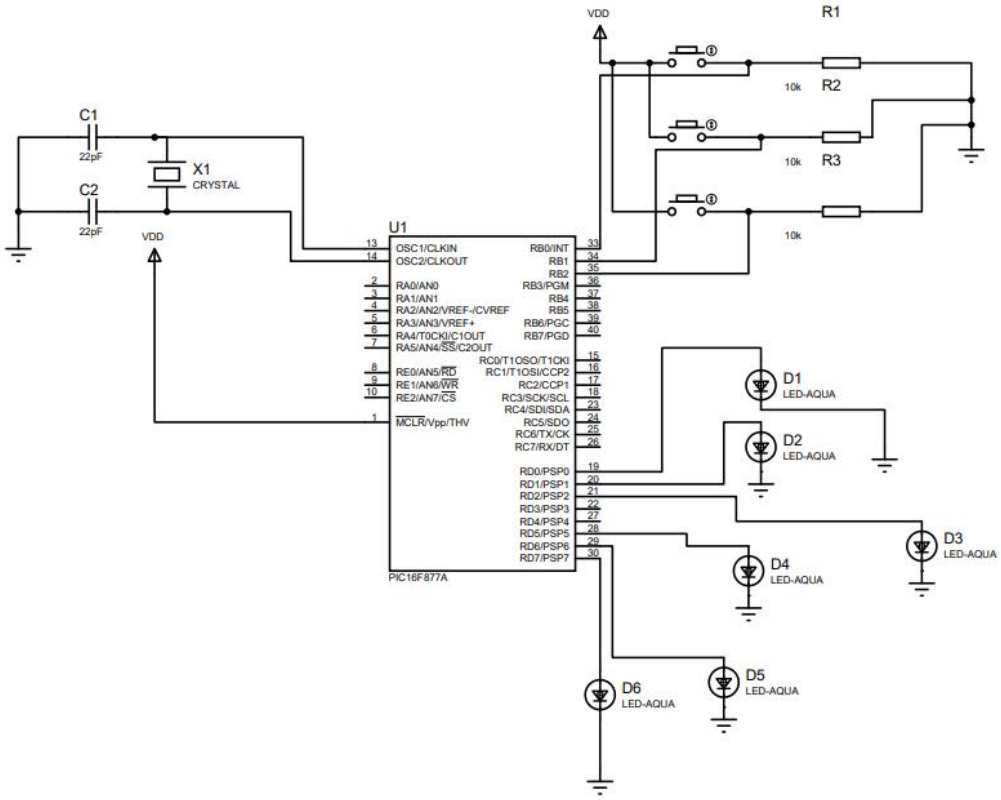
Task1:

Description:

1. RB0, RB1, RB2 – Configured as Inputs
2. RD0,1,2,5,67 – Configured as Outputs
3. As Long as RB0 is pressed it is stuck in While loop toggling the RD0 and RD1 every 1 Second
4. As Long as RB1 is pressed it is stuck in While loop toggling the RD7 and RD6 every 1 Second
5. As Long as RB2 is pressed it is stuck in While loop toggling the RD0,RD1,RD2,RD5,RD6,RD7 every 1 Second

