S.E. (Comp) (Semester – III) Examination, November/December 2015
COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours | Total Marks : 100

Instruction : *Assume* ***necessary*** *details.*

MODULE – I

1. a) Find the fourth root of 32 using False position method. Correct answer upto 3 decimal places. **8**

   b) Explain the various sources of errors in Numerical Computing. **4**

   c) Solve the following system of equations using Gauss-Elimination method.

   $10x - 7y + 3z + 5u = 6$

   $-6x + 8y - z - 4u = 5$

   $3x + y + 4z + 11u = 2$

   $5x - 9y - 2z + 4u = 7$ **8**

2. a) Derive Newton-Raphson formula. **5**

   b) Use Gauss-Jordan's method to find inverse of matrix

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}.$$ **6**

   c) Use Secant method to find positive root of $\cos x - x.e^x = 0$. Correct answer upto 4 decimal places. **6**

   d) State difference between partial and complete pivoting. **3**

MODULE – ii

3. a) The following data are taken from the steam table. 7

Temp. °C	140	150	160	170	180
Pressure Kg F/cm²	3.685	4.854	6.302	8.076	10.225

Find the pressure at temperature t = 175°. Use appropriate interpolation formula.

b) Determine F(x) as a polynomial in 'x' for the following data using Newton's divided difference formula. 7

x :	– 4	– 1	0	2	5
F (x) :	1245	33	5	9	1335

c) Derive Newtons' forward interpolation formula. 6

4. a) Solve the following system of equations using Jacobi's iteration method. Correct answer upto 3 decimal places. 7

$20x + y - 2z = 17$

$3x + 20y - z = -18$

$2x - 3y + 20z = 25$

b) Find y(10) using Lagrange's interpolation. 6

x :	5	6	9	11
y :	12	13	14	16

c) What are the limitations of using direct method of solving a system of linear equations. 3

d) State the appropriate choice of interpolation formula to be used in various situations. Provide appropriate examples. 4

MODULE – iii

5. a) Evaluate the integral $I=\int_0^{\pi}\sin x\,dx$ by dividing the range into ten equal parts.

Using trapezoidal and Simpson's $\frac{1}{3}$ rule. **8**

b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ derivatives at x = 1.6 of the following table. Use appropriate formula. **6**

x :	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y :	7.989	8.403	8.781	9.129	9.451	9.750	10.031

c) Solve the following integral using Simpson's $3/8$ rule $I=\int_4^{5.2}\log_e x\,dx$. **6**

6. a) Evaluate the integral $I=\int_0^1\frac{dx}{1+x^2}$ using Romberg's method. Correct answer upto 3 decimal places. Take h = 0.5, 0.25, 0.125. **8**

b) Using the finite difference method, Find y (0.5) satisfying the differential equation $\frac{d^2y}{dx^2}+y=x$. Subject to the boundary conditions y (0), y (1) = 2. **6**

c) Write a c/c++ program to implement trapezoidal rule. **6**

MODULE – IV

7. a) Given $\frac{dy}{dx}=3x^2+1$ and y(1) = 2. Find 'y' for x = 1.5 and x = 2.0 using Euler's method. **7**

b) Given $\frac{dy}{dx} = \frac{3x+1}{y^2+2x}$ and $y(1) = 2$. Evaluate $y(1.1)$ and $y(1.2)$ using Fourth order Runge-Kutta method. Take step size, $h = 0.1$. 7

c) Using Milne's method, find $y(4.5)$. Given $5xy^1 + y^2 - 2 = 0$ and $y(4) = 1$, $y(4.1) = 1.0049$, $y(4.2) = 1.0097$, $y(4.3) = 1.0143$, $y(4.4) = 1.0187$. 6

8. a) Solve $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$ using Picard's method. Estimate y at $x = 0.25$, $x = 0.5$ correct to three approximations. 8

b) Solve $\frac{dy}{dx}$ $2y + 3e^x$ and $y(0) = 0$ using Taylor's series. Estimate $y(0.2)$ and $y(0.4)$. 7

c) What are parabolic equations ? Explain with an example. 5