3 \end{bmatrix}_{3\times 3}$$ 6

   c) Write C | C++ program to solve the system of linear equations by using Gauss-elimination Method with partial pivoting. 8

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MODULE – II

3. a) How is Newtons divided difference interpolation formula is better than Lagrange's interpolation formula ? 4

   b) Estimate the value of *ln* (3.5) using Newtons-Gregory forward difference formula, given the following data :

x :	1	2	3	4
y = *ln*(x) :	0	.6931	1.0986	1.3863

   6

   c) Using Stirling and Bessel's formula find the value of y at x = 35, given

x :	20	30	40	50
y :	512	439	346	243

   10

4. a) Give an algorithm for solving a system of linear equations using Gauss-Jacobi Method. 6

   b) Solve the following equations by Gauss Seidal method

   $2x - 7y - 10z = -17$

   $5x + y + 3z = 14$

   $x + 10y + 9z = 7$ 7

   c) Find eigen values and eigen vectors of the following matrix 7

$$A = \begin{bmatrix} 2 & -1 & 3 \\ 0 & -1 & 4 \\ 0 & 0 & 3 \end{bmatrix}$$

MODULE – III

5. a) Solve the following differential equation using the Shooting Method 7

$$\frac{d^2y}{dx^2} = 12x^2,\ y(1) = 2,\ y(2) = 17.$$

b) Given the boundary value problem,

$$\frac{d^2y}{dx^2} = 3x + 4y \quad y(0) = 1, y(1) = 1.$$

Obtain its solution in the range $0 \le x \le 1$ with $\Delta x = 0.25$, using the finite difference method. 7

c) Use Power method to find the largest eigen value and the corresponding eigen vector of the matrix

$$A = \begin{bmatrix} -13 & 3 & -5 \\ 0 & -4 & 0 \\ 15 & -9 & 7 \end{bmatrix}_{3\times 3}$$ 6

6. a) The following table gives the velocity of an object at various points in times

Time in sec. :	1	1.2	1.4	1.6	1.8	2.2	2.4
Velocity in m/sec. :	9	9.5	10.2	11	13.2	14.7	18.7

Find acceleration of the object at T = 2.0 Sec. 7

b) Use Simpson's $\frac{3}{8}^{th}$ rule to evaluate $\int_3^{4.8} \log_e(4 + x \cdot e^x)\, dx$. 6

c) Write C|C++ program to implement Trapezoidal rule. 7

MODULE – IV

7. a) Solve the following equation by Picard's method and estimate y at x = .25 and 0.50, given

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

b) Use the classical Runge-Kutta method to estimate y at x = 0.5 of the following equation, with h = 0.25, given

$$\frac{dy}{dx} = y + \sin x, \quad y(0) = 2.$$ 7

c) Write C|C++ program to implement Euler's Simple Method. 6

8. a) $\frac{dy}{dx} = (\cos x) \cdot y,\ y(0) = 1$

Use Euler's prediction-correction method to estimate y at x = 0.25, result should be true up to 3-significant digits. 7

b) Solve the following initial value problem for x = 1 using th 4^{th} order Milne's method

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

Use the step-size of 0.25 and 4^{th} order Runge-Kutta method to predict starting values. 13