Schematic Diagram

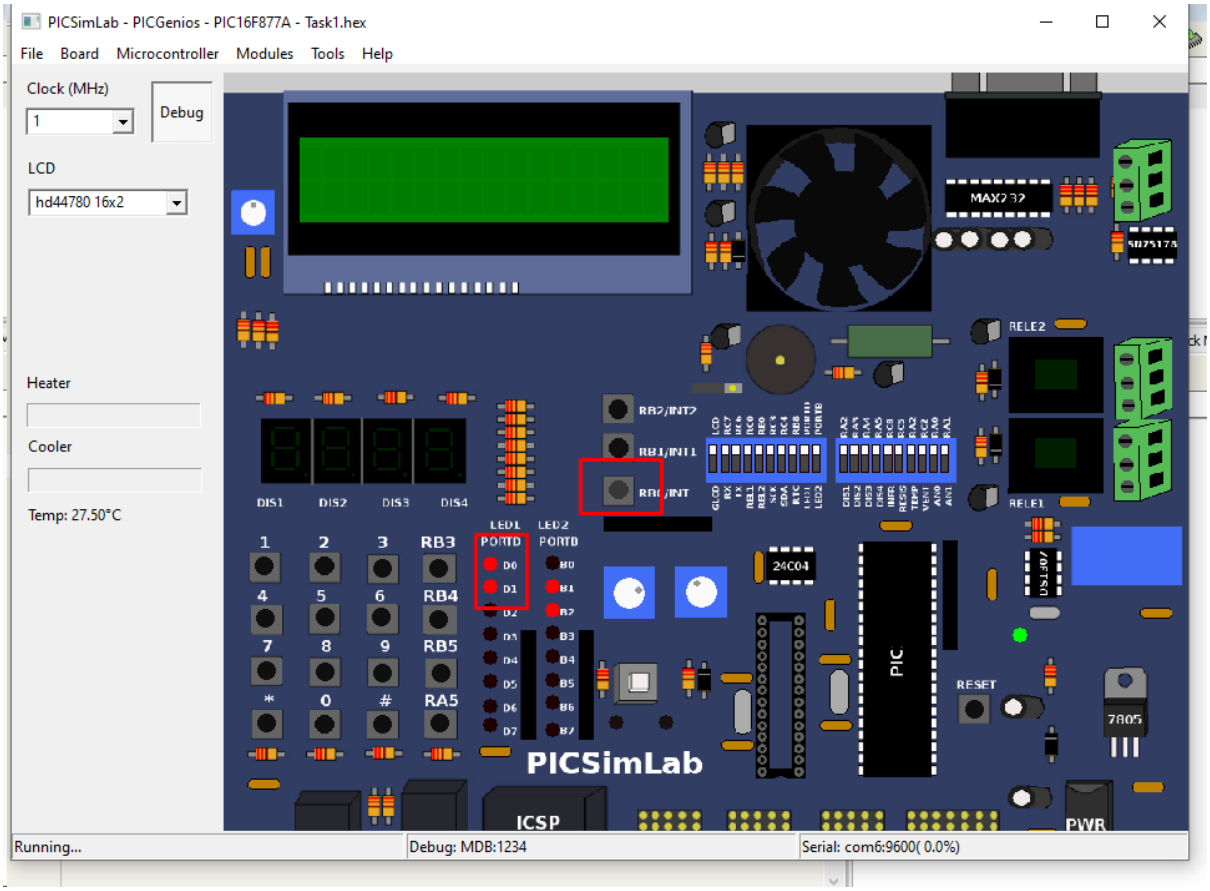


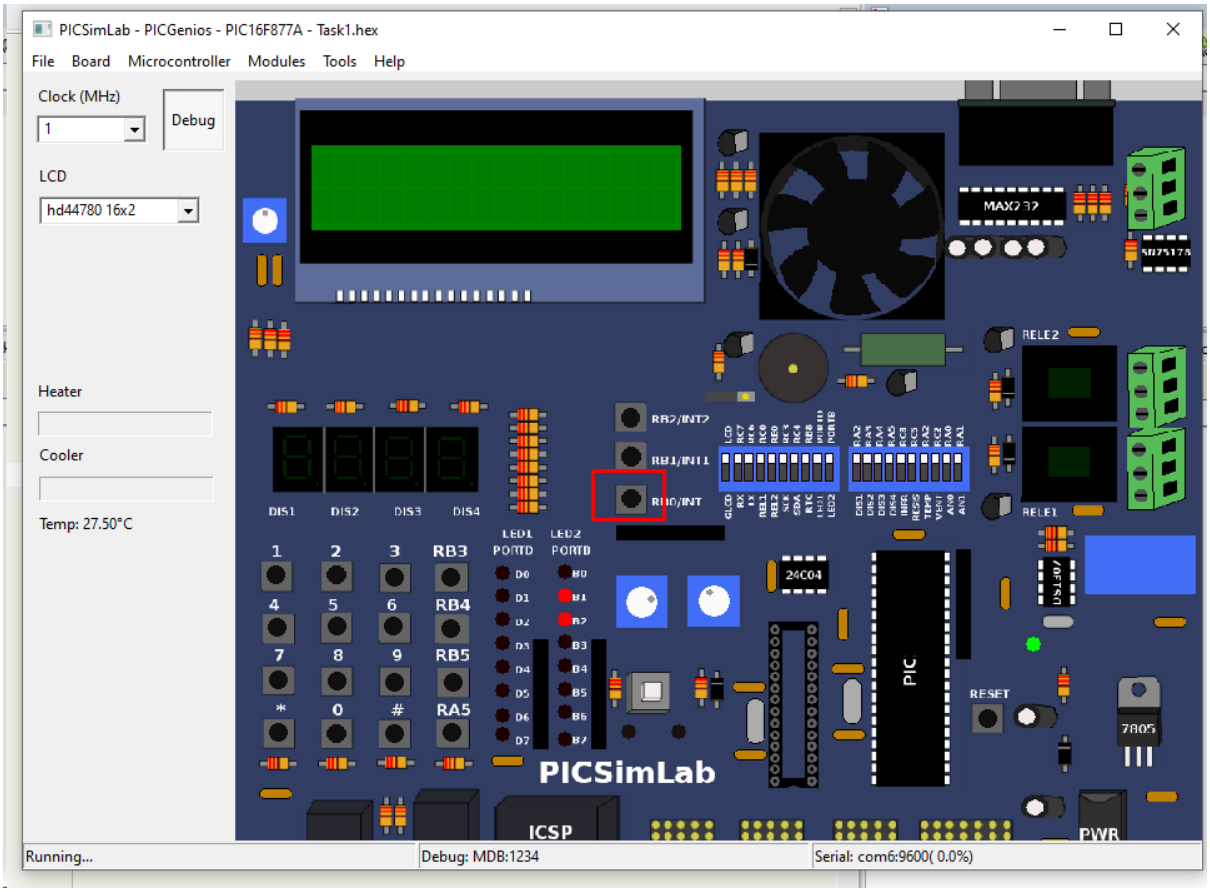
Code:

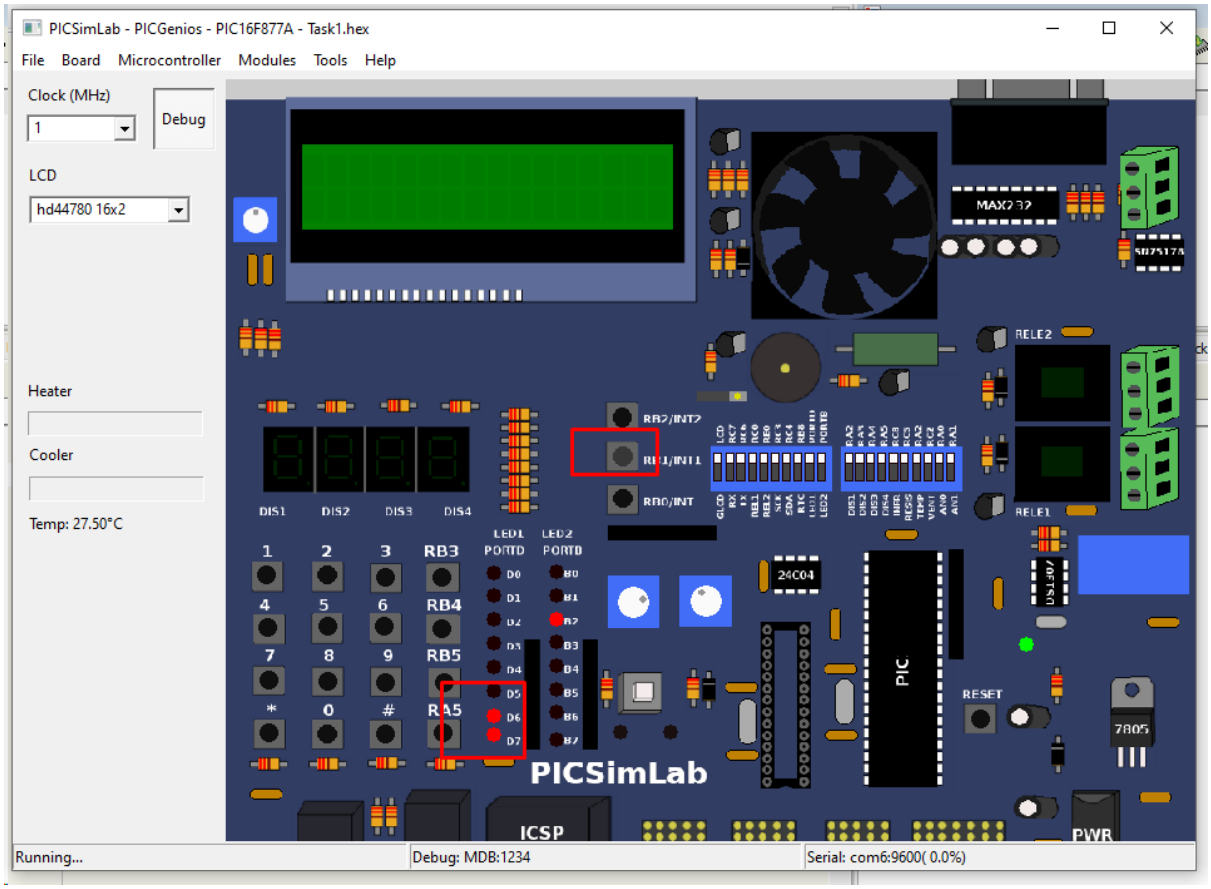
```
void main() {
TRISB = 0x07;   //RB0, RB1, RB2 as Input Pins
TRISD = 0x00;   //All the Pins in Port configured as Output
PORTD = 0x00;

  while(1)
  {
      PORTD =0x00;
```

