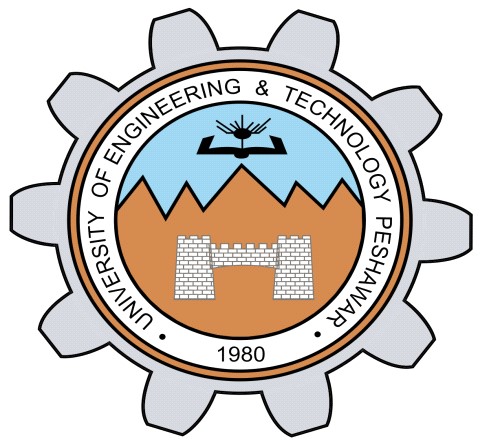
**Task no 6**

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**Microprocessor Based System Design**

**Spring 2022**

**Submitted by**

**Name Registration no**

**Muhammad Ali 19pwse1801**

**Submitted to: Dr Bilal Habib**

**Data: 13/6/2022**

**Department of Computer System Engineering**

**Task: -** simple calculator with LCD and microcontroller (8051) in proteus.

**Code: -**

#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);

//\*\*\*\*\*\*\*

//Pin description

/\*

P2 is data bus

P3.7 is RS

P3.6 is E

P1.0 to P1.3 are keypad row outputs

P1.4 to P1.6 are keypad column inputs

\*/

//\*\*\*\*\*\*\*\*

// Define Pins

//\*\*\*\*\*\*\*\*

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 C4 = P1^7; //Column4

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

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

unsigned int key\_count = 0, result\_int;

char array[3], result\_char;

// Main program

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

writecmd(0x95);

writedata('T'); //write

writedata('i'); //write

writedata('m'); //write

writedata('e'); //write

writedata(' '); //write

writedata('2'); //write

writedata('3'); //write

writedata(':'); //write

writedata('5');

writedata('9');

writedata(':');

writedata('2');

writedata('7');

writecmd(0xd5);

writedata('D'); //write

writedata('a'); //write

writedata('t'); //write

writedata('e'); //write

writedata(' '); //write

writedata('3'); //write

writedata('1'); //write

writedata('/'); //write

writedata('1');

writedata('2');

writedata('/');

writedata('2');

writedata('0');

writedata('2');

writedata('1'); //write

writecmd(0x80);

while(1)

{

key = get\_key(); // Get pressed key

if (key == 'C')

{

writecmd(0x01); // Clear screen

array[0]= array[1]= array[2]='n';

result\_int = 0; key\_count = 0;

}

else if(key == '=')

{

writedata(key); // Echo the key pressed to LCD

if(array[1] == 'x')

result\_int = (array[0] -'0') \* (array[2] - '0');

else if(array[1] == '/')

result\_int = (array[0] -'0') / (array[2] - '0');

else if(array[1] == '+')

result\_int = (array[0] -'0') + (array[2] - '0');

else if(array[1] == '-')

result\_int = (array[0] -'0') - (array[2] - '0');

if(result\_int > 9) //if the result is greater than 9 then we need to store each digit in an array

{

int result[2]; //Delare an array

result[0] = result\_int/10; //Store the digit at ten's place at index 0

result[1] = result\_int%10; //Store the digit at unit's place at index 1

result\_char = (char)result[0] + '0'; //Convert the integer at index 0 to character

writedata(result\_char ); // Echo the key pressed to LCD

result\_char = (char)result[1] + '0'; //Convert the integer at index 1 to character

writedata(result\_char ); // Echo the key pressed to LCD

}

else

{

result\_char = (char)result\_int + '0';

writedata(result\_char ); // Echo the key pressed to LCD

}

}

else

writedata(key); // Echo the key pressed to LCD

}

}

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 '7'; }

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

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

if (C4 == 0) { delay(10000); while (C4==0); return '/'; }

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'; }

if (C4 == 0) { delay(10000); while (C4==0); return 'x'; }

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

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'; }

if (C4 == 0) { delay(10000); while (C4==0); return '-'; }

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

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

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

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

if (C4 == 0) { delay(10000); while (C4==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

array[key\_count++]= key;

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

}

**Output result on LCD: -**

