University of Dhaka
Department of Mathematics
2nd Year B.S. Honors, Session 2023-24
Subject: Mathematics
Course Code: MTH 250 Course Title: Math Lab – II
Assignment 5: Numerical Analysis, Deadline: 2 lab classes
Name: Roll:

Q1. Use (i) Bisection method, (ii) Fixed point iteration method and (iii) Newton-Raphson method (iv) False position method to find the roots of the equation $f(x) = 0$ correct up to five decimal places where,

$$f(x) = sin^2(x) - x^2 + 1,$$

Practice: $f(x) = 3x + \sin x - e^x$.

Q2. Using Newton's interpolation formula write a script m-file to calculate $F(X)$ for the given set of values. It should take the value of X as an input and give $F(X)$ as output. Find the values of $F(1.175), F(1.772)$ and $F(1.943)$.

X	1.0	1.20	1.40	1.60	1.80	2.00
$Y = F(X)$	0.242	0.1942	0.1497	0.1109	0.079	0.054

Q3. Write a matlab function m-file for the function $f(x) = 0.5\,xe^{0.1x^2}$. Use Lagrange's interpolation formula to approximate $f(1.25)$ where the reference points are $x_0 = 0.0$, $x_1 = 0.5$, $x_2 = 1.0, x_3 = 1.5$ and $x_4 = 2.0$. Compare the exact value and approximated value. Take the values of each x_i in a single vector x and perform the operations.

Q4. Evaluate the definite integral $\int_0^2 \frac{2}{x^2+4} dx$ by using

(i) Trapezoidal rule,

(ii) Simpson's 1/3 rule,

(iii) Simpson's 3/8 rule,

(iv) Weddle's rule,

(v) Romberg integration

Compare your results with exact value.

Practice: $\int_0^1 \frac{1}{\sqrt{1+x^2}} dx$

Q5. Input the augmented matrix for the following system of linear equations in a single variable. Solve the system using the following two methods:

1. Gaussian Elimination
2. LU decomposition

$$3x_1 - 7x_2 - 2x_3 = -7$$
$$-3x_1 + 5x_2 + x_3 = 5$$
$$6x_1 - 4x_2 = 2$$

Practice:

$$x_1 + 2x_2 - 3x_3 = 5$$
$$2x_1 - 3x_2 - 2x_3 = -5$$
$$3x_1 + 5x_{2+}\ x_3 = -16$$