



LAB FILE RECORD

B.TECH VI SEM

ESD[CSP320]

Department of Computer Science &
Engineering Malaviya National Institute Of Technology, Jaipur
Session: 2023 - 2024

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[2021UCP1148, A2]

Program List 2021UCP1148

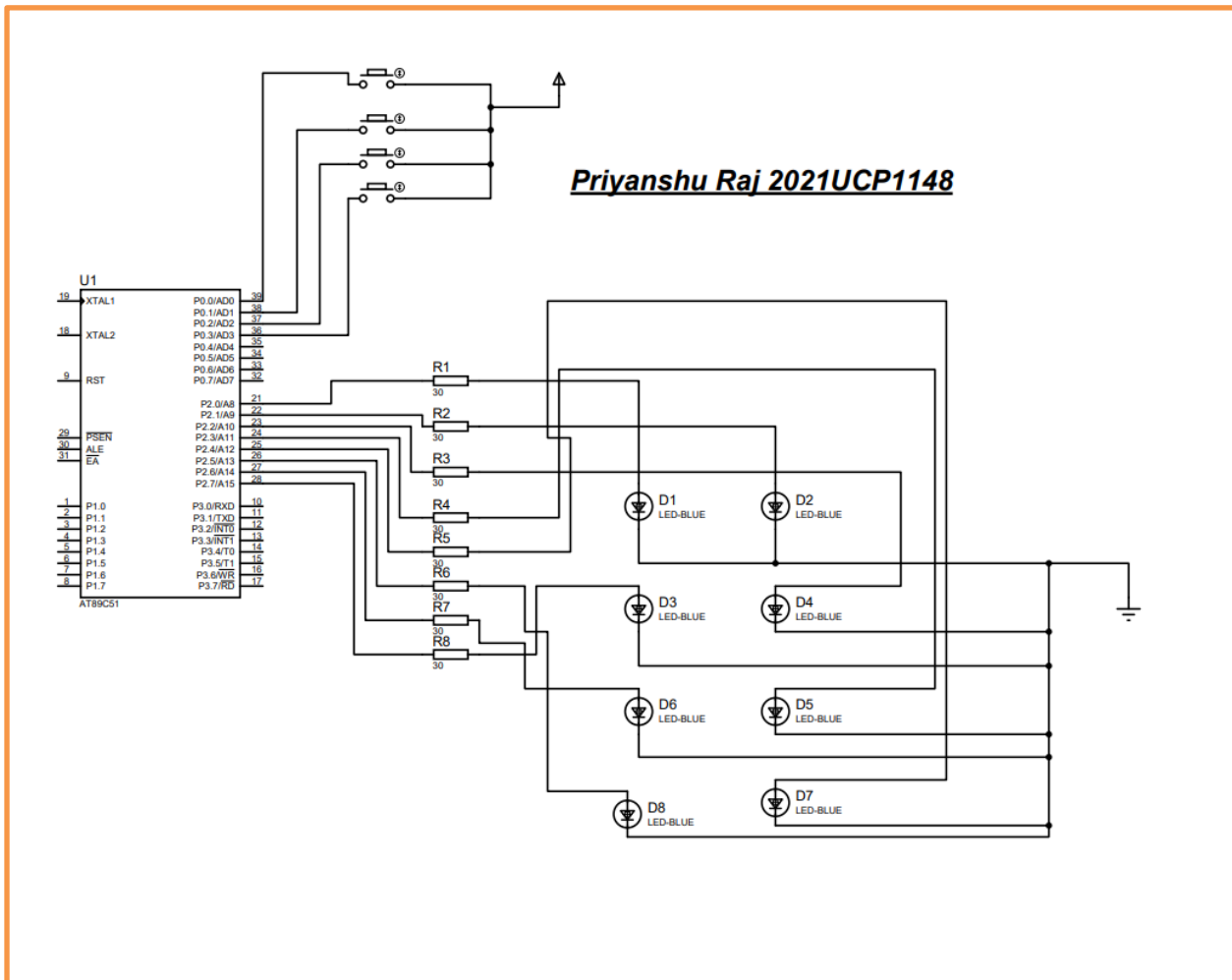
S. No.	Program Objective	
1	Working of LED a. Wave pattern b. Circular rotation Pattern	
2	Display a message on LCD.	
3	Display the pressed key of hex keypad on LCD.	
4	Implement a simple calculator.	
5	Display the pressed key of the hex keypad on 4 digit 7-Segment Display.	
6	Implement an increasing counter and show on 4 digits 7-Segment Display	
7	Set the counter using hex keypad and display on 7 Segment	
8	Write a program to show the movement of Elevator	
9	Write a program for Quiz-answer setup using Relay Buzzer and LCD.	
10	Display date and time on LCD using RTC section.	
11	Design a petri net to show elevator movement using CPN tool	
12	Design a petri net to count coffee/tea order using CPN tool	

Lab 1

Program Objective: Blinking of LED in circular and wave rotation Pattern

Program component : 8051, resistor , led, button, power

Program circuit :



Code:

```
#include <reg51.h>
#include <stdlib.h>
void clock_rot(void);
void wave_patt(void);
sbit btn_a = P0 ^ 0;
sbit btn_b = P0 ^ 1;
sbit btn_c = P0 ^ 2;
sbit btn_d = P0 ^ 3;

sbit l0 = P2 ^ 0;
sbit l1 = P2 ^ 1;
sbit l2 = P2 ^ 2;
sbit l3 = P2 ^ 3;
```

```

sbit l4 = P2 ^ 4;
sbit l5 = P2 ^ 5;
sbit l6 = P2 ^ 6;
sbit l7 = P2 ^ 7;

void delay(unsigned int t)
{
    unsigned int i, j;
    for (i = 0; i < t; i++)
        for (j = 0; j < 500; j++)
            ;
}

void main()
{
    P1 = 0;
    l0 = l1 = l2 = l3 = l4 = l5 = l6 = l7 = 0;

    while (1)
    {
        if (btn_a)
        {
            cir_rot();
        }

        if (btn_c)
        {
            wave_patt();
        }
    }
}

void cir_rot()
{
    P1 = 0;
    while (1)
    {
        l0 = 1;
        delay(100);
        l0 = 0;
        l1 = 1;
        delay(100);
        l1 = 0;
        l2 = 1;
        delay(100);
        l2 = 0;
        l3 = 1;
        delay(100);
        l3 = 0;
        l4 = 1;
        delay(100);
    }
}

```

```

    14 = 0;
    15 = 1;
    delay(100);
    15 = 0;
    16 = 1;
    delay(100);
    16 = 0;
    17 = 1;
    delay(100);
    17 = 0;
    delay(100);

    if (btn_a == 0)
    {
        break;
    }
}

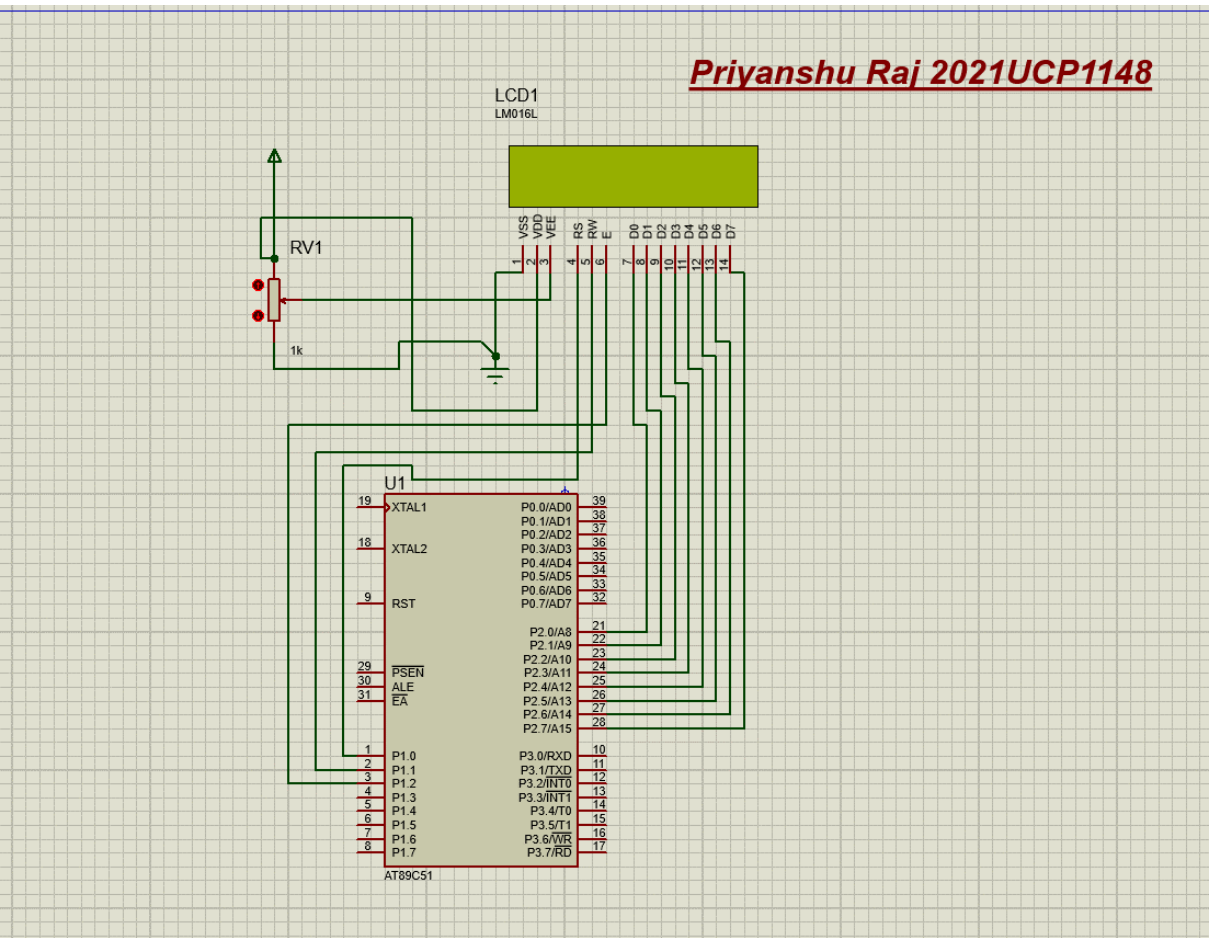
void wave_patt()
{
    P1 = 0;
    while (1)
    {
        12 = 17 = 1;
        delay(100);
        12 = 17 = 0;
        delay(100);
        12 = 17 = 13 = 16 = 1;
        delay(100);
        12 = 17 = 13 = 16 = 0;
        delay(100);
        10 = 11 = 12 = 17 = 13 = 16 = 1;
        delay(100);
        10 = 11 = 12 = 17 = 13 = 16 = 0;
        delay(100);
        14 = 15 = 16 = 13 = 12 = 11 = 17 = 10 = 1;
        delay(100);
        14 = 15 = 16 = 13 = 12 = 11 = 17 = 10 = 0;
        delay(100);

        if (btn_c == 0)
        {
            break;
        }
    }
}

```

Program component : 8051,lcd,pot, power

Priyanshu Raj 2021UCP1148



```
#include <reg51.h>
sbit rs=P1^0;
sbit rw=P1^1;
sbit e= P1^2;
void delay(unsigned int);
```

```

void cmd(unsigned char);
void dat(unsigned char);

void main(void)
{
    unsigned char ch[]="Priyanshu Raj";
    unsigned char ch1[]="2021UCP1148";

    unsigned int i,j,k;

    cmd(0x38);
    cmd(0x01);
    cmd(0x0c);
    //cmd(0x83);
    //cmd(0x06);

    for(i=0;ch[i]!='\0';i++)
        dat(ch[i]);

    cmd(0xc0);
    for(j=0;ch1[j]!='\0';j++)
    {
        dat(ch1[j]);
    }
    while(1){
        for(k=0;k<16;k++)
        {
            cmd(0x1c);
        }
    }
}

void delay(unsigned int t)
{
    unsigned int i,j;
    e=1;
    for(i=0;i<t;i++)
        for(j=0;j<1275;j++);
    e=0;
}

void cmd(unsigned char ch)
{
    rs=0;
    rw=0;
    P2=ch;
    delay(20);
}

```

```

}
void dat(unsigned char ch)
{
rs=1;
rw=0;
P2=ch;
delay(100);
}

```

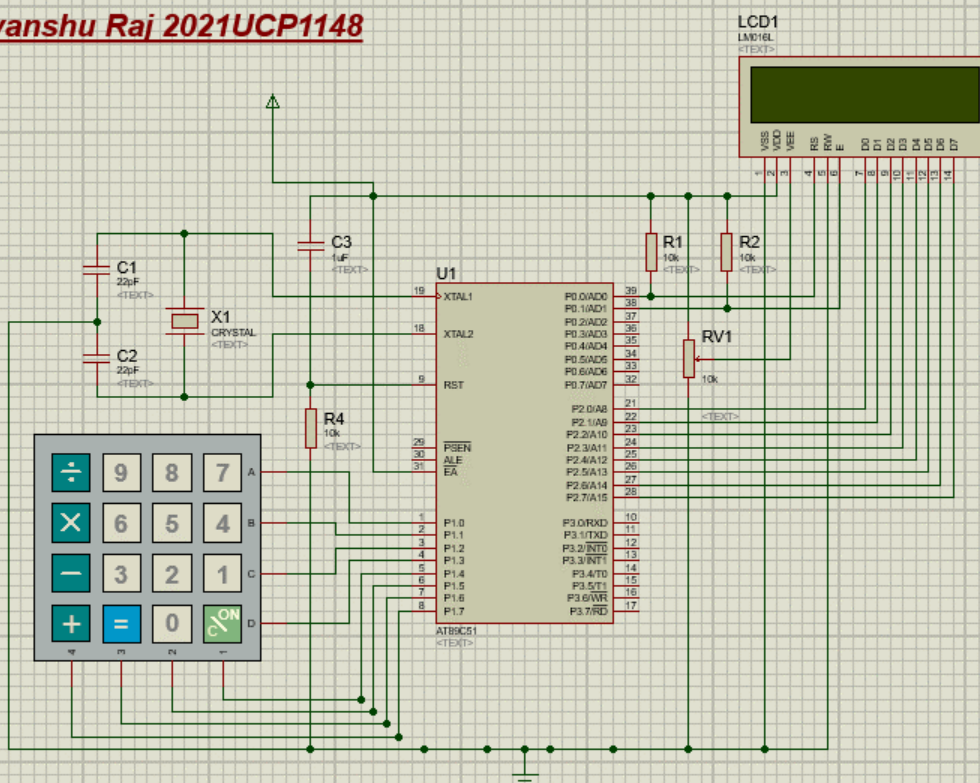
Lab 3

Program Objective: Display the pressed key of hex keypad on LCD.

Program component : 8051, lcd, pot, power

Program circuit :

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Code:

```
#include<reg52.h>
#include<lcd.h>

//LCD Module Connections
sbit RS = P0^0;
sbit EN = P0^1;
sbit D0 = P2^0;
sbit D1 = P2^1;
sbit D2 = P2^2;
sbit D3 = P2^3;
sbit D4 = P2^4;
sbit D5 = P2^5;
sbit D6 = P2^6;
sbit D7 = P2^7;
//End LCD Module Connections

//Keypad Connections
sbit R1 = P1^0;
sbit R2 = P1^1;
sbit R3 = P1^2;
sbit R4 = P1^3;
sbit C1 = P1^4;
sbit C2 = P1^5;
sbit C3 = P1^6;
sbit C4 = P1^7;
//End Keypad Connections

void Delay(int a)
{
    int j;
    int i;
    for(i=0;i<a;i++)
    {
        for(j=0;j<100;j++)
        {
        }
    }
}

char Read_Keypad()
{
    C1=1;
    C2=1;
    C3=1;
    C4=1;
    R1=0;
    R2=1;
    R3=1;
    R4=1;
    if(C1==0){Delay(100);while(C1==0);return '7';}
```

```

if(C2==0){Delay(100);while(C2==0);return '8';}
if(C3==0){Delay(100);while(C3==0);return '9';}
if(C4==0){Delay(100);while(C4==0);return '/';}
R1=1;
R2=0;
R3=1;
R4=1;
if(C1==0){Delay(100);while(C1==0);return '4';}
if(C2==0){Delay(100);while(C2==0);return '5';}
if(C3==0){Delay(100);while(C3==0);return '6';}
if(C4==0){Delay(100);while(C4==0);return 'X';}
R1=1;
R2=1;
R3=0;
R4=1;
if(C1==0){Delay(100);while(C1==0);return '1';}
if(C2==0){Delay(100);while(C2==0);return '2';}
if(C3==0){Delay(100);while(C3==0);return '3';}
if(C4==0){Delay(100);while(C4==0);return '-' ;}
R1=1;
R2=1;
R3=1;
R4=0;
if(C1==0){Delay(100);while(C1==0);return 'C';}
if(C2==0){Delay(100);while(C2==0);return '0';}
if(C3==0){Delay(100);while(C3==0);return '=';}
if(C4==0){Delay(100);while(C4==0);return '+';}
return 0 ;
}

void main()
{
    int i=0;
    char c,p;
    Lcd8_Init();
    c='_';
    while(1)
    {
        Lcd8_Set_Cursor(1,1);
        Lcd8_Write_String("Keys Pressed:");
        Lcd8_Set_Cursor(2,1);
        Lcd8_Write_String("Times:");
        while(!(c = Read_Keypad()));
        p=c;
        while(p==c)
        {
            i++;
            Lcd8_Set_Cursor(1,14);
            Lcd8_Write_Char(c);
            Lcd8_Set_Cursor(2,7);
            Lcd8_Write_Char(i+48);

```

```
        Delay(100);  
        while(!(c = Read_Keypad()));  
    }  
    i=0;  
    Lcd8_Clear();  
}  
}
```

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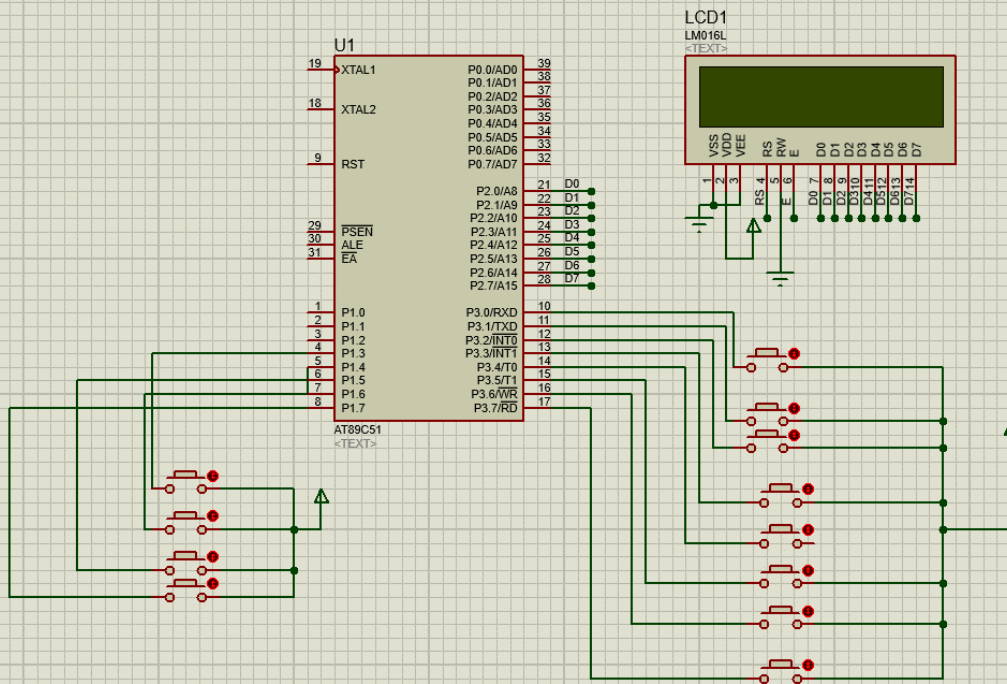
Lab 4

Program Objective: Implement a simple calculator.

Program component : 8051, resistor , lcd, button, power

Program circuit :

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Code:

```
#include <reg51.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

#define LCD_DATA P2

void delay_ms(unsigned int ms) {
    unsigned int i, j;
    for (i = 0; i < ms; i++)
        for (j = 0; j < 300; j++); // Adjust this loop count based on your
microcontroller's clock frequency
}

sbit rs = P1^0;
sbit rw = P1^1;
```

```

sbit e = P1^2;

sbit btn0 = P3^0;
sbit btn1 = P3^1;
sbit btn2 = P3^2;
sbit btn3 = P3^3;
sbit btn4 = P3^4;
sbit btn5 = P3^5;
sbit btn6 = P3^6;
sbit btn7 = P3^7;

sbit btnPlus = P1^3;
sbit btnMinus = P1^4;
sbit btnMultiply = P1^5;
sbit btnDivide = P1^6;
sbit btnEquals = P1^7;

void LCD_command(unsigned char command) {
    rs = 0; // Selecting command
    rw = 0; // We are writing to the LCD
    LCD_DATA = command; // Sending the command
    e = 1;
    delay_ms(1);
    e = 0;
    delay_ms(1);
}

void LCD_data(unsigned char dat) {
    rs = 1; // Selecting
    rw = 0; // We are writing to the LCD
    LCD_DATA = dat; // Sending the
    e = 1;
    delay_ms(1);
    e = 0;
    delay_ms(1);
}

void LCD_init() {
    LCD_command(0x38); // 2 lines, 5x8 matrix
    LCD_command(0x0E); // Display on, cursor blinking
    LCD_command(0x01); // Clear display
    delay_ms(10);
    LCD_command(0x06); // Increment cursor
}

void LCD_clear() {
    LCD_command(0x01); // Clear display
    delay_ms(10);
}

void LCD_print(char *str) {

```

```

    LCD_clear(); // Clear the display before printing
    while (*str != '\0') {
        LCD_data(*str);
        str++;
    }
}

void LCD_print_number(int num) {
    char buffer[16];
    sprintf(buffer, "%d", num);
    LCD_print(buffer);
}

void main() {
    unsigned char operand1[3] = "";
    unsigned char operand2[3] = "";
    char operator = '\0';
    int result = 0;

    LCD_init();

    while (1) {
        if (btn0 == 1) {
            if (strlen(operand1) < 2) {
                strcat(operand1, "0");
                LCD_print(operand1);
            }
        }

        if (btn1 == 1) {
            if (strlen(operand1) < 2) {
                strcat(operand1, "1");
                LCD_print(operand1);
            }
        }

        // Repeat this pattern for btn2 to btn7

        if (btnPlus == 1 || btnMinus == 1 || btnMultiply == 1 || btnDivide == 1) {
            operator = btnPlus == 1 ? '+' : btnMinus == 1 ? '-' : btnMultiply == 1
? '*' : '/';
            LCD_print(&operator);
        }

        if (btn2 == 1) {
            if (strlen(operand2) < 2) {
                strcat(operand2, "2");
                LCD_print(operand2);
            }
        }
    }
}

```

```

// Repeat this pattern for btn3 to btn7

if (btnEquals == 1 && operator != '\0') {
    int num1 = atoi(operand1);
    int num2 = atoi(operand2);

    switch (operator) {
        case '+':
            result = num1 + num2;
            break;
        case '-':
            result = num1 - num2;
            break;
        case '*':
            result = num1 * num2;
            break;
        case '/':
            if (num2 != 0) {
                result = num1 / num2;
            } else {
                LCD_clear();
                LCD_print("Error: Division by 0");
                while (1); // End the program or handle the error as needed
            }
            break;
    }

    LCD_print("=");
    LCD_print_number(result);
    break; // End the program after displaying the result
}

while (1); // Infinite loop to keep the program running
}

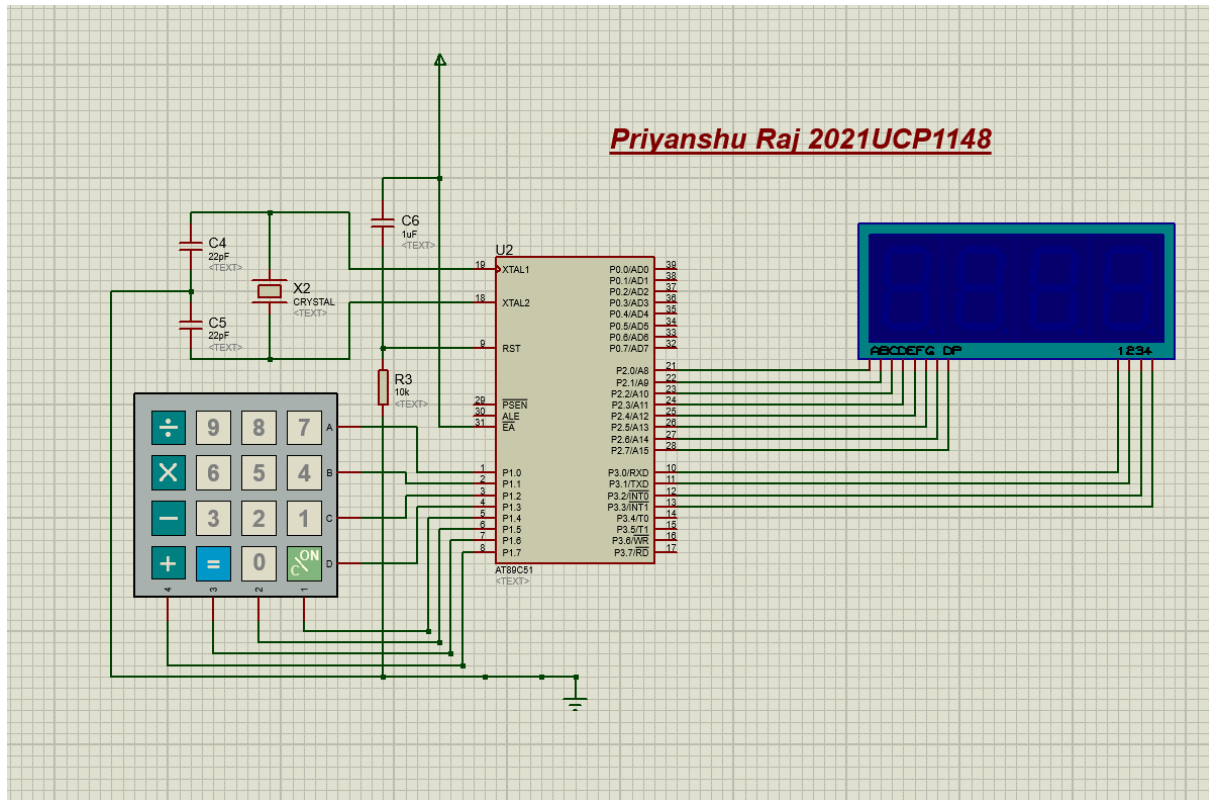
```

Lab 5

Program Objective: Display the pressed key of the hex keypad on 4 digit 7- Segment

Program component : 8051,hex keypad, 4dig 7 seg display

Program circuit :



Code:

```
#include<reg52.h>
#include<lcd.h>
```

```
//Keypad Connections
```

```
sbit R1 = P1^0;
sbit R2 = P1^1;
sbit R3 = P1^2;
sbit R4 = P1^3;
```



```

sbit C1 = P1^4;
sbit C2 = P1^5;
sbit C3 = P1^6;
sbit C4 = P1^7;
//End Keypad Connections

void Delay(int a)
{
    int j;
    int i;
    for(i=0;i<a;i++)
    {
        for(j=0;j<100;j++)
        {
        }
    }
}

char Read_Keypad()
{
    C1=1;
    C2=1;
    C3=1;
    C4=1;
    R1=0;
    R2=1;
    R3=1;
    R4=1;
    if(C1==0){Delay(100);while(C1==0);return '7';}
    if(C2==0){Delay(100);while(C2==0);return '8';}
    if(C3==0){Delay(100);while(C3==0);return '9';}
    if(C4==0){Delay(100);while(C4==0);return '/';}
    R1=1;
    R2=0;
    R3=1;
    R4=1;
    if(C1==0){Delay(100);while(C1==0);return '4';}
    if(C2==0){Delay(100);while(C2==0);return '5';}
    if(C3==0){Delay(100);while(C3==0);return '6';}
    if(C4==0){Delay(100);while(C4==0);return 'X';}
    R1=1;
    R2=1;
    R3=0;
    R4=1;
    if(C1==0){Delay(100);while(C1==0);return '1';}
    if(C2==0){Delay(100);while(C2==0);return '2';}
    if(C3==0){Delay(100);while(C3==0);return '3';}
    if(C4==0){Delay(100);while(C4==0);return '-';}
    R1=1;
    R2=1;
    R3=1;

```

```

R4=0;
if(C1==0){Delay(100);while(C1==0);return 'C';}
if(C2==0){Delay(100);while(C2==0);return '0';}
if(C3==0){Delay(100);while(C3==0);return '=';}
if(C4==0){Delay(100);while(C4==0);return '+';}
return 0 ;
}
unsigned int arr[10] = {0x40, 0xF9, 0x24, 0x30, 0x19, 0x12, 0x02, 0xF8, 0x00,
0x10};
unsigned int r;

sbit d2 = P3 ^ 0;
sbit d1 = P3 ^ 1;
sbit d0 = P3 ^ 2;
sbit d = P3 ^ 3;
void main()
{
    int i=0;
    char c,p;
    P2=0xc0;
    c='_';
    while(1)
    {

        c = Read_Keypad();

        r = c-'0';
        if(r>9 || r<0){continue;}

        d=1;
        d1=d2=d0=0;
        P2=arr[r];
    }
}

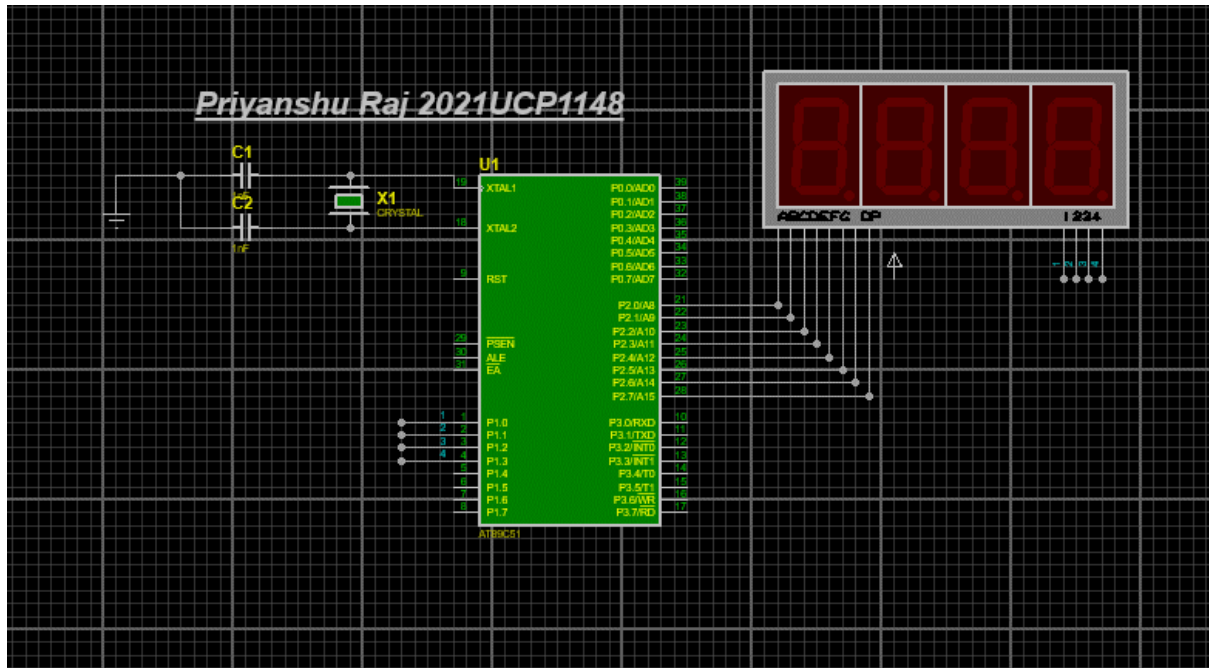
```

Lab 6

Program Objective: Implement an increasing counter and show on 4 digits 7-Segment

Program component : 8051, 4 digit 7 seg-display

Program circuit :



Code:

```
#include <reg51.h>
#define msec 100
unsigned int arr[10] = {0x40, 0xF9, 0x24, 0x30, 0x19, 0x12, 0x02, 0xF8, 0x00, 0x10};
sbit d2 = P1 ^ 0;
sbit d1 = P1 ^ 1;
sbit d0 = P1 ^ 2;
sbit d = P1 ^ 3;
unsigned int v1, v2, v3, v4, v0;
void delay(unsigned int count)
{
    unsigned int j, k;
    for (j = 0; j <= count; j++)
        for (k = 0; k <= 5; k++)
```

```

        ;
    }
void main()
{
    v1 = v2 = v3 = v4 = v0 = 0;
    while (1)
    {
        {
            v0 = v0 + 1;
            if (v0 == 2)
            {
                v0 = 1;
                v1 = v1 + 1;
            }

            P2 = 0xFF;
            if (v1 == 10)
            {
                v1 = 0;
                v2 = v2 + 1;
            }
            d = 1;
            d2 = d0 = d1 = 0;
            P2 = arr[v1];
            delay(msec);

            P2 = 0xFF;
            if (v2 == 10)
            {
                v2 = 0;
                v3 = v3 + 1;
            }
            d0 = 1;
            d1 = d = d2 = 0;
            P2 = arr[v2];
            delay(msec);

            P2 = 0xFF;
            if (v3 == 10)
            {
                v3 = 0;
                v4 = v4 + 1;
            }
            d1 = 1;
            d2 = d = d0 = 0;
            P2 = arr[v3];
            delay(msec);

            P2 = 0xFF;
            if (v4 == 10)
            {

```

```
        v1 = 0;
        v2 = 0;
        v3 = 0;
        v4 = 0;
    }
    d2 = 1;
    d1 = d = d0 = 0;
    P2 = arr[v4];
    delay(msec);

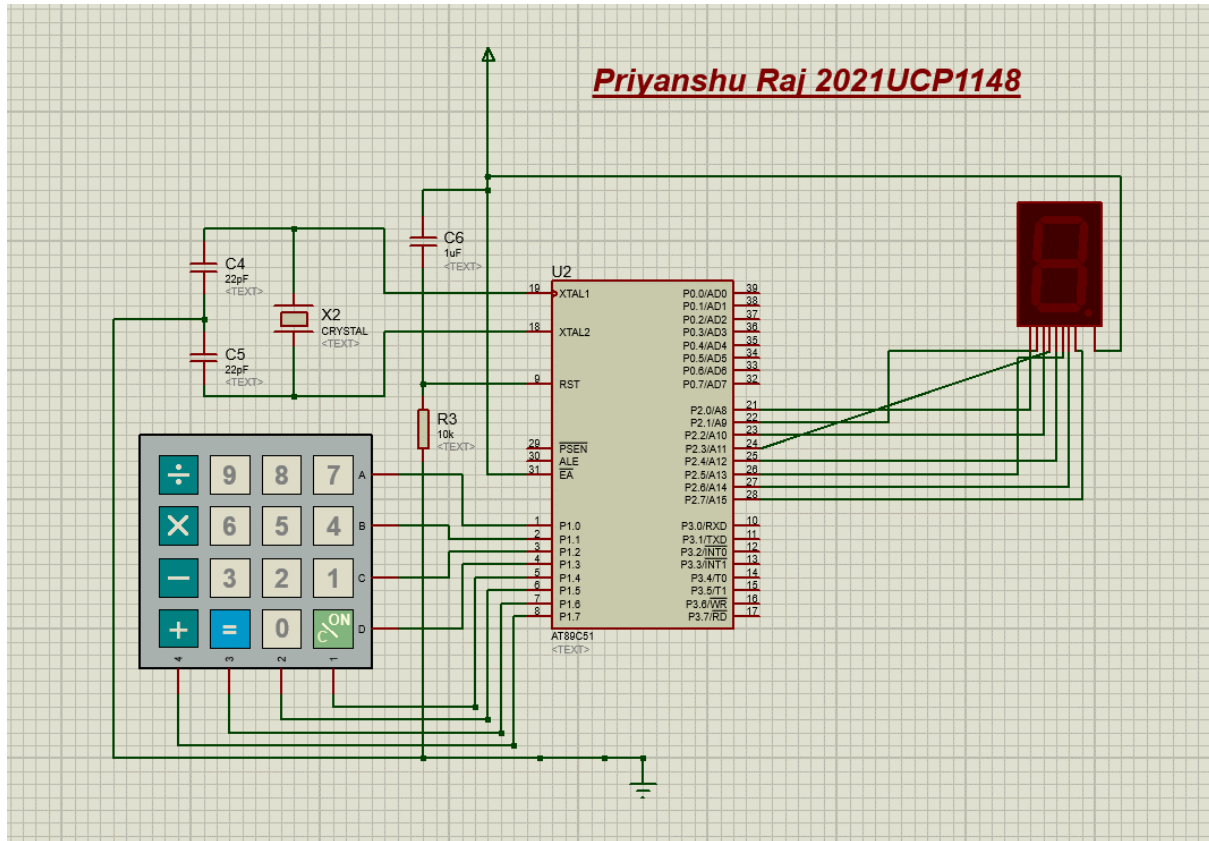
    delay(msec);
    P2 = 0xFF;
}
}
```

Lab 7

Program Objective: Set the counter using hex keypad and display on 7 Segment

Program component : 8051, 1 digit 7 seg-display, Hex-keypad

Program circuit :



Code:

```
#include<reg52.h>
#include<lcd.h>

//Keypad Connections
sbit R1 = P1^0;
sbit R2 = P1^1;
sbit R3 = P1^2;
sbit R4 = P1^3;
sbit C1 = P1^4;
sbit C2 = P1^5;
sbit C3 = P1^6;
sbit C4 = P1^7;
```

```
//End Keypad Connections
```

```
void Delay(int a)
```

```
{  
    int j;  
    int i;  
    for(i=0;i<a;i++)  
    {  
        for(j=0;j<100;j++)  
        {  
        }  
    }  
}
```

```
char Read_Keypad()
```

```
{  
    C1=1;  
    C2=1;  
    C3=1;  
    C4=1;  
    R1=0;  
    R2=1;  
    R3=1;  
    R4=1;  
    if(C1==0){Delay(100);while(C1==0);return '7';}  
    if(C2==0){Delay(100);while(C2==0);return '8';}  
    if(C3==0){Delay(100);while(C3==0);return '9';}  
    if(C4==0){Delay(100);while(C4==0);return '/';}  
    R1=1;  
    R2=0;  
    R3=1;  
    R4=1;  
    if(C1==0){Delay(100);while(C1==0);return '4';}  
    if(C2==0){Delay(100);while(C2==0);return '5';}  
    if(C3==0){Delay(100);while(C3==0);return '6';}  
    if(C4==0){Delay(100);while(C4==0);return 'X';}  
    R1=1;  
    R2=1;  
    R3=0;  
    R4=1;  
    if(C1==0){Delay(100);while(C1==0);return '1';}  
    if(C2==0){Delay(100);while(C2==0);return '2';}  
    if(C3==0){Delay(100);while(C3==0);return '3';}  
    if(C4==0){Delay(100);while(C4==0);return '-'};  
    R1=1;  
    R2=1;  
    R3=1;  
    R4=0;  
    if(C1==0){Delay(100);while(C1==0);return 'C';}  
    if(C2==0){Delay(100);while(C2==0);return '0';}  
    if(C3==0){Delay(100);while(C3==0);return '='};  
}
```

```

if(C4==0){Delay(100);while(C4==0);return '+';}
return 0 ;
}
unsigned int ch[]={0xC0,0xF9,0xA4,0xB0,0x99,0x92,0x82,0xF8,0x80,0x90};
unsigned int r,i;
void main()
{
    int i=0;
    char c,p;
    P2=0xc0;
    c='_';
    while(1)
    {

        c = Read_Keypad();

        r = c-'0';
        if(r>9 || r<0){continue;}

        i=0;
        while(i<=r){
            P2 = ch[i];
            i++;
            Delay(650);
        }
        P2=0xc0;
    }
}

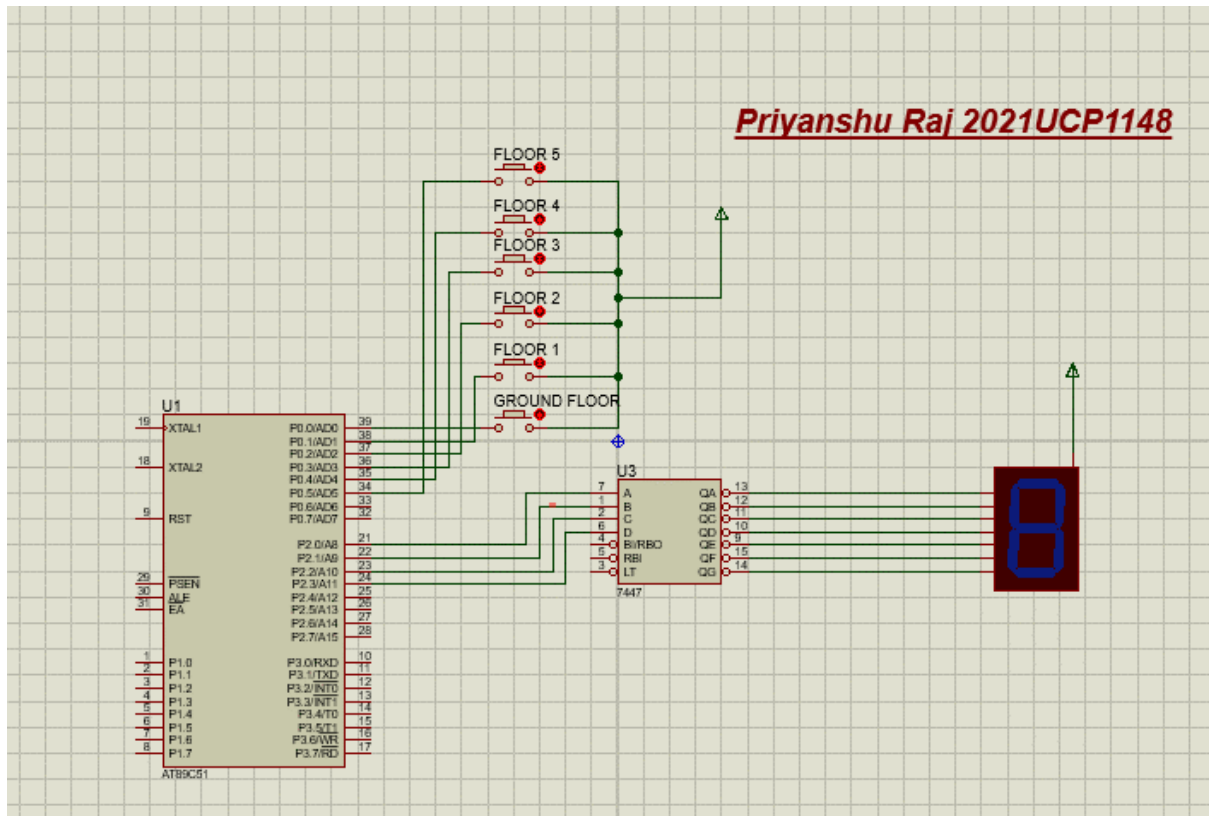
```


Lab 8

Program Objective: Elevator Movement

Program component : 8051, 1 digit 7 seg-display, Hex-keypad

Program circuit :



Code:

```
#include <REG51.H>
#include <stdio.h>
int p, q, r;
// q=10; //for every motor freezing count
// r=10; //rotation of the motor 0 min 32000 max
delay(c)
{
    int i, j;
    if (c == 0)
    {
        for (i = 0; i < 500; i++)
        {
            for (j = 0; j < r; j++)
```

```

        ;
    }
}
return c;
}
// elevator going up
up(b)
{
    int i, j;
    for (i = 1; i <= b; i++)
    {
        for (j = 0; j <= 10; j++)
        {
            P3 = 1;
            delay(0);
            P3 = 2;
            delay(0);
            P3 = 4;
            delay(0);
            P3 = 8;
            delay(0);
            P3 = 16;
            delay(0);
        }
        P2 = p + i;
    }
    p = p + b;
    return b;
}
// elevator going down
down(b)
{
    int i, j;
    for (i = 1; i <= b; i++)
    {
        for (j = 0; j <= q; j++)
        {
            P3 = 16;
            delay(0);
            P3 = 8;
            P3 = 4;
            delay(0);
            P3 = 2;
            delay(0);
            P3 = 1;
            delay(0);
        }
        P2 = p - i;
    }
    p = p - b;
    return b;
}

```

```

}
control(a)
{
    int difference;
    if (a > p)
    {
        difference = a - p;
        up(difference);
    }
    if (a < p)
    {
        difference = p - a;
        down(difference);
    }
    return a;
}
main()
{
    int p1;
    p = 0;
    P2 = p;
    while (1)
    {
        if (P0 == 2)
        {
            p1 = 1;
            control(1);
        }
        if (P0 == 4)
        {
            p1 = 2;
            control(2);
        }
        if (P0 == 8)
        {
            p1 = 3;
            control(3);
        }
        if (P0 == 16)
        {
            p1 = 4;
            delay(0);
            control(4);
        }
        if (P0 == 32)
        {
            p1 = 5;
            control(5);
        }
        if (P0 == 1)
        {

```

```
    p1 = 0;  
    control(0);  
  }  
}  
}
```

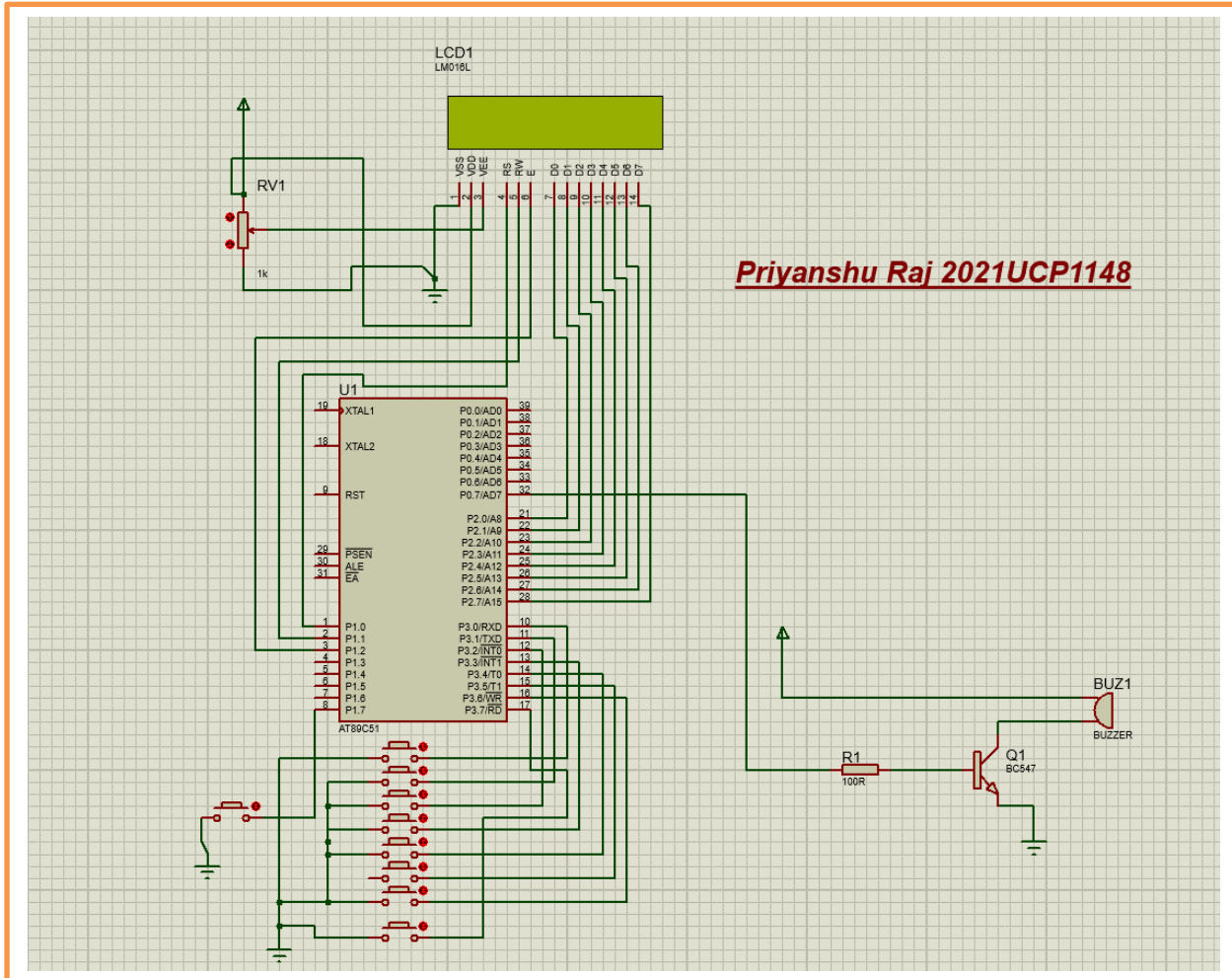
2021UCP1148

Lab 9

Program Objective: Quiz-answer setup using Relay Buzzer and LCD

Program component : 8051,lcd,buzzer

Program circuit :



Code:

```
#include <reg51.h>
sbit rs=P1^0;
sbit rw=P1^1;
sbit e= P1^2;

#define SWITCH P3 // Input Switches (buttons) to PORT1
sbit buzz = P0^7; // Buzzer
sbit rst = P1^7; // Reset Switch (Reset the display) - not the microcontrolle

void delay(unsigned int);
void cmd(unsigned char);
void dat(unsigned char);
unsigned char btnPressed;
void main(void)
```

```

{

cmd(0x38);
cmd(0x01);
cmd(0x0c);
//cmd(0x83);
//cmd(0x06);


    buzz = 0; // Initialize buzzer off


    while (1) {
        btnPressed = SWITCH; // Read the state of the switches


        if (btnPressed != 0xFF) { // If any button is pressed
            cmd(0x01); // Clear display
            cmd(0x80); // Move cursor to the beginning of the first line
            dat('0' + (btnPressed & 0x0F)); // Display the pressed button number
            buzz = 1; // Turn on the buzzer
            delay(1000); // Keep buzzer on for 1 second
            buzz = 0; // Turn off the buzzer
            while (SWITCH != 0xFF); // Wait until the button is released
        }
    }
}

void delay(int ms) {
    unsigned int i, j;
    for (i = 0; i < ms; i++) {
        for (j = 0; j < 120; j++); // Delay loop, adjust based on your
microcontroller's clock frequency
    }
}

void cmd(unsigned char ch)
{
rs=0;
rw=0;
P2=ch;
delay(20);
}

void dat(unsigned char ch)
{
rs=1;
rw=0;
P2=ch;
delay(100);
}

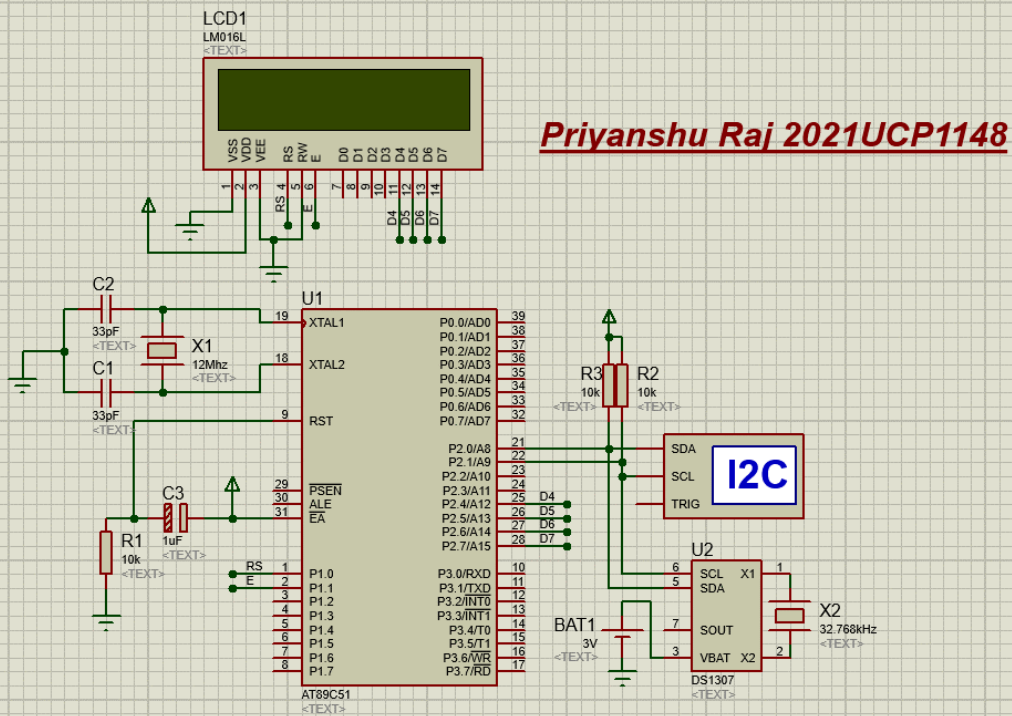
```

Lab 10

Program Objective: Display date and time on LCD using RTC section.

Program component : 8051,lcd, i2c, ds1

Program circuit :



Code:

```
#include "Includes.h"

// Main function
void main()
{
    InitLCD(); // Initialize LCD
    InitI2C(); // Initialize i2c pins

    // Set initial time
    Set_DS1307_RTC_Time(AM_Time, 8, 32, 59); // Set time 08:32:59 AM
```

```
// Set initial date
Set_DS1307_RTC_Date(2, 05, 24, Friday);    // Set 02-05-2024 @ Friday

while(1)
{
    // Display RTC time on first line of LCD
    DisplayTimeToLCD(Get_DS1307_RTC_Time());

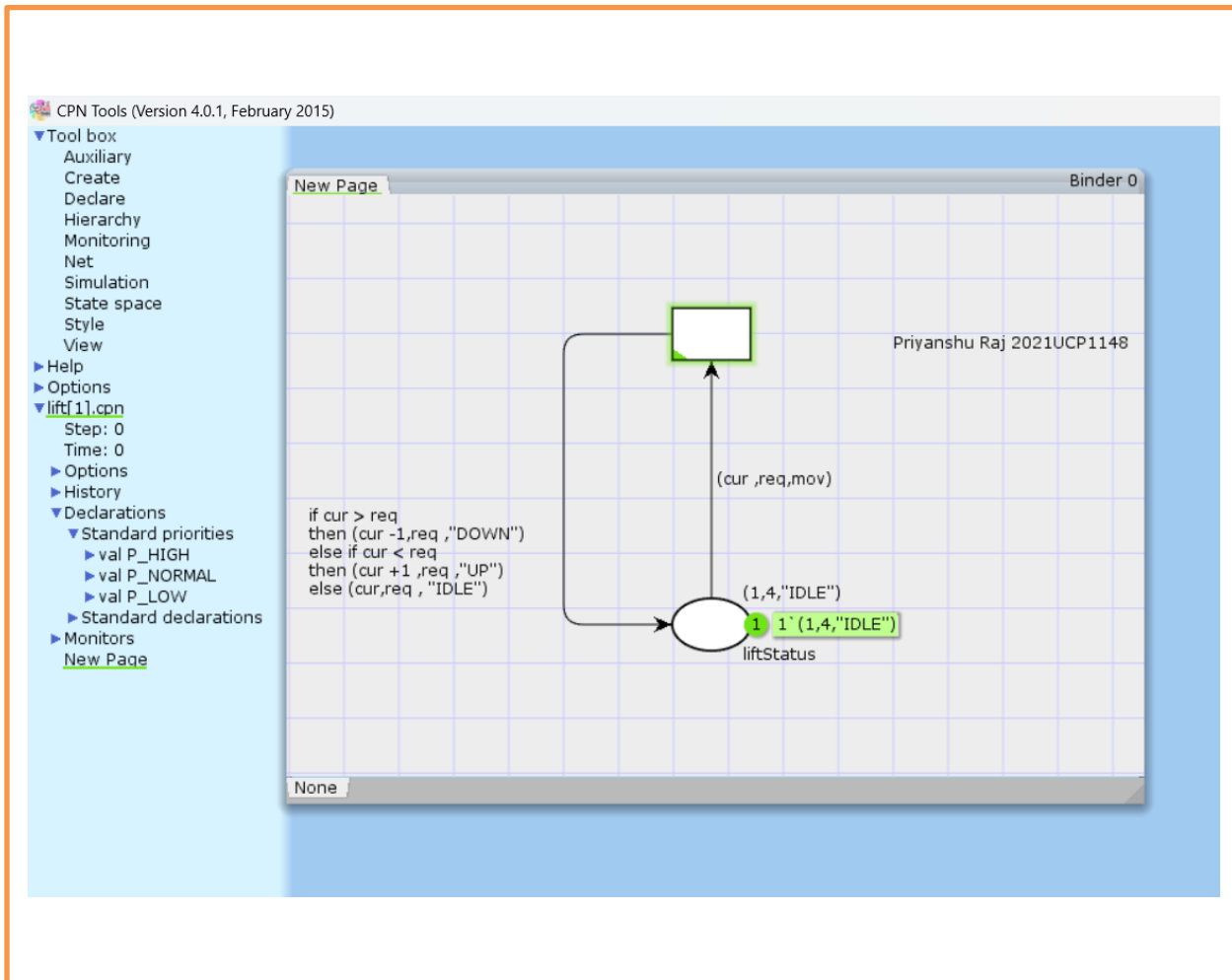
    // Display RTC date on second line of LCD
    DisplayDateOnLCD(Get_DS1307_RTC_Date());

    delay(65000);    // Roughly about 1 second delay
}
}
```


Lab 11

Program Objective: Design a petri net to show elevator movement using CPN tool

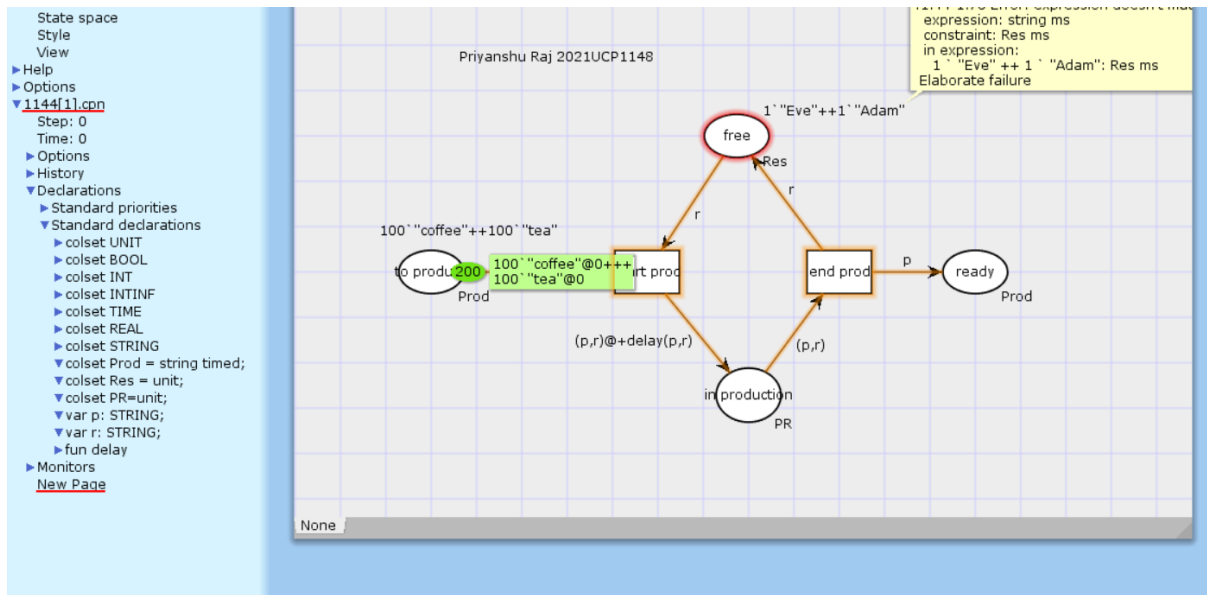
Program circuit :



Lab 12

Program Objective: Design a petri net to count coffee/tea order using CPN tool

Program circuit :



2021UCP1148