UCONN

Department of Electrical and Computing Engineering

UNIVERSITY OF CONNECTICUT

ECE 3411 Microprocessor Application Lab: Spring 2019

Lab Test 1

This two-page booklet contains one multi-part test problem. Answer the questions according to the instructions given.

You have **120 minutes (3:30 p.m. to 5:30 p.m.)** to program your AVR. You must upload the code by PDF/Word via Husky CT "Lab Test 1" by 5:30 p.m. The tasks in this test are also to be demonstrated to the instructor or TA from 5:00 p.m. – 6:00 p.m.

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 any assumptions you make. For clarification you may watch the TA demo video clip in HuskyCT.

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.

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/40)	b(x/30)	c(x/30)	Total 100(xx/100)

Name:

Student ID:

Q1. [100 points] Write C code to program the ATmega328PB XPlained mini kit and demonstrate that it implements the following tasks:

a. [40 points] Use the UART peripheral to control the blinking of LED's.
   (i) Connect 6 LED's to pin PD2-PD7 and configure them as outputs
   (ii) Initially, assign 5th LED (PD3) to be blinked with the frequency of 5Hz. The rest of the LED's should be off.
   i.e. The status of the LED will be 0x0000. x status means 1/0. State of x will be changed based on the 5Hz blinking frequency with a duty of 50%.
   (iii) Your program should prompt the user via UART console to change which LED is blinking, as well as change the frequency at which the LED blinks.
   i.e. The console will print: "Frequency:_____" and "Position:_____" allowing the user to enter integer values for both frequency and position.
   (iv) The user should be able to select any LED. The blinking frequency of the selected led should range from 1-15Hz.

b. [30 points] Now change the blinking frequency by pressing the switches connected to port B.
   (i) If SW1 (internal, connected to PB7) is pressed, frequency will be increased by 1Hz.
   (ii) If SW2 (external, connected to PB2) is pressed, frequency will be decreased by 1Hz.

c. [30 points] Use the UART and switches at the same program.
   (i) If both SW1 and SW2 are pressed, then the position of the blinking LED will be shift right by 1 pin (i.e. PD3 to PD4).
   (ii) The UART commands from part (a) should still be fully functional after implementing the buttons.