

Department of Computer Science and Engineering

Lab Manual

Course: CSE-225

Couse Title: Numerical Methods

Lab-1: Function Evaluation

Problem 1:

Write a program to evaluate a function f(x), given the definition of the function and the value of x.

Sample Input:

f(x)=55x9+4.5 x7.5-12 x5-6.9 x2+2.9

x=2.3

Sample Output:

f(x)=100581.0873

Lab-2: Approximation and Round off Errors

Problem 1:

Write a program to evaluate using two approaches:



and compute the true and approximation relative errors until the absolute value of the error falls below a prespecified error criterion .

Input the value of x, n and the maximum number of iterations you want to perform in case of the absolute error not falling below .

Lab-3: Taylor Series

Problem 1:

Given a polynomial of degree n defined as follow:

f(x)= anxn+ an-1xn-1+…………………..+ a2x2+ a1x+a0

Write a program where the user will be asked to input the degree of the polynomial (n), the coefficients, ai and the value of xi . Use zero through nth order Taylor series expression to approximate a the values of f(xi+1) for a given values of xi+1 . At each approximation, find the values of | and | .

Lab-4: Solving Nonlinear Equation: Bisection and False Position Methods

Problem 1:

Write a program to determine the real root of a polynomial function of degree n

1. Using bisection methods
2. Using false position methods
3. The user should input the function, two initial guesses of Xl and Xu and

Format of Output:

Iteration No.:

Xl:

f(Xl):

Xu:

f(Xu):

Xr:

f(Xr):

|%:

Lab-5: Solving Nonlinear Equation: Newton-Raphson and Secant Methods

Problem 1:

Write a program to determine the real root of a polynomial function of degree n

1. Using Newton Raphson method
2. The user should input the function, initial guesses of X0 and

Format of Output:

Iteration No. Xi f(Xi)

Problem 2:

Write a program to determine the real root of a polynomial function of degree n

1. Using Secant method
2. The user should input the function, two initial guesses of Xi-1 & Xi and

Format of Output:

Iteration No. Xi-1 Xi Xi+1 f(Xi+1)

Lab-6: One Dimensional Unconstrained Optimization: Golden Section Search, Newton’s Methods

Problem 1:

Write a program to determine the maximum/minimum of a function

1. Using Golden Section Search method
2. The user should input the function, two initial guesses of Xl & Xu and

Format of Output:

Iteration No. Xl f(Xl) Xu f(Xu) Xopt f(Xopt)

Problem 2:

Write a program to determine the maximum/minimum of a function

1. Using Newton’s method
2. The user should input the function, two initial guesses of X0 and

Format of Output:

Iteration No. X0  f(X0) Xopt  f(Xopt)