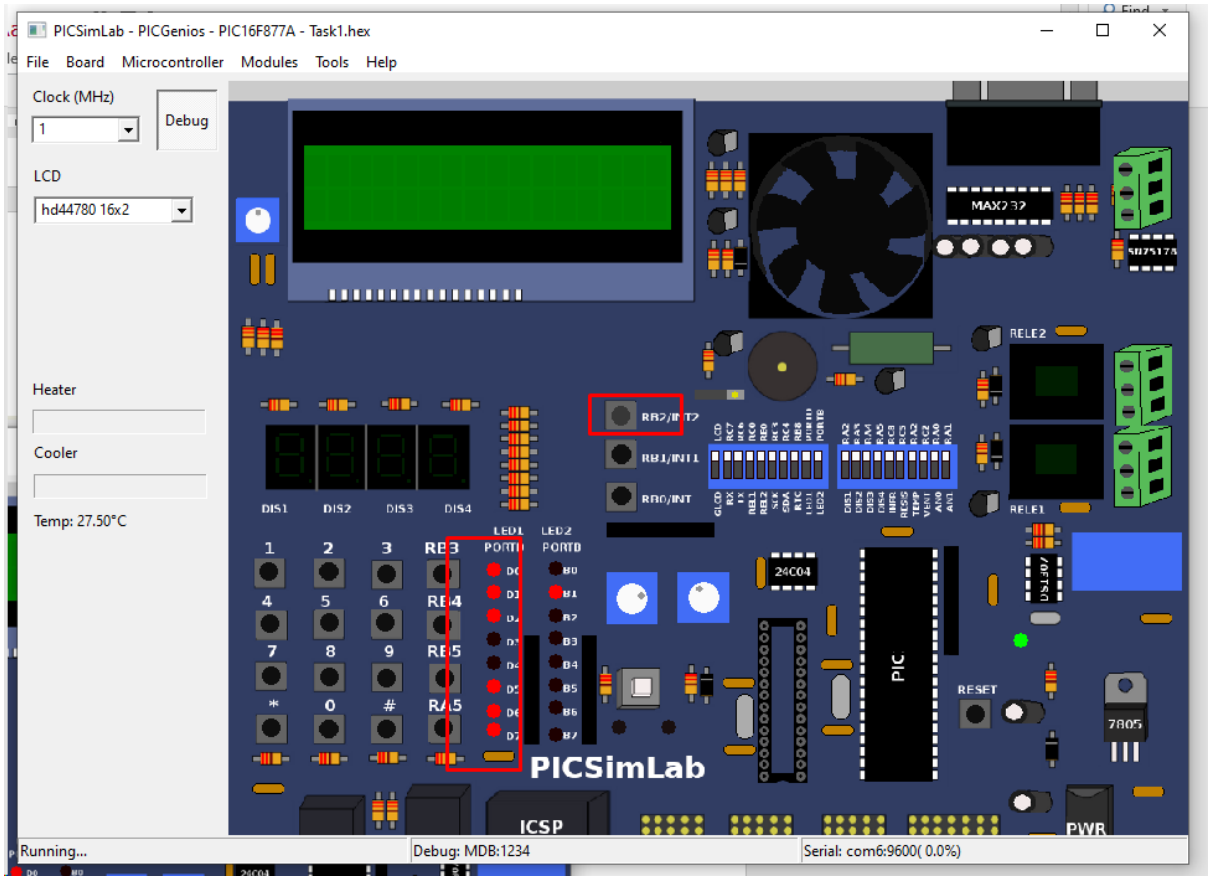
```
        while(!(PORTB & 0x1) )
        {

                    PORTD ^= 0x3;
                    Delay_ms(1000);
         }

        while(!(PORTB & 0x2) )
        {

                    PORTD ^= 0xC0;
                    Delay_ms(1000);
         }

          while(!(PORTB & 0x4) )
        {

                    PORTD ^= 0xE7;
                    Delay_ms(1000);
         }


    }
}
```

PICSIMLAB Output


PICSimLab - PICGenios - PIC16F877A - Task1.hex
File Board Microcontroller Modules Tools Help
Clock (MHz)
1
Debug
LCD
hd44780 16x2
Heater
Cooler
Temp: 27.50°C
PICSimLab
Running...
Debug: MDB:1234
Serial: com6:9600(0.0%)


PICSimLab - PICGenios - PIC16F877A - Task1.hex
File Board Microcontroller Modules Tools Help
Clock (MHz)
1
Debug
LCD
hd44780 16x2
Heater
Cooler
Temp: 27.50°C
PICSimLab
Running...
Debug: MDB:1234
Serial: com6:9600(0.0%)


PICSimLab - PICGenios - PIC16F877A - Task1.hex
File Board Microcontroller Modules Tools Help
Clock (MHz)
1
Debug
LCD
hd44780 16x2
Heater
Cooler
Temp: 27.50°C
PICSimLab
ICSP
PWR
Running...
Debug: MDB:1234
Serial: com6:9600(0.0%)

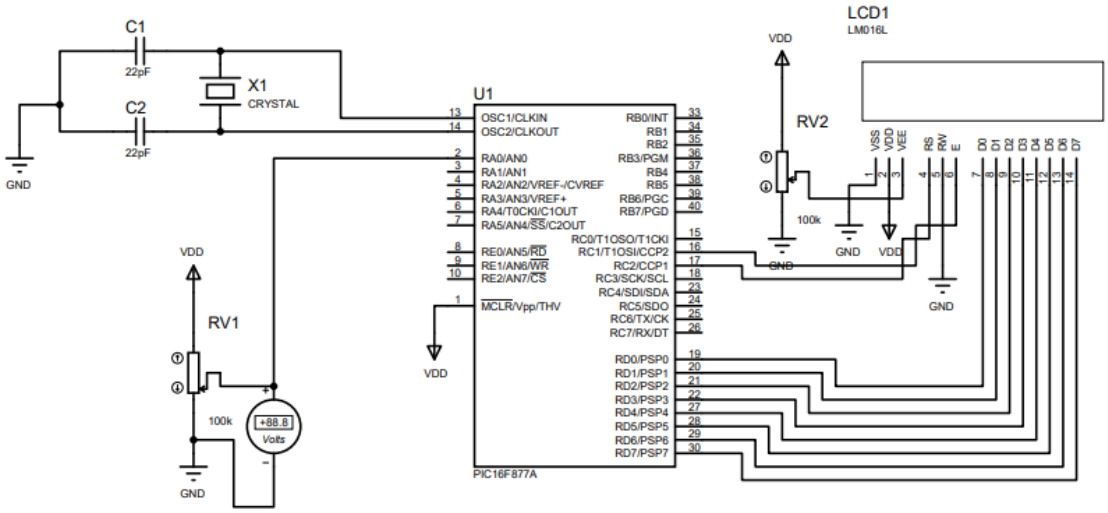

PICSimLab - PICGenios - PIC16F877A - Task1.hex
File Board Microcontroller Modules Tools Help
Clock (MHz)
1
Debug
LCD
hd44780 16x2
Heater
Cooler
Temp: 27.50°C
PICSimLab
ICSP
PWR
Running...
Debug: MDB:1234
Serial: com6:9600(0.0%)

