## ECE 376 - Homework \#2

Assembler, Flow Charts, Binary Inputs. Due Wednesday, September 7th

## Assembler Programming

1) Determine the contents of registers W , A , and B after each assembler command:

| Command | W | A | B |
| :---: | :---: | :---: | :---: |
| ; Start | 5 | 6 | 7 |
| incf A,F |  |  |  |
| decf B,W |  |  |  |
| addwf A,F |  |  |  |
| sublw 3 |  |  |  |
| andwf A,F |  |  |  |
| iorwf B,F |  |  |  |

2) Convert the following $C$ code to assembler (8-bit operations)
unsigned char A, B, C;
$A=4 * B+5 * C+6 ;$
3) Convert the following $C$ code to assembler: (16-bit operations)
```
unsigned int A, B, C;
A = 4*B + 5*C + 6;
```

4) Convert the following $C$ code to assembler (bar chart - if-statements)
```
unsigned char A, B;
if(A == 0) B = 0;
if(A == 1) B = 1;
if(A == 2) B = 3;
if(A == 3) B = 7;
```

5) The flow chart below turns your PIC into a Dungeon's and Dragon's 20-sided die:

- Press \& release RB0 to roll the die
- If you roll a 20, light up PORTD (critical hit)

Write the corresponding assembler code.
6) The flow chart below turns your PIC into a prime-number detector

- If the buttons on PORTB are a 4-bit prime number $\{1,2,3,5,7,9,11,13)$, PORTC lights up
- Otherwise, PORTC = 0

Write the corresponding assembly code


## Binary Inputs (hardware)

Assume a thermistor has a resistance-temperature relationship of

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

7) Design a circuit which outputs

- $0 V$ when $T<20 \mathrm{C}$
- 5 V when $\mathrm{T}>20 \mathrm{C}$

8) Design a circuit which outputs

- 0V when $\mathrm{T}<20 \mathrm{C}$
- 5 V when $\mathrm{T}>25 \mathrm{C}$

Assume three momentary switches are used: $\{\mathrm{A}, \mathrm{B}, \mathrm{C}\}$. These switches are

- open when not pressed
- shorted ( 0 ohms) when pressed

9) Design a circuit which outputs the function $Y=A B+C$

- 5 V when (A and B ) is pressed,
- 5 V when C is pressed, and
- 0 V otherwise.

