ECE 376 - Homework #4

C Programming, LCD Displays, Keypads - Due Monday, February 3rd

1) (20pt) Determine how many clocks the following C code takes to execute

- Compile and download the code (modify working code and replace the main loop)
- Measure the frequency you see on RC0 (toggles every loop).
  - Use an osiclloscope - or -
  - Connect a speaker to RC0 with a 200 Ohm resistor and measure the frequency with a cell phone app like Piano Tuner
  - RC1 is 1/2 the frequency of RC0, RC2 is 1/4th, RC3 = 1/8th, etc
- The number of clocks it takes to execute each loop is

$$N = \left(\frac{10{,}000{,}000}{2 \cdot Hz} \right)$$

1a) Counting mod 64

```
unsigned char i
while(1) {
      i = (i + 1) % 64;
      if(i == 0) PORTC += 1;
      }
```

1b) Counting mod 63

```
unsigned char i
while(1) {
      i = (i + 1)% 63;
      if(i == 0) PORTC += 1;
      }
```

1c) Integer Division

```
unsigned int A, B, C;
A = 12345;
B = 273;
while(1) {
    if(i == 0) PORTC += 1;
    C = A / B;
    }
```

1d) Floating Point Division

```
float A, B, C;
A = 123.456;
B = 7.2143;
while(1) {
    PORTC += 1;
    C = A / B;
    }
```

LCD Display & LED Flashlight!

Turn your PIC board into an LED flashlight

2) Write the C code for an LED flashlight. The requirements are:

- 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
- The status of the LED flashlight is displayed on the LCD display (Off / Red / Green / Blue / White)

Include

- Your C code
- The compiled size of your C code

3) Collect data to verify your LED flashlight meets the requirements

Keypads:

Turn your PIC board into a clock

- The LCD displays the time as hours : minutes : seconds
- When you type in a number on the keypad and press a button, one of these numbers is updated:
  - RB0: Update seconds (0-59)
  - RB1: Update minutes (0-59)
  - RB2: Update hours (0-23)

4) Write a C program to read the keypad and update the LCD display. Include

- Your C code
- The compiled size of your C code

5) Collect data to verify your keypad-controlled clock

Demo

6) Demo either the flashlight or the keypad.

- Video or in-person