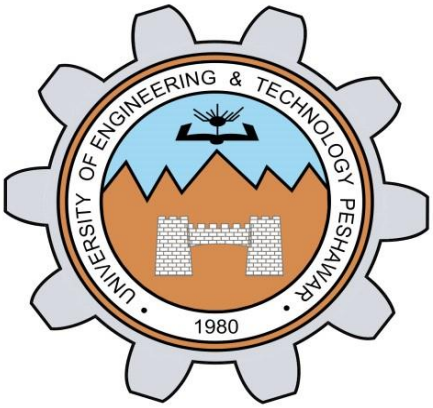
Task no 6



Microprocessor Based System Design

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Submitted by

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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: -