Project 2 Checklist
04-May-2021 (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. Increment/decrement amount determined by Switch[1:0].
3. Switch[15]- Force crash (1), do not force crash (0)
4. Switch[5:4]- PID parameters (K_p, K_I , or K_D) button increment/decrement. 00 – inc/dec by 1, 01 – inc/dec by 5, 1x – inc/dec by 10.
5. Switch[3:2]- Determine which control constant to change (K_p, K_I , or K_D)
6. Switch[1:0] Motor speed increment. position: 00 - Inc/dec by 1, 01- Inc/Dec by 5, 1x- Inc/Dec by 10.
7. The seven-segment display is used to show the desired motor speed (the target setpoint). Motor speed should range from minimum RPM (at PWM 0) to the maximum RPM (at 99% duty cycle) at the output of the gearbox.
8. Center button when pressed: motor speed = 0 RPM. K_p, K_I , or $K_D = 1$
9. Up button: Increment the selected control constant (K_p, K_I , or K_D) by current increment/decrement amount (on Switch[5:4]), Down button: Decrement the selected constant by the current increment/decrement amount
10. LED [2:0]- Show which control constant is being changed.
11. LED [15]- Watchdog indicator.
12. The system should not be slow to respond when buttons are pressed or rotary encoder is turned.
13. 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 by bringing the motor speed to 0, changing direction, and then increasing the speed to the value it was before the direction changed.
14. 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, KP, 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 KP/I/D parameters.
5. Explanation/analysis of your algorithms for converting desired RPM to PWM, displaying the motor speed, etc.