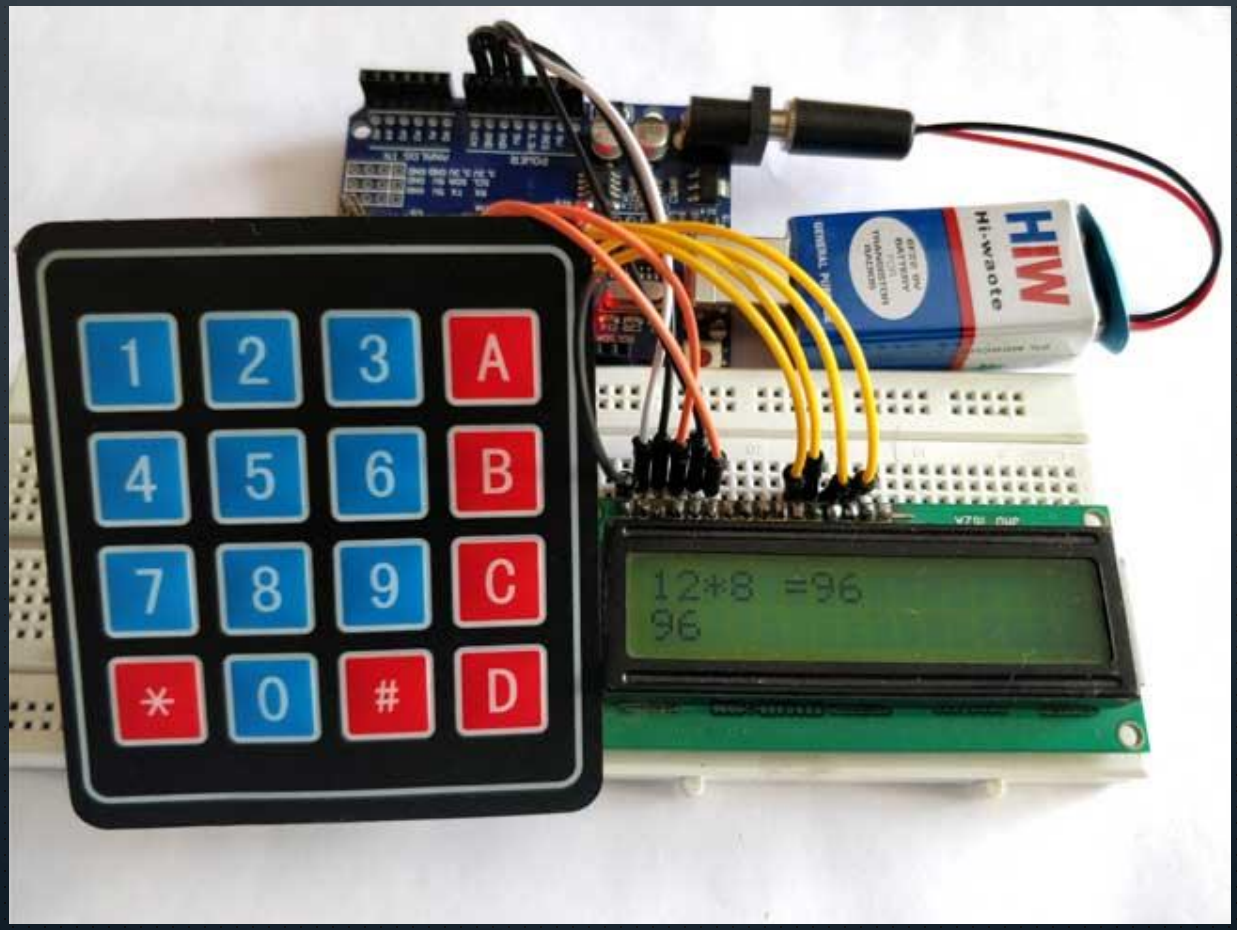
SIMPLE CALCULATOR PROJECT



PROJECT TEAM:

