CS 325 Numerical Computing Project

WHY DO WE NEED NUMERICAL COMPUTING?

MATHEMATICS is an elegant and precise subject, however when numerical answers are required one sometimes needs to rely on approximate methods to obtain useable answers. There are many problems which simply do not have analytical solutions, or those whose exact solution is beyond our current state of knowledge. There are also many problems which are too long (or tedious) to solve by hand. When such problems arise we can exploit numerical analysis to reduce the problem to one involving a finite number of unknowns and use a computer to solve the resulting equations. The text starts with a description of how we could perform some very basic calculations (that is, simply using the computer as a calculator). It then moves on to solving problems which cannot, in practice, be solved by hand.

Sometimes the solution of these problems can become as intricate and involved as the original problems and requires almost as much finesse and care to obtain a solution. There are several

options available to us, both in terms of language and also overall approach. In this project we elect to express our ideas in terms of the syntax of the computer package MATLAB. Once you have mastered the syntax of MATLAB it will be easier for you to learn other languages,

MATLAB stands for Matrix Laboratory. The basic building block of MATLAB is the matrix. It is not confined to the solution of Matrix related problems. With its inbuilt functions, it is an excellent tool for linear algebraic computations, data analysis, signal processing, optimization, numerical solutions of ordinary differential equations (ODE), quadrature, nonlinear equation, System of linear and Nonlinear equation,Interpolation,differentiation, 2D & 3D, graphics and many other types of scientific computation. Therefore, we can say:

MATLAB is a software package in high performance language for technical computing. It integrates computation, visualization and programming in an easy to use environment where problems and solutions are expressed in familiar mathematical notations.

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Write a code (Program) on Matlab or C++ of the following any 2 selections out of 5 topics :

1	**Solution of non linear equation :** Bisection,Fixed Point iteration ,Regula False , Newton and Secant Method.
2	**Interpolation** : Lagrange and Newton formulas(forward , back word and central difference) Using SDT and DDT
3	**Numerical Integration**: Trapezoidal , Midpoint , Simpson's and Boole's formula
4	**Solution of ordinary differential equation** : Euler's , Huen's , 4-RK Method
5	**System of linear equation (Iterative methods)** Gauss-Siedel and Jacobi's methods.

Instructions:

1. Due Date of submission: 8-June, 2020
2. Maximum weightage: 10
3. You have to submit a report on given project with the following
    a. Introduction
    b. Details about group members
    c. Acknowledgements
    d. Algorithm
    e. Code (Program)

f. Comparison between the methods (Analysis)

g. Reference/Bibliography

4. Display final solution in term of tabular form with at least 5 number of decimal places .

5. Class CR is responsible to make a group of maximum 4 (if possible) and send me list via email .

6. I will update group members on slate.

7. Viva or presentation will be taken after submission date

8. Key dates of presentation will soon announce after making a group.

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