



S.E. (Comp.) Semester – III (RC) Examination, May 2010
COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours

Total Marks : 100

Instructions : 1) Attempt 5 questions atleast one from each Module.

2) Assume suitable data if necessary.

MODULE – I

1. a) Explain procedural errors, relative errors and absolute error with examples. 6
b) Use Bisection method to find a +ve root of the equation $e^x - 3x = 0$. The root should be correct upto three significant digits. 7
c) Write C/C++ program to implement Newton Raphson Method to solve equation $f(x) = 0$. 7
2. a) Solve following system of linear equations by using Basic Gauss-Elimination method. 7
$$\begin{aligned} x - y + z &= 1 \\ -3x + 2y - 3z &= -6 \\ 2x - 5y + 4z &= 5 \end{aligned}$$

b) Explain Gauss Elimination Method with partial pivoting. 6
c) Find inverse of $A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 2 & 3 \\ 3 & 4 & 2 \end{bmatrix}$ 7
using Gauss – Jordan Method. 7

MODULE – II

3. a) Use Newton's forward difference formula to compute y at $x = 16$ from the given table. 7

x :	5	10	15	20	25
y :	26.782	19.951	14.001	8.762	4.163.

b) Develop an algorithm to implement Lagrange's Method of Interpolation. 6

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- c) Use Newton's Divided difference formula to find a polynomial of degree 3, from the following data :

x :	2	4	5	6
y :	22	44	59	68

and hence find y at x = 4.3.

4. a) Using Stirlings formula find the value of y at x = 35, given.

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

- b) Solve the following system of linear equations by Gauss-Seidal Method. Obtain the solution correct to 3-decimal places.

$$x + 3y + 10z = 24$$

$$28x + 4y - z = 32$$

$$2x + 17y + 4z = 35$$

- c) Determine largest eigen value and corresponding eigen vector of the matrix

$$A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}, \text{ Take initial vector as } \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

MODULE - III

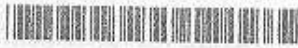
5. a) Solve the following differential equation using shooting method :

$$\frac{d^2y}{dx^2} = 6x + 4, y(0) = 2, y(1) = 5.$$

- b) From the following table of values of x and y, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x = 1.2

x :	1.0	1.2	1.4	1.6	1.8	2.0
y :	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891

- c) Draw a flow chart and write C/C++ program to implement Trapezoidal rule for numerical integration.



6. a) Write a C/C++ program to implement Simpson's 1/3rd rule. 7
- b) Using Simpson's 3/8th rule to evaluate $\int_1^3 \frac{x}{\sin x + e^x} dx$, taking 6 intervals. 6
- c) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ numerically. Using Trapezoidal rule by taking $h = 0.5$ and 0.25 and use Romberg's Method to improve the result. 7

MODULE - IV

7. a) Develop an algorithm and write C/C++ program to implement Euler's Predictor-Corrector Method. 12
- b) Find $y(0.25)$, $y(0.5)$ using Runge-Kutta Method of 4th order. Given $\frac{dy}{dx} = \frac{x^2}{1+y^2}$, $y(0) = 0$. 8
8. a) Solve $\frac{dy}{dx} = x + y^2 + 1$, $y(0) = 0$ using Picard's Method and hence compute y at $x = 0.1, 0.2$ 7
- b) Compute $y(0.3)$, $y(0.4)$ using Euler's Predictor-Corrector method. Given $\frac{dy}{dx} = y - \frac{2x}{y}$, $y(0) = 1$. 7
- c) Draw a flow chart to implement Runge-Kutta Method of 4th order. 6