The purpose of this lab is to get used to programming the board’s keypad and LCD.

1. **Pre-lab:**

**This must be completed before coming to the lab.**

Do the following programming task.

**PROGRAMMING ASSIGNMENTs:**

Write a program to do the following tasks:

1. At the beginning, display on the LCD the message “Welcome to Lab9”. This message should be cleared when any keypad button is pressed.
2. When any key from {0, 1, 2, 3, .., 9} is pressed, display the number on the LCD.
3. Key ‘\*’ is on/off switch. If the LCD is on and the key ‘\*’ is pressed, the LCD should be off. If the LCD is off and the key ‘\*’ is pressed, the LCD should be on.

**Hint: to know whether the LCD is on or off, you need a variable that takes one of two values, e.g., 1 means the LCD is on and 0 means the LCD is off. At the beginning, the LCD is on and the variable has the value of 1. Every time ‘\*’ key is pressed update the variable to echo the status of the system. If you want to know whether the system is on or off, simply check the value of the variable.**

1. If key ‘A’ is pressed, clear the display.
2. If key ‘D’ is pressed, move the cursor one step to the right.
3. If key ‘#’ is pressed, move the cursor one step to the left.
4. If key ‘B’ is pressed, move the cursor to the beginning of the other line. That means move the cursor to the beginning of the first line if the cursor is at the second line, or move it to the first line if it is at the second line.

**Hint: to know whether the cursor is in the first or second line, you will need a variable, similar to what is done in task 3.**

1. If key ‘C’ is pressed, delete one character. This is like backspace.

**Hint: there is no command to delete characters. What you can do is 1) move cursor to left; 2) write space (this will move the cursor to right); and 3) move the cursor one step to left.**

To do this lab, you can first start with executing the program Keypad.c posted on the course website, and them modify the main function to do the tasks described above. You also need to study the slides of the LCD to learn the codes of the commands you need in the tasks and also to learn how to display the message “Welcome to Lab9” in the beginning.

1. **In lab:**
2. Enter the code, compile it, and run it.

**Task one works? [7 marks]**

Approved: Lab TA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task two works? [7 marks]**

Approved: Lab TA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task three works? [7 marks]**

Approved: Lab TA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task four works? [7 marks]**

Approved: Lab TA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task five works? [7 marks]**

Approved: Lab TA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task six works? [7 marks]**

Approved: Lab TA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task seven works? [7 marks]**

Approved: Lab TA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task eight works? [7 marks]**

Approved: Lab TA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Post lab:**

**Things to turn in as your Lab Report, attached in this order:**

1. This assignment sheet, with your name at the top, signed by the TA where shown.
2. The program(**commented source code**). Should be graded if any task does not work to give a partial mark.