Task2:

Description:

1. AN0 is configured as Analog Input Pin, and Interanl Vref+ (5v) and VSS (0V) is used for converting the input voltage
2. Max 5V – will give ADC output value 1023
3. We convert max 5 volt value to 150 --> i.e 15.0V
4. Whenever the voltage drops below 10.5 – Low Voltage is Displayed
5. Whenever the voltage raises above 10.5 and below 13.5 –Normal Voltage is Displayed
6. Whenever the voltage raises above 13.5 High Voltage is Displayed

Schematic:



Code:

```
void Init(void);

void LCD_Command(unsigned char);

void LCD_Data(unsigned char);

void LCDOutput(unsigned int);

void Delay(unsigned int);

unsigned char k[10],x;

unsigned char n,m;

unsigned int hivalue,lovalue,adcv;

long value;

char Lowstring[] = "Low  Voltage";

char Highstring[] = "High Voltage";

char Normstring[] = "Normal Voltage";
```

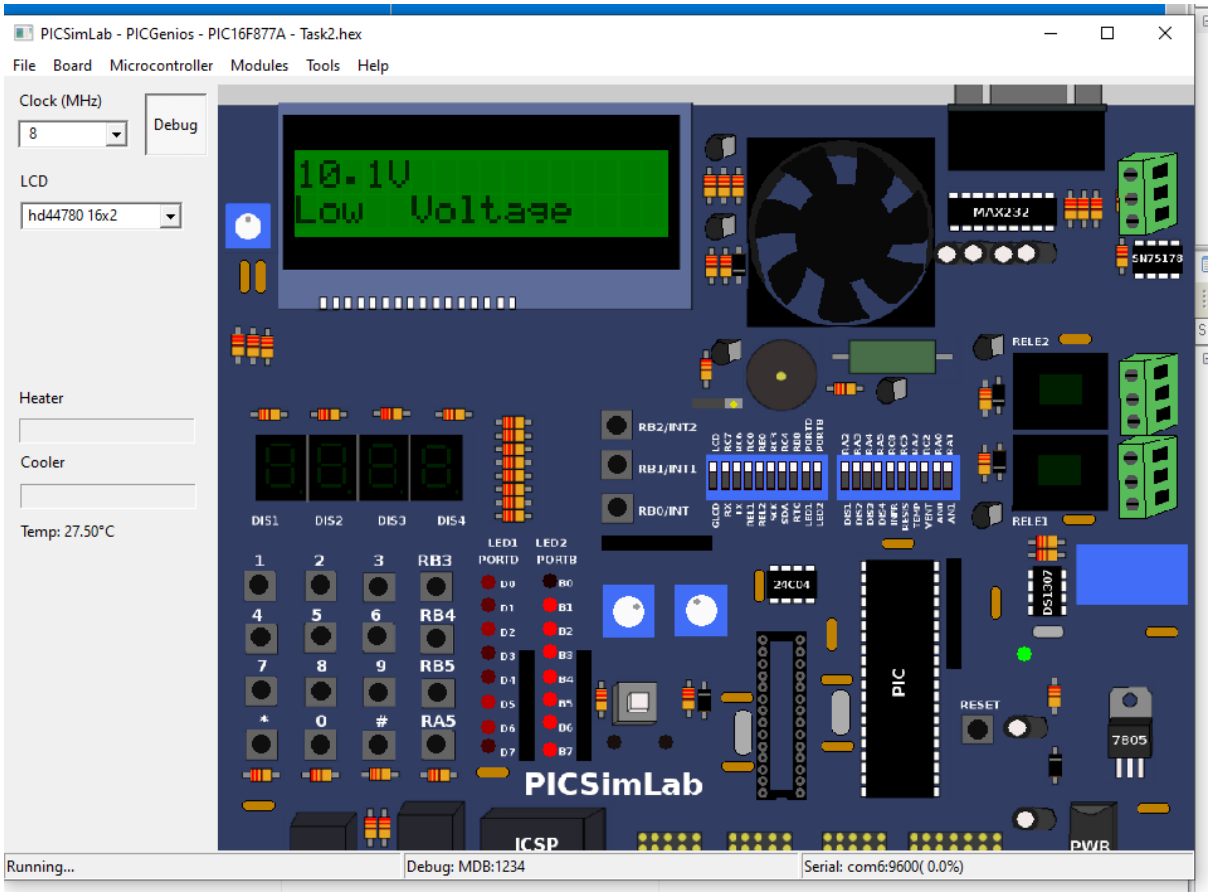
```
char *ptr;



void update_lcd(unsigned int num)
{
   LCD_Command(0x80);               //Initialize cursor to first Position
   LCDOutput(num);
   if(num > 135)
   {
       ptr = (char *)Highstring;
   }
   else if(num < 105)
   {
      ptr = (char *)Lowstring;
   }
   else
   {
       ptr = (char *)Normstring;
   }
   LCD_Command(0xC0);
   while(*ptr != '\0')
      LCD_Data(*ptr++);
  Delay(100);
}



 void main()
 {
     Init();

     ADCON0=0x00;                              // sampling freq=osc_freq/2,ADC off initially
     ADCON0=0x81;                              //configure the A/D control registers
     ADCON1=0x8E;

     while(1)
     {
       ADCON0|=0X04;                             //start ADC conversion
       while(ADCON0&0X04);                       //wait for conversion to complete
       lovalue=ADRESL;                           //read the low 8 bit value
```

