

Name _____

CM _____ Section _____

ME430 - Mechatronics
Examination I – Computer Portion
December 13, 2012

Problem	Score
5	/ 23
6	/ 5
7	/ 15
8	/ 14
Total	/ 57

For the computer portion of the exam, you may use only:

- Your computer
- Any paper notes (such as notes on the videos) you brought to the exam, so long as those notes were written by you or your lab partner.
- Any electronic notes or code residing on your local (C:) hard drive, so long as those notes/code were written by you or your lab partner.
- The course website. (This is the only approved use of the internet for this exam.)
- A calculator (optional).
- ANGEL for code submission.

Anything not specifically allowed is prohibited. In particular, you may not use notes or code written by someone outside your lab group.

Problem 5 – H-Bridge circuit

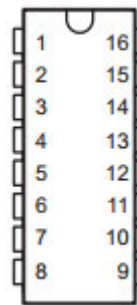
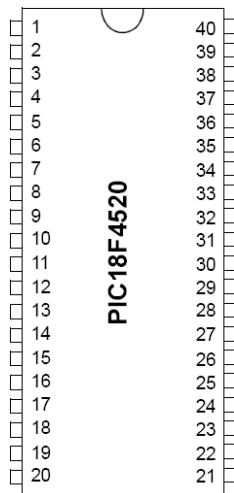
We wish to create an H-Bridge circuit to drive a bidirectional DC motor. Assume the PIC is already programed to drive the H-Bridge input lines using RB0 and RB1. In addition to the PIC controlling the motor, add a basic switch to serve as an emergency stop on the H-Bridge enable line. When the switch is pressed the motor should stop. On the diagram below, make connections to the physical devices shown, don't redraw schematic symbols for those items.

- Draw the power, ground, and enable (MCLR) connections on the PIC. You may draw a ground symbol, but for power connect to the schematic symbol shown.
- Draw a basic switch into the H-Bridge enable line.
- Ground the enable pin on the unused side of the H-Bridge.
- Choose standard E12 series (10%) size resistors and **label them** on the diagram.
- Add inductive kick protection to your circuit as appropriate.
- Add decoupling capacitors to the circuit as appropriate.

5 volt regulated



Unregulated
5 volts



Problem 6 – Instruction cycles

Write lines of code that would go within main (lines of code within main only for now) that would be needed to set the internal oscillator to 125 kHz.

```
#pragma code
void main (void)
{
    // Add your code here.
```

```
    while (1) {
        }
    }
```

In addition to the code within main you also need to setup the OSC config statement. Complete the line below to use the internal oscillator.

```
#pragma config OSC = _____
```

Problem 7 – Delays

Assuming the internal oscillator is setup to run at 125 kHz as described above what line(s) of code would you need for a 0.5 second delay? Show your work.

```
#include _____
```

```
#pragma code
```

```
void main (void)
```

```
{
```

```
    // Add your code here.
```

```
    // Stuff that happens 0.5 seconds later.
```

```
    while (1) {
```

```
    }
```

```
}
```

Problem 8 – Digital IO

Start this program with the template.c file but rename it to **problem8_yourName.c**.

Create a program that changes which PORTB lights are on based on the RA4 button value. If RA4 is *not pressed* **only RB0** should be on. If RA4 *is pressed* then three LEDs, **RB1-RB3**, should be on. (Note that *pressing* RA4 makes it **low**.)

You will not have access to the PICDEM board to test your work. You can use the simulator if you find that helpful or you can simply make sure it compiles then submit your work on Angel (either option is fine).

Put your finished code (just the *.c file) in the Angel dropbox.