ECE 376 - Homework #3

Binary Inputs, Outputs, and Timing. Due Monday, February 3rd

Please make the subject "ECE 376 HW#3" if submitting homework electronically to Jacob_Glower@yahoo.com (or on blackboard)

Solder your PIC board

1) Demonstrate that your PIC board works

Binary Inputs

Assume the resistance - votlage relationship for a thermistor is

$$R = 1000 \cdot \exp\left(\frac{3905}{T} - \frac{3905}{298}\right)\ \Omega$$

2) Design a circuit that output

- 0V for temperatures less than 15C
- 5C for temperatures more than 15C

3) Design a circuit with hysteresis that outputs

- 0V when the temperature is less than 15C
- 5V when the temperature is more than 20C
- No change (0V or 5V) for temperatures inbetween 15C and 20C

Binary Outputs

4) 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

5) Design a circuit which allows your PIC board to turn on and off a 100W LED. Assume the specs for the LED are: Vf = 32.0V, Current = 3500mA, 9000 Lumens (equivalent to a 900W light bulb).

Timing:

6) Write a program which outputs note G#4 (415.30 Hz)

Problem 7-10) 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

7) Requirements: Specify

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

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

9) 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?

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