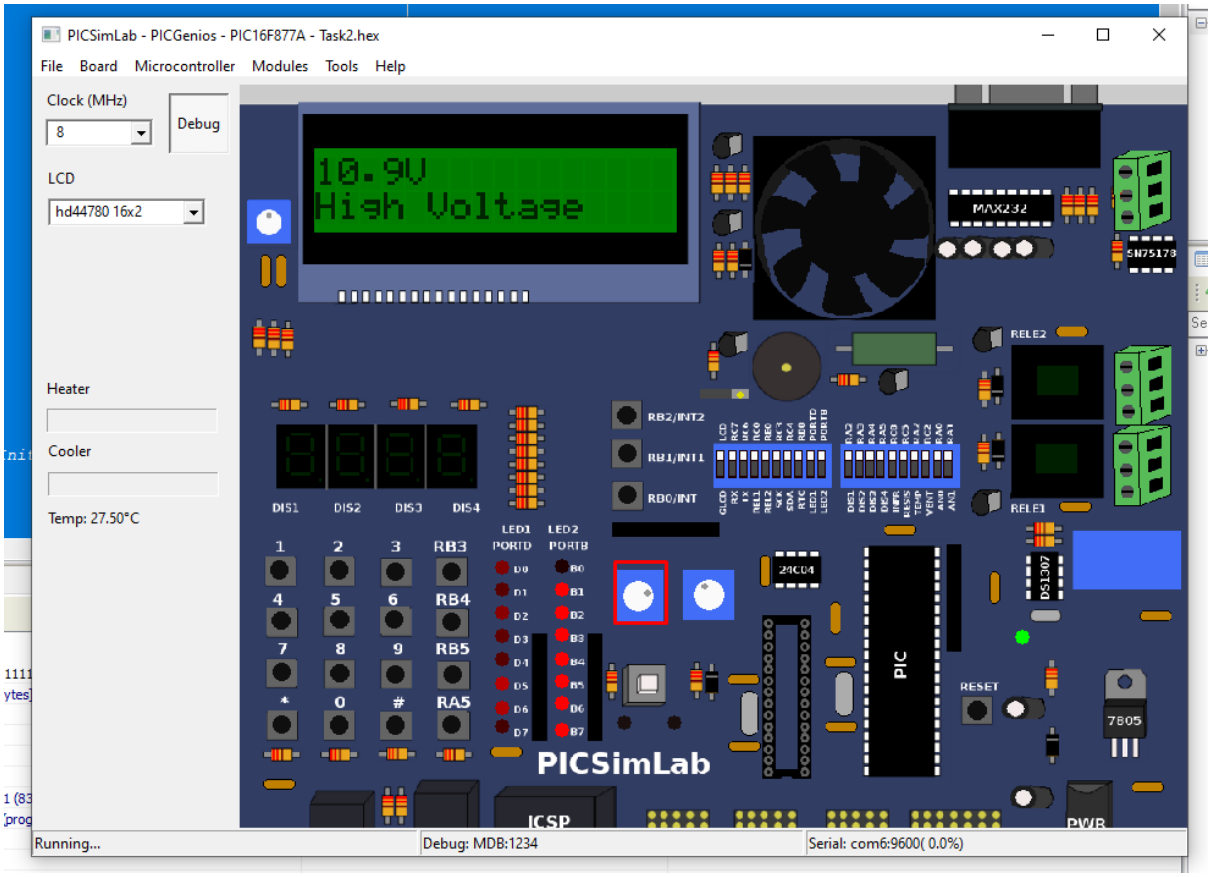
```
        hivalue=ADRESH;                          //read the upper 8 bit value
        value=((unsigned int)hivalue<<8)+(unsigned int)lovalue;
        adcv = (value*150)/1023 ;
        update_lcd(adcv);
      }
 }
/*end main program*/
void Init(void)
{
  TRISD = 0x00;                    //Initialize the PORTD as output
  TRISC = 0x00;                    //Initialise the PORT C as output
  TRISA = 0x01;
  LCD_Command(0x38);               //Initialize the 2 lines and 5*7 Matrix LCD
  Delay(100);
  LCD_Command(0x38);
  Delay(100);
  LCD_Command(0x38);
  Delay(100);
  LCD_Command(0x38);
  Delay(100);
  LCD_Command(0x06);              //Increment cursor (shift cursor to right)
  Delay(100);
  LCD_Command(0x0C);              //Display on,cursor off
  Delay(100);
  LCD_Command(0x01);              //clear display screen
  Delay(100);
}

/*define the output function*/
/*BCD conversion*/
void LCDOutput(unsigned int num)
{
    unsigned int j;
    unsigned int i;
    unsigned int tdata;

    tdata = num   ;
    if(tdata == 0)
    {
```

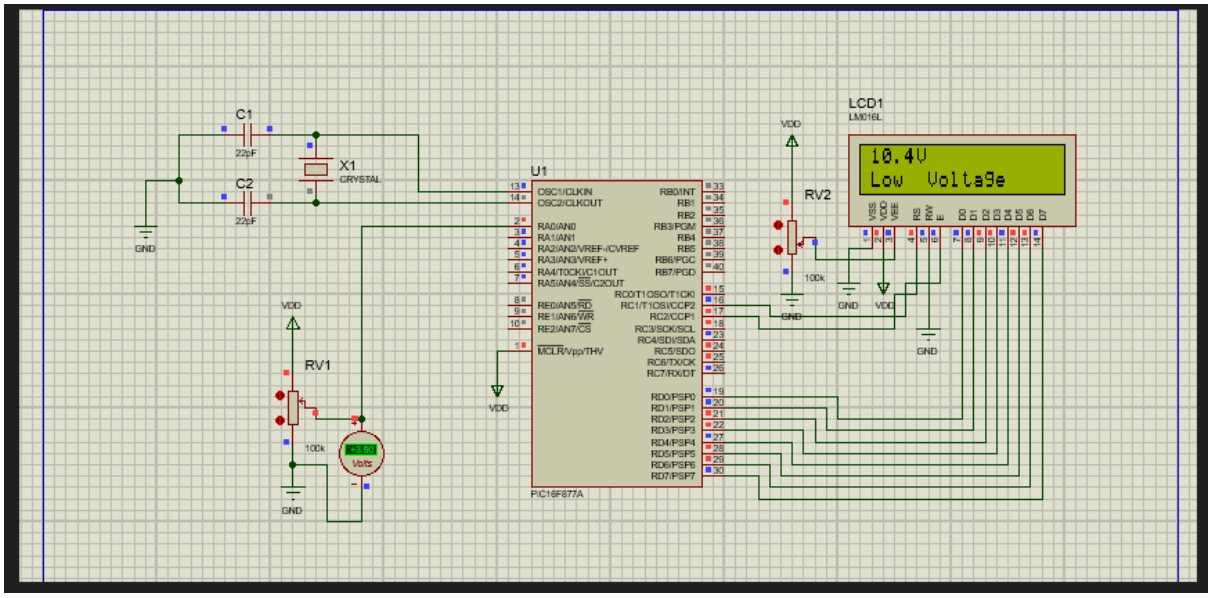
```
       LCD_Data(0x30);                      //assign formal argument to other variable
       LCD_Data(0x30);
       LCD_Data(0x2E);
       LCD_Data(0x30);
       LCD_Data('V');
     }
    else
    {
        j=0;
        while (tdata != 0)
                {
                        i = tdata - (tdata / 10) * 10;
                        k[j] = i+0x30;
                        tdata = tdata / 10;
                        j++;
                }
                k[j] = '\0';
                //LCD_Data(k[3]);
                LCD_Data(k[2]);
                LCD_Data(k[1]);
                LCD_Data(0x2E);
                LCD_Data(k[0]);
                LCD_Data('V');

    }
}

void LCD_Command(unsigned char i)
{
     PORTC&=~0x04;               // RS=0
     PORTD=i;
     PORTC |=0x02;               // RS=0,R/W=0,EN=1
     PORTC&= ~0x02;              // RS=0,R/W=0,EN=0
     Delay(100);
}

void LCD_Data(char i)
{
    PORTC|=0x04;              //RS=1
```