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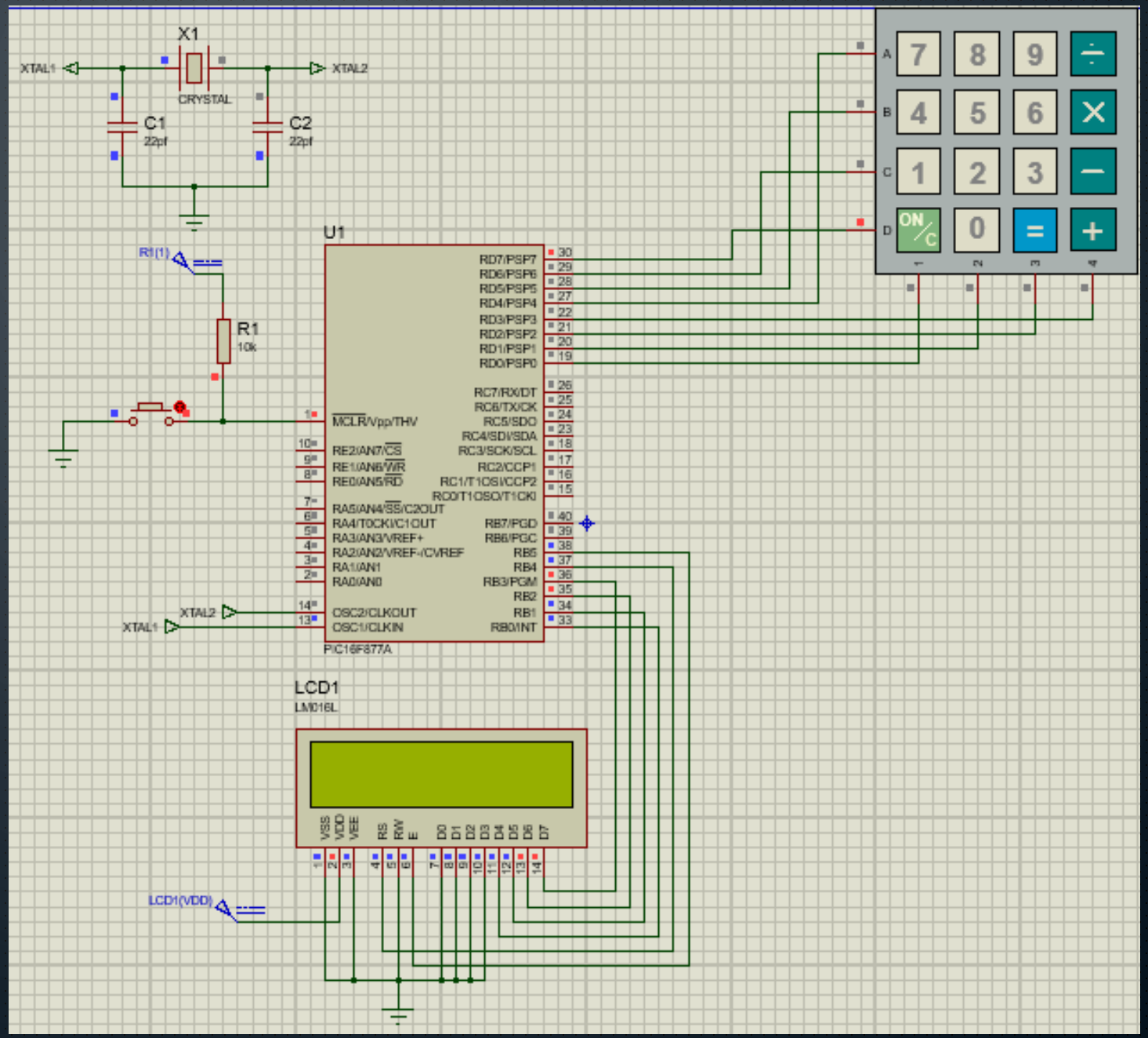
SUMMARY:

A simple 4 x 4 calculator project to make basic calculation functions of one digit and one digit, using mikroC for programming the microcontroller, and proteus for simulating the calculation process.

USED COMPONENTS:

- Interactive 4 x 4 matrix keypad for a small calculator.
- PIC16f877a microcontroller IC.
- 16*2 Alphanumeric LCD.

THE HARDWARE CONNECTION:



THE CODE

Error Function:

1- print "error" on the LCD screen.

2- make "error" disappear from LCD only if 'c' button is clicked.

```
// print error
void err()
{
      lcd_cmd(_LCD_CLEAR);
      lcd_out_cp("error");
      while(allowed!= 13){
          allowed = keypad_key_click();
      }
      lcd_cmd(_LCD_CLEAR);

}
```

THE CODE

Input Function:

1- allow taking 3 input

number + op (+,-,/,*) + number.

2- determine what the clicked button represent.

