ECE 376 - Homework #4

C Programming, LCD Displays, & Keypads. Due Monday, September 29th

1) 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 256

- note: if using your cell phone to measure the frequency, you might have to try different pins on PORTC until you get one in the audio range. Each pin is 1/2 the frequency of the previous pin

```
unsigned char i
while(1) {
      i = (i + 1)% 256;
      if(i == 0) PORTC += 1;
      }
```

1b) Counting mod 255

```
unsigned char i
while(1) {
      i = (i + 1)% 255;
      if(i == 0) PORTC += 1;
      }
```

1c) Integer Multiply

```
unsigned int A, B, C;
unsigned char i;
A = 0x1234;
B = 0x5678;
while(1) {
    i = (i + 1)% 256;
    if(i == 0) PORTC += 1;
    C = A*B;
    }
```

1d) Floating point multiply

```
float A, B;
A = 1.0002;
B = 0.02;
while(1) {
    i = (i + 1)% 256;
    if(i == 0) PORTC += 1;
    B = B * A;
    }
```

Keypad Alarm Clock

2) Give the flow chart for a C program which turns your PIC into an alarm clock with a resolution of 100ms

- On reset, TIME is set to 0 (0.0 seconds)
- Pressing the keypad allows you to set the time from 0.00 to 99.9 seconds
- RB0: When you press RB0, TIME starts to decrement down to 0.00 seconds
- Every 100ms, TIME is decremented by one, stopping at 0.0 seconds
- When TIME reaches zero, PORTA turns on for 1 second (approx)

3) Write the corresponding C code

4) How many lines of assembler does your code compile into?

5) Collect data to determine how accurate your program is (one count = 100ms ideally)

6) Demo

- In-person or with a video