Lab Report #07:

Simulation of Elevator Control System

**Authors:** Midshipman 3/C **First Last Name** and Midshipman 3/C **First Last Name**   
**Course:** SY202 Cyber Systems Engineering

**Enclosures:** (a)Optional

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Metric** | **Weight** | **Quality** | | | | | **Max**  **Score** | **Midn**  **Score** |
| **0** | **1** | **2** | **3** | **4** |
| Use of Lab Template | 1 | No |  | Partially |  | Yes | 4 |  |
| Introduction | 1 | Problem, purpose, and objectives are unclear |  | Problem stated but purpose/objectives unclear |  | Well discussed | 4 |  |
| Modeling | 2 | Simulink model is not included, components are not explained |  | Model included but incorrect or components are not explained |  | Correct Simulink model with components and functionalities explained | 8 |  |
| Results and Discussion  (P, PI controllers and Disturbances) | 4 | Results are not presented or are poorly discussed, missing several observations |  | Result are presented, but missed some relevant observations, unsubstantiated claims |  | Results are well discussed; **short but cohesive**; trends and observations are well substantiated with data | 16 |  |
| Results and Discussion  (Sensor Noise) | 1 | Results are not presented, incomplete, or incorrect |  | Results are partially presented or some are incorrect; unsubstantiated claims |  | Results are complete and correct | 4 |  |
| Figures and Tables | 1 | Figures and Tables are not correctly labeled or are hard to read |  | Figures and Tables are missing some important features |  | Figures include a descriptive caption, are well identified, and are easy to read | 4 |  |
| Conclusions | 1 | Not included or poorly summarize main results |  | Included but inaccurate or vague |  | Included and cohesively summarize results | 4 |  |
| Grammar, organization, & Professionalism | 1 | Poor grammar and use of slang |  |  |  | Professional writing | 4 |  |
| **Total Points** | | | | | | | **48** |  |
| **Normalized Report Score = (Total Point / 48) x 50** | | | | | | **Letter Grade:** | **50** |  |

Instructions: **ERASE instructions that are given in red**.

# Introduction

In brief, describe the purpose and objective of the lab. This section should not be more than 2 paragraphs.

# Modeling of Elevator

Include a brief description of the system being modeled, mentioning the different components and their function within the system. Include (this is REQUIRED) a screen-shot or figure of your Simulink Model. If it too large, you may include it as an enclosure or Appendix but make sure to mention its existence within the text (otherwise, I might overlook it).

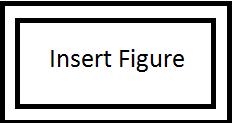


Figure 1. Simulink Model of Elevator System

# Simulation Results and Discussion

So far in the course we have discussed the different metrics we can use to compare the performance of a control system (e.g., settling time, rise time, steady-state error, etc.). We have also discussed the effect of P and PI controllers, i.e., how the proportional and integral gains affect the response of your closed-loop system. In this section, you will use your results from the different steps of the lab guidelines to draw observations, explanations, comparisons, and describe trends. This should be the larger portion of your report.

Discuss (in detail) the results from your simulation. You may use figures and tables as necessary (just remember to include captions, proper labels, units, etc.). **DO NOT OVERLOAD your report with figures, th**inking that the more figures you include, the better the report is. If you do so, your report will appear unprofessional and too difficult to follow. Describe the behavior of the system (PWM and voltage signals, elevator’s height, sensor readings, etc.) for the different cases. Provide a comparison when using a proportional control (with no integral action) and describe how the system’s response varied as a function of “Kp”. You can use the performance values you approximated in your arguments.

You should also describe what happened to the system as soon as you added more weight and, please, attempt to explain the reasoning behind the new behavior. Describe the effect of adding an integral action. Look at the PWM signal and try to make sense of it. Describe how changing Ki affects the response. Use steps 17 – 20 for your arguments. You can use figure as necessary.

# Conclusions

Summarize your results and observations. (1-2 paragraphs)

# Comments

Summarize any challenges that you overcame. Include what you learned and how the lab can be improved.