

ELEC3040/3050 Final Design Project

Created: April 5, 2010

1 Introduction

The ELEC3040/3050 Final Design Project consists of two main parts:

1. PID Motor Speed Controller *CC = v_k PID, CC = v_{ref} PI + f_{speed} ref*
2. Motor Speed Indicator and Selector

An oral presentation and a written report will be required documentation on the project.

2 PID Motor Speed Controller

The PID Motor Speed Controller is responsible for maintaining a set speed regardless of the motor load. It should have the following properties:

1. > 50% Faster rise time than open-loop
2. No steady-state error
3. < 5% overshoot of desired speed
4. Fast settling time upon reaching desired speed (< 1 ms min)

For evaluation of these parameters, you must show both the open-loop and closed-loop responses.

3 The Motor Speed Indicator and Selector

The Motor Speed Indicator and Selector part of the project should enable the user to select three different speeds, not to go below 37.5% duty cycle or to exceed 75% duty cycle via two switches. The input matrix is shown:

Sw1	Sw2	Expected Speed
0	0	Off
0	1	Low Speed
1	1	Middle Speed
1	0	High Speed

Additionally, the user should be able to read off the motor speed in RPM in scientific notation. This will involve the use of the two Hex-7 Segment converters and a few LED's from the 7 Segment display. The most significant digit should be displayed on the left most Hex-7 Segment display. The next most significant will be displayed on the right most Hex-7 Segment display. The power of 10 should be displayed based on the number of LED's turned on in the LED array under the 7-Segment display above the two Hex-7 Segment displays. This value should be updated every 250 ms. No rounding should occur. A simple truncation will be sufficient. An example is listed below

Measured Motor Speed (RPM)	Right Display	Left Display	Number of LED's Lit
260	2	6	2
1350	1	3	3
10	1	0	1
2	2	0	0
999	9	9	2