**CPEG 222 Homework #5**

**Related to Project 1 - Speed Controlled LEDs**

**A hard copy of this should be brought with you to the Mid-Stage Demo on September 21st in Evans 129**

1. Show the proper values for the TRISA, ANSELA, and LATA special function registers to drive the on board LEDs (LD0 thru LD7) such that the odd LEDs (LD1, LD3, LD5, and LD7) are ON and the even LEDs are OFF.

TRISA = 0x0

ANSELA = 0x55

LATA = 0x0

1. What GPIO pins are BTNL, BTNR, and BTNC connected to? How would you set up the TRIS register for these buttons?

BTNL = RB0

BTNR = RB8

BTNC = RF0

1. List and describe the states/modes in your Mid-stage Project 1 demo.

State 0 = light stops

State 1 = light moves right

State 2 = light moves left

1. When pressing a button, you expect only a single contact recognized by the MCU. However, due to the so-called “bouncing” effect, multiple contacts may be recognized. How do you solve this problem in software?

Use a software debouncer to lock button input

1. No matter how long a button is pressed, it should only be recognized as “pressed” for once before it is released. How can you “lock” the state transition so that no more than one transition happens before you release the button?

In our project, we assign button presses to a state variable and move the LEDs based on this state variable. This way, LED Output is tied to the state variable rather than a potentially large number of button inputs.

1. The analog Input controller is connected to a 10-bit analog to digital converter (ADC) which has a range of 0 to 210 – 1 = 1023. What math do you use to convert this 0 to 1023 range to 10 ms to 1000 ms delay times?

1 bit = .966 ms

Use the range in milliseconds (990) and divide by the number of bits (1024)

1. List the include files needed from the Digilent LibPack for using the LCD display. Write the library functions that you would use to display “Team:” X in the top row of the LCD display where X is your team number.

To use the LCD display, we had to import lcd.h, lcd.c, utils.c, and utils.h. We used the LCD\_Init() and LCD\_WriteStringAtPos().

1. Include a computer generated flow chart for the Mid-Stage Project 1 demo.