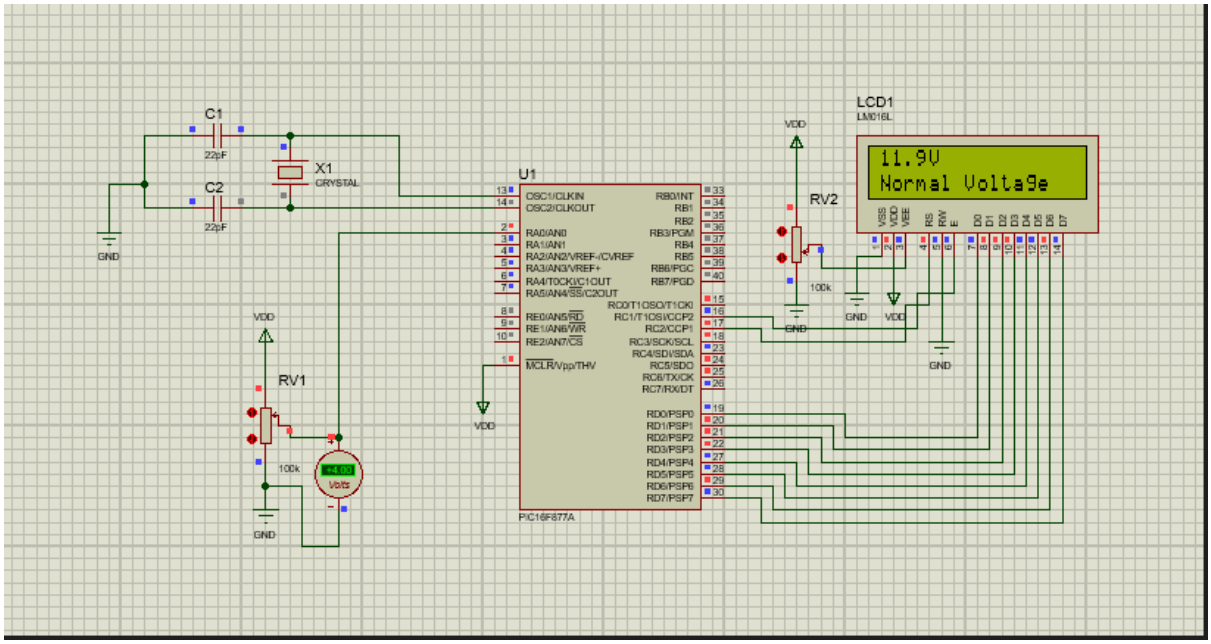
```
    PORTD=i;                    //Assign the value to PORTD to display
    PORTC|=0x02;                // RS=1,R/W=0,EN=1
    PORTC&=~0x02;               // RS=1,R/W=0,EN=0
    Delay(100);
}

void Delay(unsigned int DelayCount)
{
    while(--DelayCount);
}
```

