*Department of Electrical and Computing Engineering*

UNIVERSITY OF CONNECTICUT

# ECE 3411 Microprocessor Application Lab: Spring 2018

## Lab Test 1

There are 1 set of problem in this test. There are 2 pages in this booklet. Answer 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 1". 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 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/40) | b(x/30) | c(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. [40 points] Use UART to control the LED blinking.
   (i) Set up 6 LEDs connected to the PD2 to PD7 as output.
   (ii) Initially, assign $3^{rd}$ 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.
   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. [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 PB1) is pressed, frequency will be decreased by 1Hz.

c. [30 points] Use UART and switches at the same time.
   (i) If both SW1 and SW2 are pressed, then the position of the blinking LED will be shift left by 1 pin.
   (ii) UART commands for frequency set up and position selection as described in part (a) should be fully functional, while switches has been used.