

Name _____ CM _____ Section _____

For the computer portion of the exam (problems 5-8), you may use only:

- Your computer running MPLAB
- 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 -- If statements and SFRs:

Starting from template.c, write a piece of code that would turn on the LEDs RB0, RB1, and RB2 on the PICDEM2 (green) boards based on the value of the variable me430score.

- Show the special function register setup to make all pins digital and make all of PORTB outputs.
- Create an int variable named me430score and set it equal to 100
- Create an if-else if-else structure so that
 - if me430score is less than 60 we turn on just RB0
 - if me430score is equal to or larger than 60 but less than 90 we turn on just RB1
 - if me430score is equal to or larger than 90 we turn on just RB2

Obviously, you cannot test the physical LEDs, but using the simulator can help you check your work if you like.

Rename your template.c file to **problem5_yourName.c**

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

Problem 6 -- Loops and printing:

Starting from template.c, write a piece of code that *uses a while loop* to print out the numbers 95 through 75, by 5's, each on a separate line. That is, the output of the code (to the Uart1 IO window) should be:

```
95
90
85
80
75
```

For full credit on this problem, you must use a while loop to accomplish this task (i.e. you can't just type in five different print statements).

Rename your template.c file to **problem6_yourName.c**

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

Problem 7 – Wiring a stepper motor and PIC:

On the next page you will be drawing the connections necessary to drive a stepper motor with a PIC that someone else has programmed.

Assume that the PIC is programmed so that when a pushbutton circuit connected to RA0 goes low the stepper motor will run counter clockwise, and when a different pushbutton circuit connected to RA1 goes low the stepper motor will run clockwise. The program is set up so that RB0 should be connected to pin 2 of the H-bridge, RB1 should be connected to pin 7 of the H-bridge, RB2 to pin 10, and RB3 to pin 15 of the H-bridge.

Make sure to accomplish the following when you add your connections on the next page :

- Draw a 12 V power source and an unregulated 6 V power source. Hook up the voltage regulator chip to the 6V source to create a 5 V regulated line.
- Connect two of the pushbuttons, using basic switch circuits, to RA0 and RA1. Be sure to connect the power to the switches appropriately.
- Connect the RB0 to RB3 lines on the PIC to the H-bridge as described above.
- Connect the H-bridge to the stepper motor as we did in lab.
- Connect the PIC and the H-bridge to power and ground. The motor should run at 12 V.
- Add a third pushbutton/basic switch circuit which is connected to the enable pin of the H-Bridge so that when the pushbutton is pressed the stepper motor stops.
- Connect the MCLR line on the PIC appropriately.
- Add appropriate forms of inductive kick protection to the circuit, including snubber diodes and decoupling capacitors.
- Label all resistor and capacitor sizes. Use real resistor sizes from the E12 (10%) series.

You must connect to the physical devices already shown (i.e. don't ignore the pictures and just draw schematic symbols for them).

