Department of Electrical and Computing Engineering

UNIVERSITY OF CONNECTICUT

ECE 3411 Microprocessor Application Lab: Spring 2018

Lab Test 2

There are 1 set of problem in this test. There are 3 pages in this booklet. Answer each question according to the instructions given.

You have **180 minutes** to answer the questions. Once you are done, you need to show the output to the Instructor or TA and upload in Husky CT "Lab Test 2". Upload option in the Husky CT will be unavailable after 180 Minutes.

Answer questions sequentially to complete the tasks easily — you may want to skim all questions before starting. If you find a question ambiguous, be sure to write down in comment section of the code any assumptions you make.

Be neat and legible. If we can't understand your answer, we can't give you credit! Write your name in the space below. Write your initials at the bottom of each page.

THIS IS AN OPEN BOOK, OPEN NOTES TEST.YOU CAN USE YOUR LAPTOP BUT PLEASE TURN YOUR NETWORK DEVICESOFF.

Any form of communication with other students is considered **cheating** and will merit an F as final grade in the course.

Do not write in the boxes below

a(x/20)	b(x/20)	c(x/30)	d(x/30)	Total 100(xx/100)

Name:

Student ID:

Q1. [100 points] Write C code to program ATmega328P XPlained mini kit and demonstrate its performance that it shows the following functions:

a. [20 points] Use UART to control the LED blinking.
   (i) Set up 6 LEDs connected to the PD2 to PD7 as output.
   (ii) Initially, assign 3rd LED to be blinked with the frequency of 3Hz. Rest of the LEDs should be turned off.
   i.e. The status of the LED will be 000x00. x status means 1/0. State of x will be changed based on the 3Hz blinking frequency with a duty of 50%.
   (iii) UART console could be used to select the blinking LEDs position and frequency. UART option should be available for the initial set up.
   i.e. UART console will print: "Frequency:_____" and "Position:_____".
   You have to enter the frequency in Hz and position in numeric values.
   (iv) By the option of UART, you will be able to select any LED with frequencies between 1 to 15Hz.

b. [20 points] Set up the LCD to display the blinking frequency and position as follows: first row of the LCD will display the frequency in Hz and second row will display the position. i.e. "Frequency: 4 Hz" and "Position: 3"

c. [30 points] Set up Mode: Now set up the frequency and position by pressing the switches connected to port B while the LED is continuously blinking.
   (i) If both SW1 (internal, connected to PB7) and SW2 (external, connected to PB1) are pressed, the system will enter to the set up mode and display in LCD that "Set up mode" in first row and "Press SW1" in second row.
   (ii) In the set up mode, if SW1 is pressed, the option of set up will toggle between frequency or position. LCD will display "Frequency" or "Position" in first row based on the toggling options. LCD will display the value of frequency or position in second row. i.e. "Frequency" in first row and "4 Hz" in second row / "Position" in first row and "2" in second row.
   (iii) In the set-up mode, if SW2 is pressed then the position or frequency will be updated based on the mode selected by SW1. If "Frequency" option is selected, frequency will be increased by SW2 from 1 Hz to 15Hz and repeat. If "Position" option is selected, position will be updated by SW2 from 1 to 6

and repeat.
(iv) If both SW1 and SW2 are pressed again, it will exit the set-up mode.

d. [30 points] In the execution mode: blink the LED continuously and display based on the set-up mode.
(i) In the execution mode, LED will be blinked continuously based on the set up from the set-up mode.
(ii) LCD will display frequency and position in first row as numbers i.e. "Freq: 4Hz/Pos:2" . Second row will display the asterisks as the position number selected. i.e. For position 2, it will display "** " in second row.
(iii) If both SW1 and SW2 are pressed again, system will enter to the set-up mode.
(iv) All functions described in (a), (b) and (c) should be in same program and fully functional.