ECE 376 - Homework #3

Binary Inputs, Binary Outputs, & LEDs - Due Monday, February 3rd

Solder your PIC board (50pt)

Demonstrate that your PIC board works

- In person, video, de1mo during Zoom office hours
- 50pt: Board your built powers up & you're able to download code
- 25pt: Board 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

Binary Inputs

Assume a thermistor has a resistance-temperature relationship of

$$ R = 1000 \cdot \exp\left(\frac{3905}{T+273} - \frac{3905}{298}\right)\Omega $$

1) Design a circuit which outputs

- 0V when T < 35C
- 5V when T > 35C

2) Design a circuit which outputs

- 0V when T < 35C
- 5V when T > 40C

Binary Outputs

3) Design a circuit which allows your PIC board to turn on and off an RGB Piranah LED at 0mA (off) and 15mA (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

4) Design a circuit which allows your PIC board to turn on and off a 3W LED at 1000mA. The specs for the LED are:

- Vf = 3.0V @ 1000mA
- 100 Lumens @ 1000mA

Assume you have a 6144 NPN transistor:

- max continuous current = 3A
- current gain = 300
- Vbe = 0.7V, Vce(sat) = 0.2V

Timing:

6) Write a program which outputs the music note A#2 (116.541 Hz)
- Verify the frequency of the square wave you generate
- (Pano Tuner app on you cell phone works well for this)

Lab: RGB Flashlight

7) Give the flow chart for a program to turn your PIC board into an RGB Flashlight
- On power up, the LEDs are off
- Each button sets the color of the flashlight
  - RB0: Off
  - RB1: Red
  - RB2: Green
  - RB3: Blue
  - RB4: White
- If a button isn't pressed for 10 seconds, the lights turn off

8) Write the corresponding assembler code

9) Test your code.
- Compile and program your PIC board
- Verify each button's operation
- Verify the lights turn off after 10 seconds

10) (20 points) Demonstration
- In-person of with a video

PIC18F4620

Piranah RGB LED