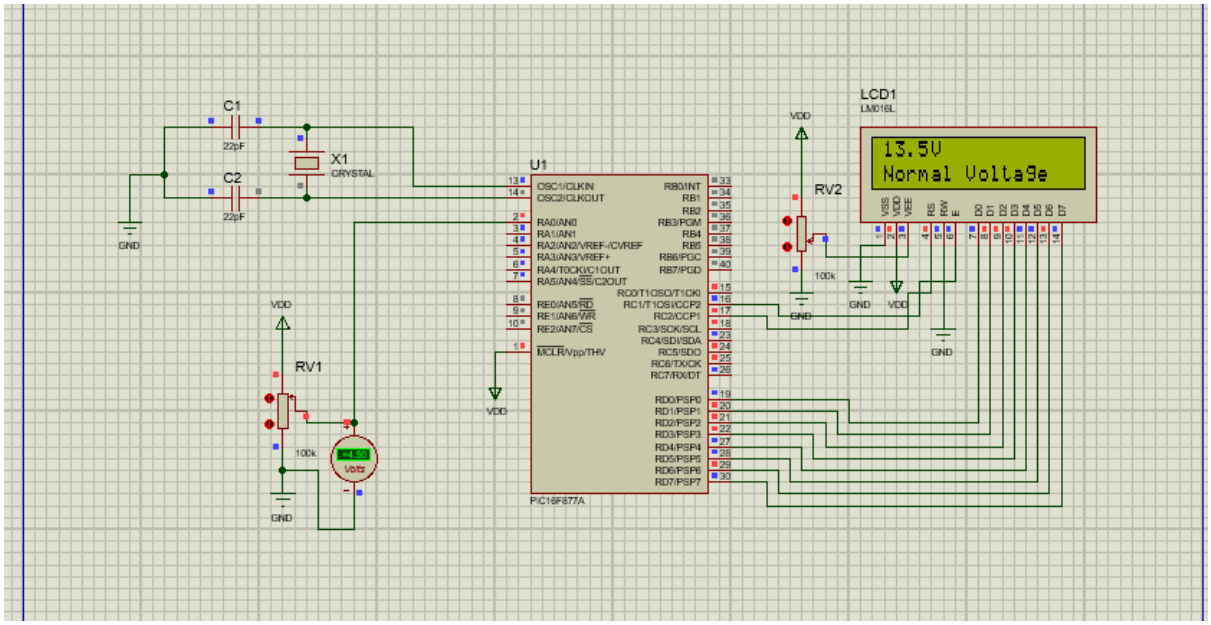
PICSIMLAB - Output

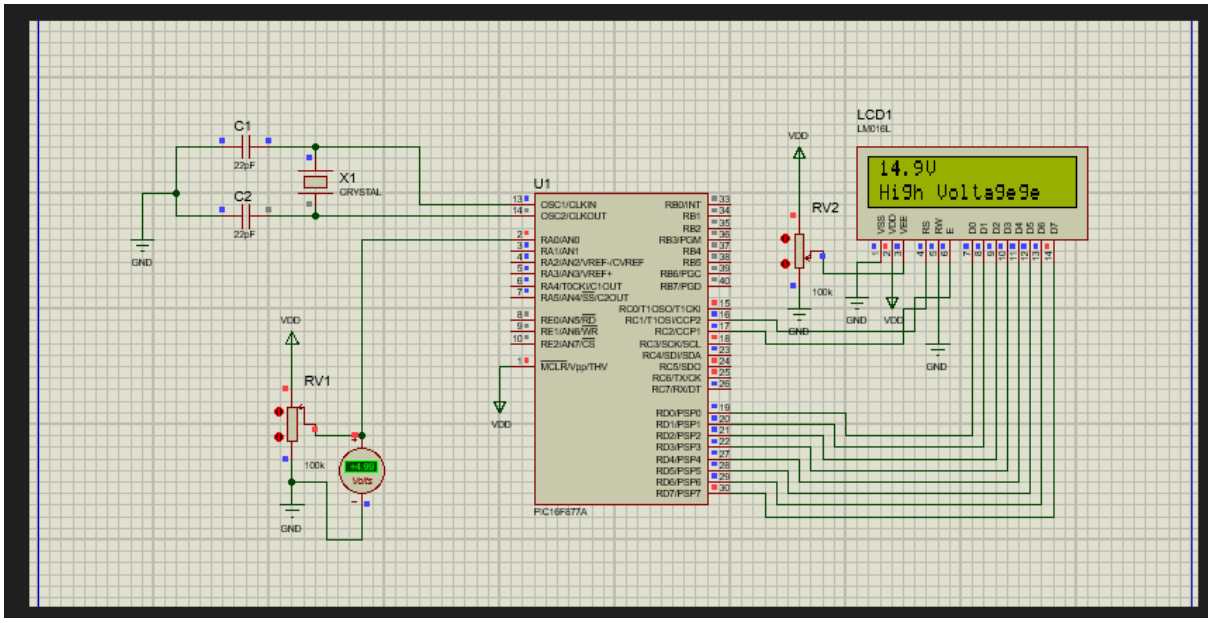



PICSimLab - PICGenios - PIC16F877A - Task2.hex
File Board Microcontroller Modules Tools Help
Clock (MHz)
8
Debug
LCD
hd44780 16x2
Heater
Cooler
Temp: 27.50°C
10.9V
High Voltage
MAX232
SN75178
RELE2
RELE1
RB2/INT2
RB1/INT1
RB0/INT
DIS1 DIS2 DIS3 DIS4
LED1 PORTD
LED2 PORTB
1 2 3 RB3
4 5 6 RB4
7 8 9 RB5
* 0 # RA5
24C04
DS1307
PIC
RESET
7805
PICSimLab
ICSP
PWR
Running...
Debug: MDB:1234
Serial: com6:9600(0.0%)


C1
22pF
C2
22pF
X1
CRYSTAL
GND
U1
PIC16F877A
RV1
10k
RV2
10k
VDD
LCD1
LM016L
10.4V
Low Voltage


C1
22pF
C2
22pF
X1
CRYSTAL
GND
U1
OSC1/CLKIN
OSC2/CLKOUT
RA0/AN0
RA1/AN1
RA2/AN2/VREF-/CVREF
RA3/AN3/VREF+
RA4/T0CKI/C1OUT
RA5/AN4/SS/C2OUT
RE0/AN5/RD
RE1/AN6/WR
RE2/AN7/CS
MCLR/Vpp/THV
RB0/INT
RB1
RB2
RB3/PGM
RB4
RB5
RB6/PGC
RB7/PGD
RC0/T1OSO/T1CKI
RC1/T1OSI/CCP2
RC2/CCP1
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX/CK
RC7/RX/DT
RD0/PSP0
RD1/PSP1
RD2/PSP2
RD3/PSP3
RD4/PSP4
RD5/PSP5
RD6/PSP6
RD7/PSP7
PIC16F877A
VDD
RV1
100k
4.63
Volts
RV2
100k
LCD1
LM016L
11.9V
Normal Voltage
VSS
VDD
VEE
RS
RW
E
D0
D1
D2
D3
D4
D5
D6
D7


C1
22pF
C2
22pF
X1
CRYSTAL
GND
U1
OSC1/CLKIN
OSC2/CLKOUT
RA0/AN0
RA1/AN1
RA2/AN2/VREF-/CVREF
RA3/AN3/VREF+
RA4/T0CKI/C1OUT
RA5/AN4/SS/C2OUT
RE0/AN5/RD
RE1/AN6/WR
RE2/AN7/CS
MCLR/Vpp/THV
RB0/INT
RB1
RB2
RB3/PGM
RB4
RB5
RB6/PGC
RB7/PGD
RC0/T1OSO/T1CKI
RC1/T1OSI/CCP2
RC2/CCP1
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX/CK
RC7/RX/DT
RD0/PSP0
RD1/PSP1
RD2/PSP2
RD3/PSP3
RD4/PSP4
RD5/PSP5
RD6/PSP6
RD7/PSP7
PIC16F877A
VDD
RV1
100k
4.63
Volts
RV2
100k
LCD1
LM016L
13.5V
Normal Voltage
VSS
VDD
VEE
RS
RW
E
D0
D1
D2
D3
D4
D5
D6
D7



Task 3: 7 Segment Display with Transistor Multiplexer

Description:

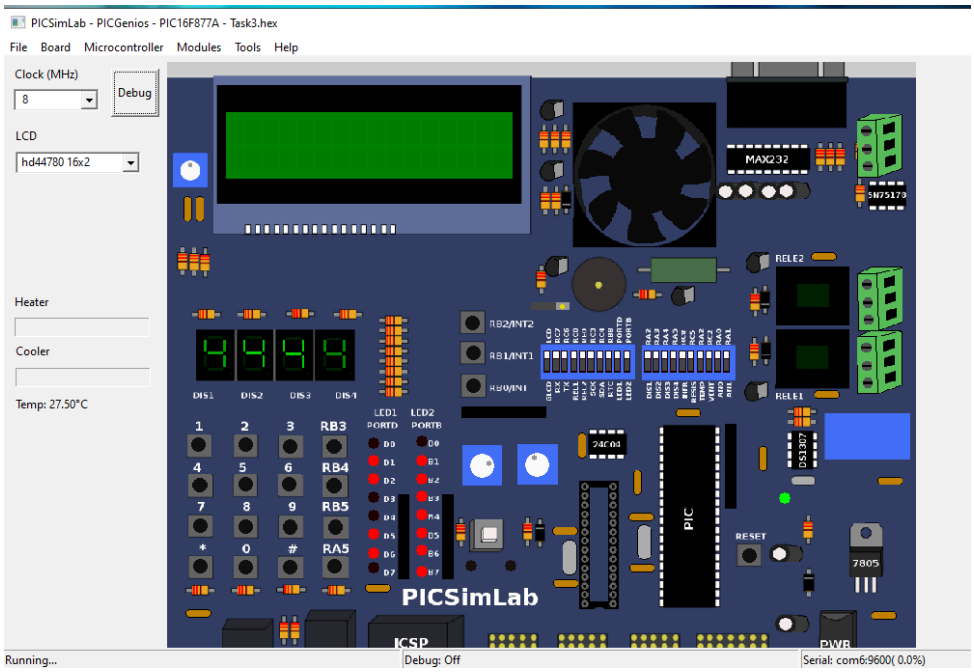
1. PORT D is configured as common inputs for the 4 7 Segment Display
2. PORTA is used as Multiplexer used to select particular 7 Segment Display

