ECE 376 - Homework #3

Binary Outputs, and Timing. Due Monday, September 13th, 2021
Please make the subject "ECE 376 HW#3" if submitting homework electronically to Jacob_Glower@yahoo.com (or on blackboard)

Solder your PIC board (50pt)

Demonstrate that your PIC board works

- In person, video, de1mo during Zoom office hours
- 50pt: Board you built powers up & you're able to download code
- 25pt: Board you built is soldered but not working (swap for a working board)
- note: If your board doesn't work, we have working boards we can swap with you. You'll need a working board for the rest of the course.

Binary Outputs

1) Design a circuit which allows your PIC board to turn on and off an RGB Piranah LED at 0mA (off) and 20mA (on). Assume the specifications for the LEDs are:

Color	Vf @ 20mA	mcd @ 20mA
red	2.0V	10,000
green	3.2V	10,000
blue	3.2V	10,000

2) Design a circuit which allows your PIC board to turn on and off a 10W LED. The specs for the LED are:

- Vf = 10.0 - 11.0V
- Current = 700mA to 1000mA
- 550 - 650 Lumens (equivalent to a 60W light bulb).

Assembler Coding

3) Determine the contents of the W register and memory locations A and B after each assembler command

Command	W	A	B
; Start	7	8	9
addwf A,W			
subwf B,F			
incf A,W			
incf B,F			
movlw 23			
andwf A,F			
iorwf B,W			

Timing:

4) Write a program which outputs the music note G2 (98.00 Hz)

- Verify the frequency of the square wave you generate
- (Pano Tuner app on you cell phone works well for this)

Lab:

Problem 5-8)   Design an embedded system with your PIC board which includes some timing. Some suggestions are

- Binary Clock: Have the PIC count 0..10 at a rate of once per second on PORTD. When PORTD reaches 10, it clears and PORTC increments.
- Electronic Dice: Generate random numbers based upon which button is pressed
  - RB0:   4 sided die (numbers 1..4)
  - RB1:   6 sided die (numbers 1..6)
  - RB2:   10 sided die (numbers 1..10)
  - Beep for 1 second at 220Hz each time a new number is generated
- Electronic Piano: Play notes B4 - B5 when you press buttons RB0 .. RB7
- Strobe Light: Generate a strobe light on RC0. The light should be
  - On for 1ms
  - Off for 99ms
  - repeat
- Other

5) Requirements: Specify

- The inputs
- The outputs
- How they relate (what your program does)

6) Analysis, Code, and Flow Chart. Give computations for resistor values (if any), timing, assembler code, and a flow chart for your code

7) Validation: Collect data in the lab to verify your code works.

- For a binary clock, is it counting once per second?
- For the dice, are the results random? Is the beep 220Hz? Is it 1 second?
- For the piano, is each note correct in frequency?

8) Demonstration: Demonstrate that your embedded system works (either in person or with a video)