x	2.0	2.2	2.6
$f(x)$	0.69315	0.78846	0.95551

Obtain an upper bound on error also. 6.5

(b) Find the approximate value of $I = \int_0^1 \frac{\sin x}{x} dx$. by using Newton's Cote open formula (i) mid- point rule (ii) two- point rule. 6.5

(c) Evaluate the integral $I = \int_0^2 \frac{dx}{3+4x}$, using Gauss Quadrature 3- point rule. 6.5

6. (a) Use the Euler method to solve boundary value problem

$$y' = 4e^{0.8t} - 0.5y,\ y(0) = 2$$

on the interval $[0,3]$ with $h = 1$. 6.5

(b) Given the initial value problem:

$$y' = -2ty^2,\ y(0) = 1$$

estimate $y(0.4)$ using Ralston's method (R. K. Method 2nd Order) with $h = 0.2$. 6.5

(c) Using a second order finite difference method with $h = 1$, find the solution of the Boundary Value Problem $y'' - y = x(x-4),\ 0 \le x \le 4$

with $y(0) = y(4) = 0$ .6.5

This question paper contains 4 printed pages.

Your Roll No. .....

S. No. of Paper	: **3376**	**IC**
Unique Paper Code	: **62357602**	
Name of the Paper	: **Numerical Analysis**	
Name of the Course	: **B.A. (Prog.) Maths.: DSE-1B**	
Semester	: **VI**	
Duration	: **3 hours**	
Maximum Marks	: **75**	

(Write your Roll No. on the top immediately on receipt of this question paper.)

*All **six** questions are compulsory. Attempt any **two** parts from each question. Use of simple calculator is allowed.*

1. (a) Perform three iterations of Newton-Raphson method to obtain root of the equation:

$$f(x) = \cos x - xe^x = 0$$

with initial approximation $x_0 = 1$. 6

(b) Define Truncation Error. Evaluate the sum:

$$\sqrt{3} + \sqrt{5} + \sqrt{7}$$

to four significant digits and find its absolute and relative errors. 6

(c) Perform three iterations of Regula Falsi method to obtain the root of the equation:

$$f(x) = x^3 - 2x^2 - 5 = 0 \quad (6)$$

in the interval $[2,3]$. 6

2. (a) Perform three iterations of secant method to obtain the square root of 3 with initial approximation:

$x_0 = 1,\ x_1 = 2$. 6

(b) Perform four iterations of bisection method to find the root of the equation:

$$x^3 - 2x^2 - 0.04x + 0.08 = 0$$

in the interval $[0,1]$. 6

(c) Perform two iterations of Newton's method to solve the non-linear system of equations:

$$x^2 + xy + y^2 = 7$$
$$x^3 + y^3 = 9$$

with initial approximation $(x_0, y_0) = (1.5, 0.5)$. 6

3. (a) Solve the following system of linear equations using the Gauss elimination method with partial pivoting:

$$2x + 6y + 10z = 0$$
$$x + 3y + 3z = 2$$
$$3x + 14y + 28z = -8 \quad 6.5$$

(b) Perform three iterations of Gauss-Seidel iteration method for the following system of equations:

$$5x + y - 2z = 2$$
$$3x + 4y - z = -2,$$
$$2x - 3y + 5z = 10,$$

starting with initial solution as $(x, y, z) = (0,0,0)$ .6.5

(c) Solve the following system of equations by using the Gauss-Jordan method:

$$\begin{pmatrix} 2 & 1 & 3 \\ 4 & -3 & 5 \\ -3 & 2 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ -7 \\ -3 \end{pmatrix} \quad 6.5$$

4. (a) Prove the following relation:

$$\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{1}{4}\delta^2} \quad 6$$

(b) Given the following data:

x	0.1	0.2
$\sin(x)$	0.09998	0.1986

Find Lagrange interpolating polynomial and approximate the value $\sin(0.15)$. Obtain a bound on the truncation error also. 6

(c) The following data represents the function $f(x) = x^{\frac{1}{3}}$:

x	0	1	8
$f(x)$	0	1	2

Find Newton divided difference interpolating polynomial of degree 2. Also find the approximate value of $f(7)$ and compare with the exact value. 6

5. (a) Find $f''(2.0)$ using quadratic interpolation using the following data: