**LAB #5 Water Level Control of a Coupled Tank System**

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IN FULFILLMENT OF THE REQUIREMENTS FOR:

MTRE 4002L

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# INTRODUCTION

The goal of this lab is to further familiarize us with MATLAB and Simulink using our knowledge of Control Systems being taught in MTRE 4001. More specifically, we used our knowledge of circuit modeling to visualize a plot. Two techniques were used to realize this, the numerical approach, and the analytical approach. The former is a methodology that allows the user to realize a rough estimate of the output of a system and can be very powerful in analyzing complicated systems than cannot be analyzed using the latter approach, analytical. The analytical approach gives the user the exact output without expected error baked in. This is also a great tool but can be difficult to use.

# QUESTION 1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Proportional Gain (kp) | Integral gain (ki) | Rise Time (Tr) | Peak Time (Tp) | Setting Time (Ts) | Percent Overshoot (%OS) | Steady-state Error (ess) | Is it a stable system? (Yes/No) | Type of the System (Under/Over/Critically damped System?) |
| 1 | 0.001 |  |  |  |  |  |  |  |
| 1 | 0.01 |  |  |  |  |  |  |  |
| 1 | 0.05 |  |  |  |  |  |  |  |
| 1 | 0.3 |  |  |  |  |  |  |  |
| 1 | 1.5 |  |  |  |  |  |  |  |
| 1 | 5.0 |  |  |  |  |  |  |  |
| 1 | 10.0 |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Proportional Gain (kp) | Integral gain (ki) | Derivitive Gain (kd) | Rise Time (Tr) | Peak Time (Tp) | Setting Time (Ts) | Percent Overshoot (%OS) | Steady-state Error (ess) | Is it a stable system? (Yes/No) | Type of the System (Under/Over/Critically damped System?) |
| 1 | 0.1 | 0 |  |  |  |  |  |  |  |
| 1 | 0.1 | 0.001 |  |  |  |  |  |  |  |
| 1 | 0.1 | 0.04 |  |  |  |  |  |  |  |
| 1 | 0.1 | 0.05 |  |  |  |  |  |  |  |
| 1 | 0.1 | 0.2 |  |  |  |  |  |  |  |

# CONCLUSION

In conclusion, this lab was a great exercise with showing the power of modeling and plotting with MATLAB and Simulink. There are many useful functions that help with getting straight to the answer with minimum software and syntax problems. Also, the difference shown between the numerical and analytical approaches on the plot was very helpful. Using Euler’s method to generate a numerical solution was very insightful on the power of that technique.