3- save expression in num[ ] to be parsed after = is clicked.

```
// take number and operation
int  take_input()
{
        int f = 0;
        for(i = 0 ; i < 4; i++)
              num[i] = 0;
        for(i = 0 ; i < 4; i++)
        {
              while(num[i]== 0){
                  num[i] = keypad_key_click();
              }
              while(num[i]!= 15 && i==3&&num[i]!=13)
              {
                 num[i] = keypad_key_click();
              }
            // define buttons
            if(num[i]==1) num[i] =  '7';
            if(num[i]==2) num[i] =  '8';
            if(num[i]==3) num[i] =  '9';
            if(num[i]==4) num[i] = '/' ;
            if(num[i]==5) num[i] =  '4';
            if(num[i]==6) num[i] =  '5';
            if(num[i]==7) num[i] =  '6';
            if(num[i]==8) num[i] =  '*';
            if(num[i]==9) num[i] =  '1';
            if(num[i]==10) num[i] =  '2';
            if(num[i]==11) num[i] =  '3';
            if(num[i]==12) num[i] =  '-';
            if(num[i]==13) {lcd_cmd(_LCD_CLEAR); f = 1; break;}
            if(num[i]==14) num[i] =  '0';
            if(num[i]==15) num[i] =  '=';
            if(num[i]==16) num[i] =  '+';
            lcd_chr(1,i+1,num[i]);
        }
        return f;
}
```

THE CODE

Parse Function:

1- parse num[ ] and determine operation.

2- convert result into string (res_text) to be printed.

3- return 1 if the expression is wrong (222,++2,2++).

```
// calc result
int  parse()
{
     if(num[0]<'0'||num[0]>'9'||num[2]<'0'||num[2]>'9') return 1;
     if(num[1]=='+')
        {
           int res;
           res = (num[0]-'0')+(num[2]-'0');
           FloatToStr(res,res_text);
           return 0;
        }
        else if(num[1]=='-')
        {
           int res;
           res = (num[0]-'0')-(num[2]-'0');
           FloatToStr(res,res_text);
           return 0;
        }

       else if(num[1]=='*')
        {
           int res;
           res = (num[0]-'0')*(num[2]-'0');
           FloatToStr(res,res_text);
           return 0;
        }
        else if(num[1]=='/')
        {
           float res;
           tmp = (num[0]-'0');
           res = tmp/(num[2]-'0');
           FloatToStr(res,res_text);
           return 0;
        }
        else  return 1;
}
```

THE CODE

Print Function:

1-erase LCD to print result.

2- prevent taking input before button 'c' is clicked to clear LCD.

```
// print result
void print_result()
{
     lcd_cmd(_LCD_CLEAR);
     lcd_out_cp(res_text);
     while(allowed!= 13){
          allowed = keypad_key_click();
     }
    lcd_cmd(_LCD_CLEAR);
}
```

