

Name _____

Section _____

ME430 - Mechatronics
Laboratory Exam

October 24, 2007

Problem	Score
1	/50
2	/40
3	/10
Total	/100

You can use your computer, the class website, any class notes,
and any lab code written by your team.

You may **not** use your neighbor or **any work that was not done by you.**

You CAN ask for help from the instructor. This will come at a price!
Each lettered part is worth 10 points. Each time you ask for help with a part,
you lose half the available points remaining for that part.

That being said, you have 75 minutes and there are 100 points.
So if it saves you 4 minutes, you might consider asking for help.

Parts get harder later in the problem, so make sure you try both problems.

**ME430 Mechatronic Systems:
Lab Exam: PIC programming on the PICDEM 2 Board**

Problem 1: The Bomb!

- _____ Part A) Binary lights displaying 12
- _____ Part B) Light countdown starting at 12
- _____ Part C) Light countdown starting at 12 at 0.5 second intervals
- _____ Part D) Light countdown with a BOOM!
- _____ Part E) Light countdown with a 3 second BOOM!

Problem 2: Random number LCD display

- _____ Part A) Displaying a number on the LCD
- _____ Part B) Displaying a random number on the LCD
- _____ Part C) Displaying a random number that changes every second
- _____ Part D) Displaying a random number in a random location every second

Problem 3: Code submission, good commenting practice

Upload your code for both problems to Angel (only the two .c files)

Print your code to D101A, staple to the test

Problem 1: The Bomb!

Part A) Binary lights displaying 12

Use the 4 LEDs on the PICDEM 2 board to display binary. An LED that is on means a one and an LED that is off means a zero. Make the LEDs display the binary number for 12.

When you finish with this part you can have Dr. Fisher check it off, or you can continue working on Problem 1. The program continues to build upon this part so checking off a later part counts as a check-off for all the earlier parts.

Part B) Light countdown starting at 12

Make the LEDs count down from 12 to 0 then stop. Each digit can be displayed for any length of time that is visible to the human eye.

Again you can have Dr. Fisher check off this part or continue working.

Part C) Light countdown starting at 12 at 0.5 second intervals

Make each binary number display on the LEDs for exactly 0.5 seconds. For the rest of this problem the countdown timer should continue to use a 0.5 second delay.

Part D) Light countdown with a BOOM!

Add a BOOM using the buzzer when the clock hits zero. The buzzer can be any audible frequency, on for any duration.

Part E) Light countdown with a 3 second BOOM!

When the binary number hits zero, play a low tone (like middle C) for exactly 3 seconds.

When you have finished this part, you have finished problem 1. Have Dr. Fisher come check off your work for Problem 1.

Problem 2: Random number LCD display

Part A) Displaying a number on the LCD

Display a number (any number you like) roughly centered on the LCD screen.

You can call over Dr. Fisher to check off this part or continue working on the problem.

Part B) Displaying a random number on the LCD

Using the rand command, display a random number roughly centered on the LCD screen. I don't care if it has leading zeros or not. Whatever is easiest for you is fine.

Part C) Displaying a random number that changes every second

Using the rand command, display a random number roughly centered on the LCD screen that changes every second. For this part remove leading zeros.

Part D) Displaying a random number in a random location every second

Next using multiple rand commands, have the random number show up on a random line of the LCD (1 or 2) at a random location (anywhere from extreme left to extreme right). Again, no leading zeros.

When you have finished this part, you have finished problem 2. Have Dr. Fisher come check off your project.

Problem 3: Code submission, good commenting practice

Upload your code for both problems to Angel (only the two .c files)

Go on Angel, under the Lessons tab, find the dropbox for your section and submit your files. You should have two .c files and they should be called “Lab Exam Problem 1.c” and “Lab Exam Problem 2.c”. You do not need to submit the LCD helper files. If you used multiple files like Supporting.c and Supporting.h, submit those too.

Make sure you add obvious things like your name and a brief description of what the program does before submitting the files.

Print your code to D101A, staple to the test

In addition to submitting those files on Angel, print out your files to the D101A printer and have Dr. Fisher go pick them up. You do not need to print the LCD helper files.

Your code is worth 10 points and your score is based on how well you follow good commenting practice. It is also possible to lose points for inefficient or overly complex, brute force solutions.