Code – PICSIMLAB

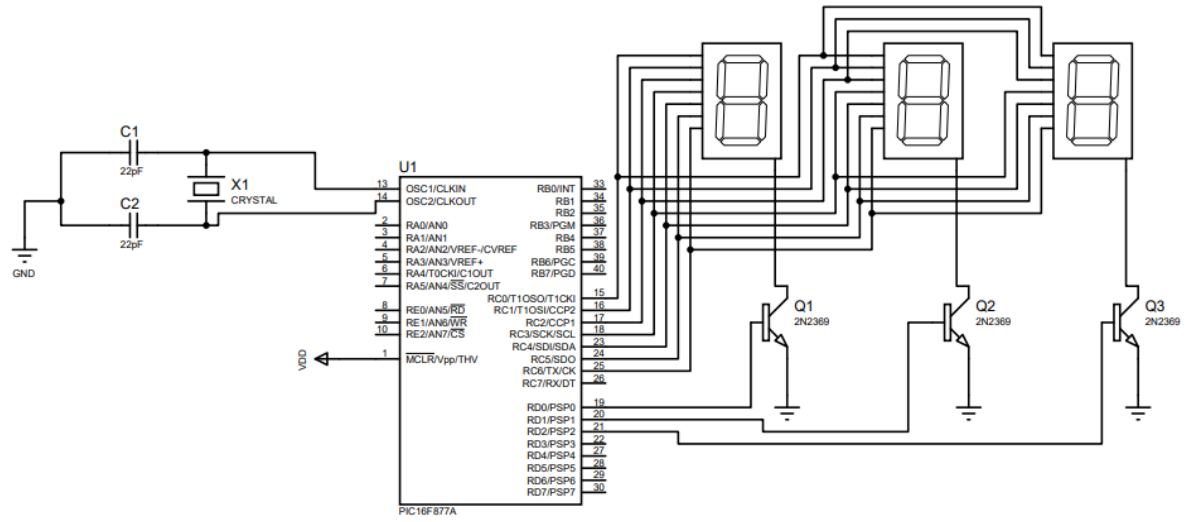
```
void main()
{
  unsigned int i,j;
  TRISD = 0x00;    //7 Segment Display output
  TRISA = 0x00;    //Transistor Multiplexer output
  while(1)
   {
      for(i =0; i < 10; i++)
      {
        PORTD = digits[i];
        for(j= 0; j <4 ; j++)
        {
          PORTA = 0x20 >> j;
          Delay_ms(30);
        }
        Delay_ms(50);
      }
   }
```

}

PICSIMLAB - Output



Schematic: with 3 Segment Display



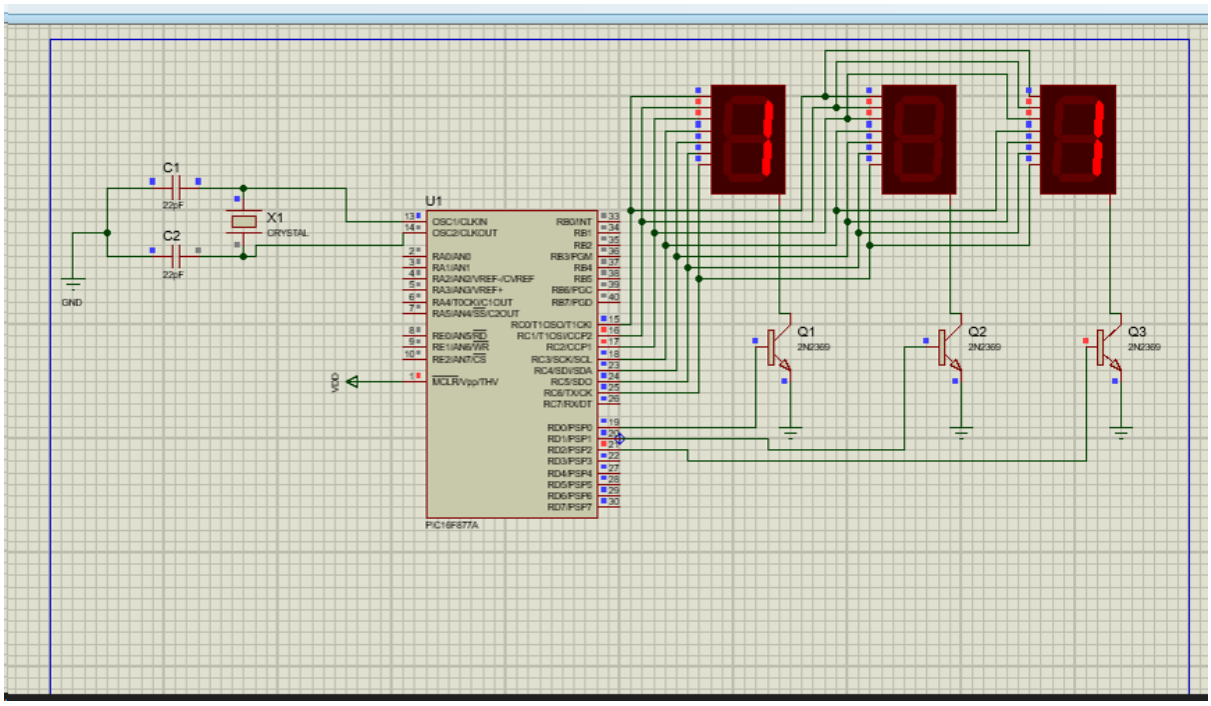
-

Code:

```
//RA2-RA5 - Transistor Mux

//RD0-RD7 - LED OUTPUT


#define D0 0x3F

#define D1 0x06
```

```
#define D2 0x5B
#define D3 0x4F
#define D4 0x66
#define D5 0x6D
#define D6 0x7D
#define D7 0x07
#define D8 0x7F
#define D9 0x6F

unsigned int digits[10] = {D0, D1, D2, D3, D4, D5, D6, D7, D8, D9};

void main()
{

  unsigned int i,j;

  TRISC = 0x00;   //7 Segment Display output
  TRISD = 0x00;   //Transistor Multiplexer output

  while(1)
   {
      for(i =0; i < 10; i++)
      {
        PORTC = digits[i];
        for(j= 0; j <3 ; j++)
        {
          PORTD = 0x4 >> j;
          Delay_ms(30);
        }

      }
   }

}
```

Proteus Output:


C1
22pF
C2
22pF
X1
CRYSTAL
GND
U1
OSC1/CLKIN
OSC2/CLKOUT
RA0/AN0
RA1/AN1
RA2/AN2/VREF-/CVREF
RA3/AN3/VREF+
RA4/T0CKI/C1OUT
RA5/AN4/SS/C2OUT
RE0/AN5/RD
RE1/AN6/WR
RE2/AN7/CS
MCLR/Vpp/THV
VDD
RB0/INT
RB1
RB2
RB3/PGM
RB4
RB5
RB6/PGC
RB7/PGD
RC0/T1OSO/T1CKI
RC1/T1OSI/CCP2
RC2/CCP1
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX/CK
RC7/RX/DT
RD0/PSP0
RD1/PSP1
RD2/PSP2
RD3/PSP3
RD4/PSP4
RD5/PSP5
RD6/PSP6
RD7/PSP7
PIC16F877A
Q1
2N2369
Q2
2N2369
Q3
2N2369