

ECH 4323L: Process Control Lab
Laboratory 2

Objective: To study the dynamics of two tanks in series

Procedure: The teaching assistant will explain the procedure

Lab Report: The report should be **brief** and should have the following sections:

1. **Objective:** State the objective of the experiment
2. **Process Model:** Develop a nonlinear model to describe the dynamics of the process (use the 5 step procedure described in the lecture).
3. **Data:** Report the experimental data that you got.
4. **Parameter Estimation:** Use the experimental data to estimate the parameters of the nonlinear model.
5. **Analysis:**
 - Linearize the nonlinear model
 - Calculate the dynamic response of the linearized model
 - Write a MATLAB program to solve the nonlinear equations directly and compute the response of the *nonlinear* model.
 - Compare the model predictions with the experimental data.
6. **Summary and Conclusions:**
7. **Additional Problem:** Consider the problem discussed in the lecture "Qualitative Effect of Controllers". Simulate this example in MATLAB for various values of the PID controller parameters and describe how the dynamic behavior changes with the parameters.

Data

Steady State:

$$\begin{array}{ll} \text{Area of cross - section} & A = 48.65 \text{ cm}^2 \\ \text{Steady state height of first tank} & h_{1s} = \text{cm} \\ \text{Steady state height of second tank} & h_{2s} = \text{cm} \\ \text{Volume added at } t = 0 & M = \text{cm}^3 \end{array}$$

Assume that it takes 2 seconds to add the beaker of water at the start of the experiment.

Time Varying:

<i>Time (s)</i>	<i>h_1 (cm)</i>	<i>h_2 (cm)</i>
0		
10		
20		
30		
40		
50		
60		
70		
80		
90		
100		
110		
120		