

## Project 2 (Revised) Checklist

### 23-April-2019 (Roy Kravitz)

#### Functionality:

1. On reset, the motor speed should be set to 0 RPM and  $K_p = 0 = K_I = K_D = 0$ .
2. Rotary encoder turns clockwise to increase the speed of the motor. Counterclockwise to decrease the speed of the motor. Rotary encoder should not wrap-around.
3. Motor speed set by the rotary encoder should change as per Switch [1:0] position: 00 - Inc/dec by 1, 01- Inc/Dec by 5, 1x- Inc/Dec by 10.
4. Switch[3:2]- Determine which control constant to change ( $K_p$ ,  $K_I$ , or  $K_D$ )
5. Switch [15]- Force crash (1), do not force crash (0)
6. The seven-segment display is used to show the control constant and motor speed without flicker. The display is split as follows: [7:4] – value of selected control constant, [3:0] – Desired Motor Speed. Motor speed should range from minimum RPM (at PWM 0) to the maximum RPM (at 99% duty cycle) at the output of the gearbox.
7. Center button when pressed: motor speed = 0 RPM and  $K_p = 0 = K_I = K_D = 0$ .
8. Up button: Increment the selected control constant ( $K_p$ ,  $K_I$ , or  $K_D$ ) by 1, Down button: Decrement the selected constant by the current increment amount
9. LED [2:0]- Show which control constant is being changed.
10. LED [15]- Watchdog indicator.
11. The system should not be slow to respond when buttons are pressed or rotary encoder is turned.
12. Direction change of motor after the position of the switch on rotary encoder is changed. Software should not allow the change of direction when the motor is running.
13. The data will be sent to a PC using UART and will be used to plot a graph on the PC.  
The data should consist of motor speed, desired speed,  $K_P$ , and error. The graph can be used to check if the P controller is working. With a change in the P, the waveform should be changed, showing some improvement in settling time without too much ripple.

#### Document:

1. Flowchart/State diagram expected.
2. Relevant code snippets w/ explanatory descriptions should be included.
3. Challenges (defects, etc.) faced should be mentioned. Explain how the challenge was overcome...or not.
4. Results from the experiment should be included. Graphs which show the changes in the waveform on changing the  $K_P/I/D$  parameters.
5. Explanation/analysis of your algorithms for converting desired RPM to PWM, displaying the motor speed, etc.