Department of Electrical and Computing Engineering

UNIVERSITY OF CONNECTICUT

ECE 3411 Microprocessor Application Lab: Spring 2019

Lab Test 3

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/30)	b(x/40)	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. [30 points] Set up the ADC based temperature sensor (MCP9701) and photo sensor (PDV-P9001) to display the ambient temperature and light in LCD.
→ First row of the LCD will display the temperature in Celsius. The display format is "**T(C)=23.18**"
→ Second row will display the brightness level between 0 to 10. The format display format is "**Bright = 5**". Note: If photo-sensor gives 0V, then bright level =0; if it gives 0.5V, bright level =1; if 1V, bright level =2;…….. if 5V, bright level =10.
***Read the values from ADC in every 40ms. Average the values after five readings and refresh the LCD in every 200ms. At the end of the LCD refreash, toggle the LED connected to **PD1**. Use 10 bit ADC resolution. To set up of MCP9701 and PDV-P9001, see the resources available in HuskyCT.

b. [40 points] Set up the **Timer 1** in CTC mode.
→ Using this timer, toggle the LED connected to **PD0** once in every **500µS**. You need to use proper prescaler and other setting to get accurate functionality.
→ Using timer 1, maintain all the timing functionalities of part (a). You are not allowed to use delay_us or delay_ms function in the program.

c. [30 points] Use the external push button to change the functionality of the LCD display.
→ External push button could be connect to external or pin changing interrupt i.e. INT1.
→ Pressing the push button will change the LCD display for 5 seconds.
→ Instead of temperature and brightness level LCD will display the actual ADC voltage for 5 seconds. i.e. 1st row of the LCD will display "**ADC6=2.51V**" and 2nd row will display "**ADC7=1.12V**"
→ After 5 seconds LCD display will come back to its normal mode of operation. i.e. it will display the temperature and brightness level again.
→ Part (a) and (b) should work with part (c).