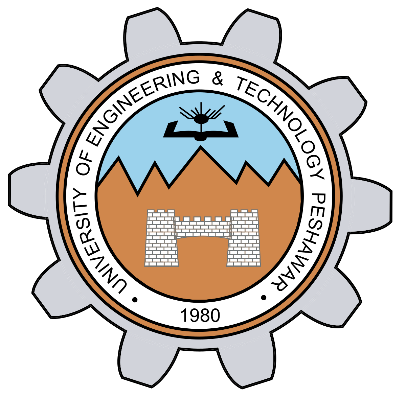
**Lab:11**

**Interfacing an LCD to the 8051 Microcontroller**



**MBSD Lab**

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“On my honour, as a student of University of Engineering and Technology Peshawar, I have neither nor received unauthorized assistance on this academic work”

**Submitted to:**

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**Task1: Write a code for calculator using 8051 MCU with 16×2 LCD and Keypad.**

Certainly! Here's an example code for a calculator using an 8051 microcontroller with a 16x2 LCD and keypad.

c

#include <8051.h>

#define LCD\_RS P1\_0

#define LCD\_E P1\_1

void delay(unsigned int count) {

while(count--);

}

void LCD\_command(unsigned char cmd) {

P2 = cmd;

LCD\_RS = 0; // RS = 0 for command mode

LCD\_E = 1; // Enable the LCD

delay(10); // Delay for a short period

LCD\_E = 0; // Disable the LCD

delay(10); // Delay for a short period

}

void LCD\_data(unsigned char dat) {

P2 = dat;

LCD\_RS = 1; // RS = 1 for data mode

LCD\_E = 1; // Enable the LCD

delay(10); // Delay for a short period

LCD\_E = 0; // Disable the LCD

delay(10); // Delay for a short period

}

void LCD\_init() {

LCD\_command(0x38); // 2 lines, 5x7 matrix

LCD\_command(0x0C); // Display on, cursor off

LCD\_command(0x01); // Clear display

LCD\_command(0x06); // Increment cursor

}

void LCD\_write\_string(unsigned char \*str) {

while (\*str) {

LCD\_data(\*str++);

}

}

unsigned char keypad[4][4] = {

{'1', '2', '3', '+'},

{'4', '5', '6', '-'},

{'7', '8', '9', '\*'},

{'C', '0', '=', '/'}

};

unsigned char readKeypad() {

unsigned char row, col;

for (row = 0; row < 4; row++) {

P3 = (P3 & 0xF0) | (0x01 << row);

col = P3 & 0xF0;

if (col != 0xF0) {

while (P3 != 0xF0);

col = P3 & 0xF0;

return keypad[row][(col >> 4) - 1];

}

}

return '\0';

}

void main() {

unsigned char key;

unsigned char buffer[16];

unsigned char operator = '\0';

unsigned int operand1 = 0;

unsigned int operand2 = 0;

unsigned int result = 0;

LCD\_init();

LCD\_command(0x80); // Set cursor to the first line

while (1) {

key = readKeypad();

if (key != '\0') {

switch (key) {

case 'C':

// Clear the display and reset variables

LCD\_command(0x01); // Clear display

LCD\_command(0x80); // Set cursor to the first line

operator = '\0';

operand1 = 0;

operand2 = 0;

result = 0;

break;

case '+':

case '-':

case '\*':

}

**Task2: Write a code for Microcontroller based Digital Stop Watch and display message on LCD using 8051.**

#include <reg51.h>

#include <stdio.h>

//Function declarations

void cct\_init(void);

void delay(int);

void lcdinit(void);

void writecmd(int);

void writedata(char);

void Return(void);

char READ\_SWITCHES(void);

char get\_key(void);

sbit RowA = P1^0; //RowA

sbit RowB = P1^1; //RowB

sbit RowC = P1^2; //RowC

sbit RowD = P1^3; //RowD

sbit C1 = P1^4; //Column1

sbit C2 = P1^5; //Column2

sbit C3 = P1^6; //Column3

sbit E = P3^6; //E pin for LCD

sbit RS = P3^7; //RS pin for LCD

int main(void)

{

char key; // key char for keeping record of pressed key

cct\_init(); // Make input and output pins as required

lcdinit(); // Initilize LCD //write

writecmd(0x80);

writedata('R');

writedata('e');

writedata('s');

writedata('e');

writedata('t');

writedata(' ');

writedata(' ');

writedata('S');

writedata('t');

writedata('o');

writedata('p');

writedata(' ');

writedata(' ');

writedata('W');

writedata('a');

writedata('t');

writedata('c');

writedata('h');

writedata(' ');

writedata(' ');

writedata('0');

writedata('0');

writedata(':');

writedata('0');

writedata('0');

writedata(':');

writedata('0');

writedata('0');

writedata(':');

}

void cct\_init(void)

{

P0 = 0x00; //not used

P1 = 0xf0; //used for generating outputs and taking inputs from Keypad

P2 = 0x00; //used as data port for LCD

P3 = 0x00; //used for RS and E

}

void delay(int a)

{

int i;

for(i=0;i<a;i++); //null statement

}

void writedata(char t)

{

RS = 1; // This is data

P2 = t; //Data transfer

E = 1; // => E = 1

delay(150);

E = 0; // => E = 0

delay(150);

}

void writecmd(int z)

{

RS = 0; // This is command

P2 = z; //Data transfer

E = 1; // => E = 1

delay(150);

E = 0; // => E = 0

delay(150);

}

void lcdinit(void)

{

///////////// Reset process from datasheet /////////

delay(15000);

writecmd(0x30);

delay(4500);

writecmd(0x30);

delay(300);

writecmd(0x30);

delay(650);

/////////////////////////////////////////////////////

writecmd(0x38); //function set

writecmd(0x0c); //display on,cursor off,blink off

writecmd(0x01); //clear display

writecmd(0x06); //entry mode, set increment

}

void Return(void) //Return to 0 location on LCD

{

writecmd(0x02);

delay(1500);

}

char READ\_SWITCHES(void)

{

RowA = 0; RowB = 1; RowC = 1; RowD = 1; //Test Row A

if (C1 == 0){ delay(10000);while (C1==0); return '1'; }

if (C2 == 0){ delay(10000);while (C2==0); return '2'; }

if (C3 == 0) { delay(10000); while (C3==0); return '3'; }

RowA = 1; RowB = 0; RowC = 1; RowD = 1; //Test Row B

if (C1 == 0) { delay(10000); while (C1==0); return '4'; }

if (C2 == 0) { delay(10000); while (C2==0); return '5'; }

if (C3 == 0) { delay(10000); while (C3==0); return '6'; }

RowA = 1; RowB = 1; RowC = 0; RowD = 1; //Test Row C

if (C1 == 0) { delay(10000); while (C1==0); return '7'; }

if (C2 == 0) { delay(10000); while (C2==0); return '8'; }

if (C3 == 0) { delay(10000); while (C3==0); return '9'; }

RowA = 1; RowB = 1; RowC = 1; RowD = 0; //Test Row D

if (C1 == 0) { delay(10000); while (C1==0); return '\*'; }

if (C2 == 0) { delay(10000); while (C2==0); return '0'; }

if (C3 == 0) { delay(10000); while (C3==0); return '#'; }

return 'n'; // Means no key has been pressed

}

char get\_key(void) //get key from user

{

char key = 'n'; //assume no key pressed

while(key=='n') //wait untill a key is pressed

key = READ\_SWITCHES(); //scan the keys again and again

return key; //when key pressed then return its value

}

**Schematic Diagram:**

