**Microprocessor Systems and Interfacing**

**Lab Report**

**Lab05**



|  |  |
| --- | --- |
| Group Members Name & Reg #: | **Muhammad Haris Irfan**  **(FA18-BCE-090)** |
|  |  |
| Class | Microprocessor Systems and Interfacing CPE342 (**BCE-6B**) |
| Instructor’s Name | Dr. Omer Ahmad |

**Pre-Lab Tasks**

**Task-1**

Interface an LCD with Atmega328p (Nano/Uno) in the 4-bit mode. Bring the breadboard implementation to the Lab.

**A picture containing text

Description automatically generated**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task-2**

Write a C function that reads an 8-bit value from a DIP switch and displays it on the LCD. Configure the port as input with pull-ups activated. Model and simulate the task shown in Figure 5.5 on Proteus.

**Code:**

#include <avr/io.h>

#define *F\_CPU* 1000000UL

#include <util/delay.h>

int LCD\_Send\_Array(char \* ptr);

void LCD\_Send\_Data( unsigned char data );

void LCD\_Send\_Command( unsigned char comm );

void LCD\_init ();

int main()

{

LCD\_init();

while (1)

{

LCD\_Send\_Data(PINB);

*\_delay\_ms*(5000); //delay to wait before next read

}

}

void LCD\_init ()

{

DDRD = 0xFF;

DDRC = 0xFF;

DDRB = 0x00; //

PORTB = 0xFF; // For pull up

*\_delay\_ms*(100);

LCD\_Send\_Command(0x02);

*\_delay\_ms*(2);

LCD\_Send\_Command(0x28);

*\_delay\_ms*(2);

LCD\_Send\_Command(0x0C);

*\_delay\_ms*(2);

LCD\_Send\_Command(0x06);

*\_delay\_ms*(2);

LCD\_Send\_Command(0x01);

*\_delay\_ms*(2);

}

void LCD\_Send\_Command( unsigned char comm )

{

PORTC &=~(1<<PC0);

PORTD = (PORTD & 0x0F);

PORTD = (comm>>4);

PORTC |= (1<<PC1);

*\_delay\_ms*(2);

PORTC &=~(1<<PC1);

*\_delay\_ms*(100);

PORTD = (comm & 0x0F);

PORTC |= (1<<PC1);

*\_delay\_ms*(2);

PORTC &=~(1<<PC1);

}

void LCD\_Send\_Data( unsigned char data )

{

PORTC |=(1<<PC0);

PORTD = (PORTD & 0x0F);

PORTD = (data>>4);

PORTC |= (1<<PC1);

*\_delay\_ms*(2);

PORTC &=~(1<<PC1);

*\_delay\_ms*(100);

PORTD = (PORTD & 0xF0);

PORTD = (data & 0x0F);

PORTC |= (1<<PC1);

*\_delay\_ms*(2);

PORTC &=~(1<<PC1);

}

**Simulation:**

**Diagram, schematic

Description automatically generated**

**\_\_\_\_\_\_\_\_\_\_\_\_**

**In Lab Tasks**

**Task 1:**

For this task, you will need to display the key pressed on the keypad on a 16 x 2 LCD interfaced in the 4-bit mode. You may use the LCD interface software from the previous task.

**Simulation:**

Diagram, schematic

Description automatically generated

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Post Lab Tasks**

**Task 1:**

Make a basic calculator with numeric addition, subtraction, multiplication and division. The user should be able to enter the operands and the operation using the keypad and the process and the results should be displayed on the LCD.

**Simulation:**

Diagram, schematic

Description automatically generated

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_