

Assignment 1 - BSE666

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1. Group Members

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2. Problem Overview

This assignment involves the numerical and analytical solution of three primary problems:

Problem 1: Root finding for flow rate (Q) across a tube using the fixed-point iteration method.

Problem 2: Solving a first-order ODE ($\frac{dy}{dt}$) using Explicit Euler, Implicit Euler, and Implicit Crank-Nicolson methods.

Problem 3: Analyzing a tank emptying process modeled by a non-linear ODE using square root approximations.

3. Instructions for Code Execution.

1. For Problem 1: Open `Problem1_Solution.m` and press Run. This will generate the plot for Q , calculate the root using `fzero`, perform fixed-point iterations, and display the error convergence on a log-scale.

2. For Problem 2: Open `Problem2_Solution.m` and press Run. The code will solve the ODE analytically and numerically for t . It will output the Root Mean Square Error (RMSE) for each method to identify the most accurate approach.

3. For Problem 3: Open `Problem3_Solution.m` and press Run. This script solves the tank emptying problem and specifies the time required for the water level to fall below h_{crit} .