Name _____   CM _____   Section _____

ME430 - Mechatronics
Examination I
September 28, 2010

Problem	Score
1 LED resistor sizing	/ 10
2 BJT (NPN) resistor sizing	/ 10
3 Fix this code	/ 5
4 Determine the output of this code	/15
5 If statements and SFRs	/15
6 Loops and printing	/20
7 Wiring a stepper motor and PIC	/ 25
Total	/ 100

For the written portion of the exam (problems 1-4), you may use only:

- 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.
- A pencil/pen.
- A calculator (optional).

For the computer portion of the exam (problems 5-7), 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 1 – LED resistor sizing:

Assume you have an LED with a 2.2 volt forward voltage drop. You want to light the LED using 25 mA of current and you have a 9 volt power supply. What exact size resistor would you use if you could choose any size at all? What size resistor would you use if you needed to select a standard E12 series (10%) resistor value? Show work for partial credit.
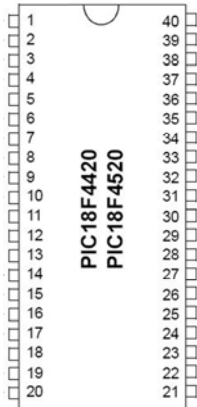
Exact size resistor _____

Standard E12 (10%) resistor _____

Draw the schematic for this circuit here with your final resistor value:

Problem 2 – BJT (NPN) resistor sizing:

Assume you have a 15 volt supply running a **lamp** that draws 60 mA of current when it is turned on.   We would like to use a PIC to drive an (NPN) BJT to run the lamp.

On the diagram above:
- Draw in the circuit for the transistor running the lamp with a 15 V power supply.
- Show the calculations to size any resistors that are needed for the transistor circuit. Choose standard E12 series (10%) size resistors and label them on the diagram.
- Connect RB0 on the PIC to the transistor circuit.   You do NOT need to show other connections on the PIC (power, ground, etc.)

Problem 3 -- Fix this code:

Suppose that we have downloaded our standard template.c file, included <stdio.h> properly, and created the main routine shown below:

```c
void main (void)
{
    while (1)
    {
        printf("Hello World \n");
    }
}
```

When we run this code, we just get "Hello World" continuously in the output window. Change the code so that it prints "Hello World" exactly once. (Mark changes on the code above.)

Problem 4 -- Determine the output of this code:

If you were using the simulator Uart1 IO capture window while running this code, what would appear in the window?

```c
#include <stdio.h>

float funcA(int a, int b, int c);
void funcB(float a);

void main()
{
        int a = 5;
        float answer;
        answer = funcA( 10, 15, a);
        funcB(answer);
        printf("Finished.  a = %d\n", a);
        while(1);
}

float funcA(int a, int b, int c)
{
        printf("Goodbye.  a = %d\n", a);
        return 2.5 + (float) c;
}

void funcB(float a)
{
        int anInt = (int) a;
        printf("Hello.  a = %d\n\n", anInt);
}
```

When you finish this written portion of the test, turn it in to receive the computer portion.