THE CODE

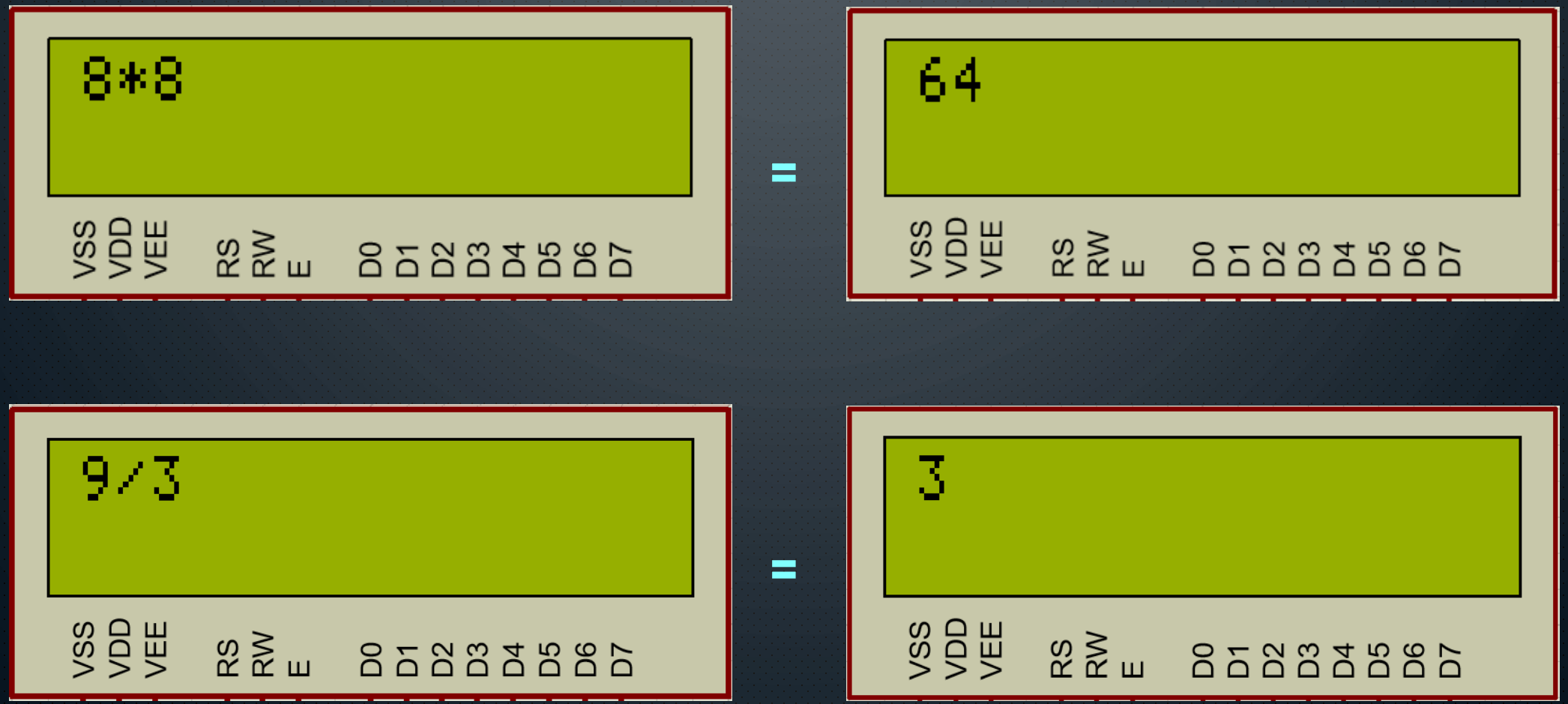
Main Function:

1- allow taking input forever.

2- if parse returns 1, the error function is called.

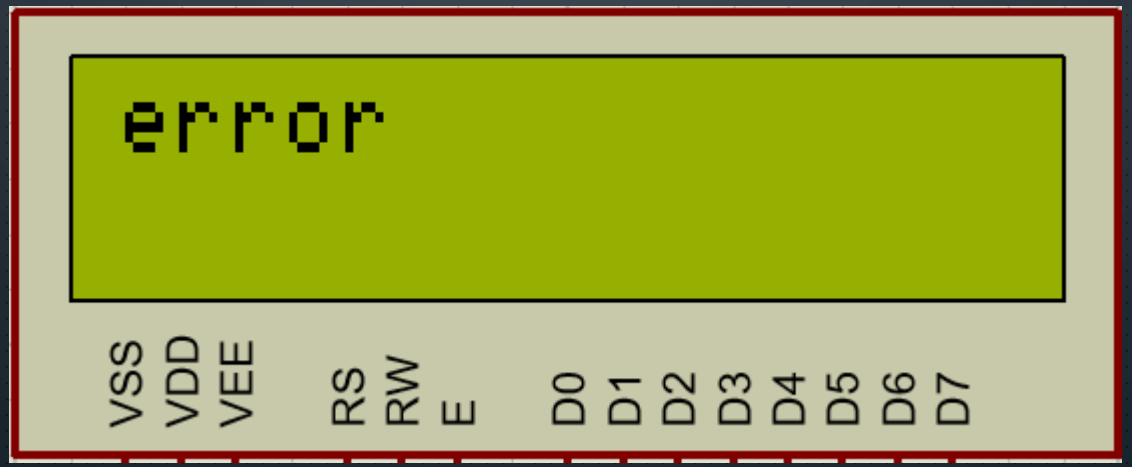
```
void main() {
     lcd_init();
     keypad_init();
     lcd_cmd(_LCD_CLEAR);
     lcd_cmd(_LCD_CURSOR_OFF);
     while(1)
     {
        allowed = 0;
        if(take_input()) {lcd_cmd(_LCD_CLEAR);continue;}
        if(parse()) {err();continue;}
        print_result();
     }
}
```

TEST SAMPLES



TEST SAMPLES

In case of wrong input or invalid operation, an “error” message will appear in the LCD.



THANK YOU