Pabna University of Science and Technology

Faculty of Engineering and Technology

Department of

Electrical, Electronic & Communication Engineering

Course Code: EECE 3232

Course Title: Sessional Based on Microprocessor and Embedded System

Lab Report

Submitted by:
Name: S. M. Habibullah
Roll: 180528
Year: 3rd Semester: 2nd
Session: 2017-18
Department of EECE, PUST

Submitted to:
Tarun Debnath
Lecturer
Department of ICE, PUST

Date of Submission: 18-01-2023

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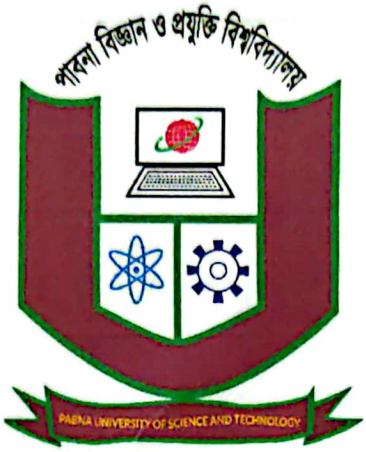

Faculty of Engineering and Technology

Department of

Electrical, Electronic & Communication Engineering

Course Code: EECE 3232

Course Title: Sessional Based on Microprocessor and Embedded System

Lab Report

Experiment No:	01
Experiment Name:	Interfacing the LED blinking using PIC16F877A microcontroller.

Submitted by:
Name: S. M. Habibullah
Roll: 180528
Year: 3rd Semester: 2nd
Session: 2017-18
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Date of Submission: 18-01-2023

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Name of the experiment :

Interfacing the blinking LED using PIC16F877A microcontroller.

Theory :

To interface an LED with the microcontroller, is the simplest and most commonly used example. It acts as a stepping stone for microcontroller development. It gives the basic idea of working with the controllers in practical environment.

In this LED blinking experiment, we will learn how to use input and output ports of PIC16F877A microcontroller as a digital output. We can also use these pints as input. In this experiment we should also know how to program in PIC microcontroller.

Features of PIC16F877A :

Some simplified features of PIC16F877A are given below.

1. CPU : 8-bit PIC
2. Number of pins: 40

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3. Operating voltage : 2 to 5.5 v
4. Number of I/O pins: 33
5. ADC module : 8 ch. 10 bit
6. Timer module : 8 bit (2), 16 bit (1)
7. Comparators : 2
8. External Oscillator : Up to 20 Mhz
9. Program memory type : Flash
10. Program memory : 14 kB
11. RAM Bytes : 368
12. Data EPROM : 256 bytes.

Apparatus:

Software:

(i) Proteus.
(ii) Mikro C.
(iii) PIC kit 2.

Hardware:

(i) PIC16F877A IC.
(ii) AVR burner.
(iii) crystal
(iv) Capacitor
(v) Resistor
(vi) LED
(vii) DC power Supply.

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Circuit Diagram:

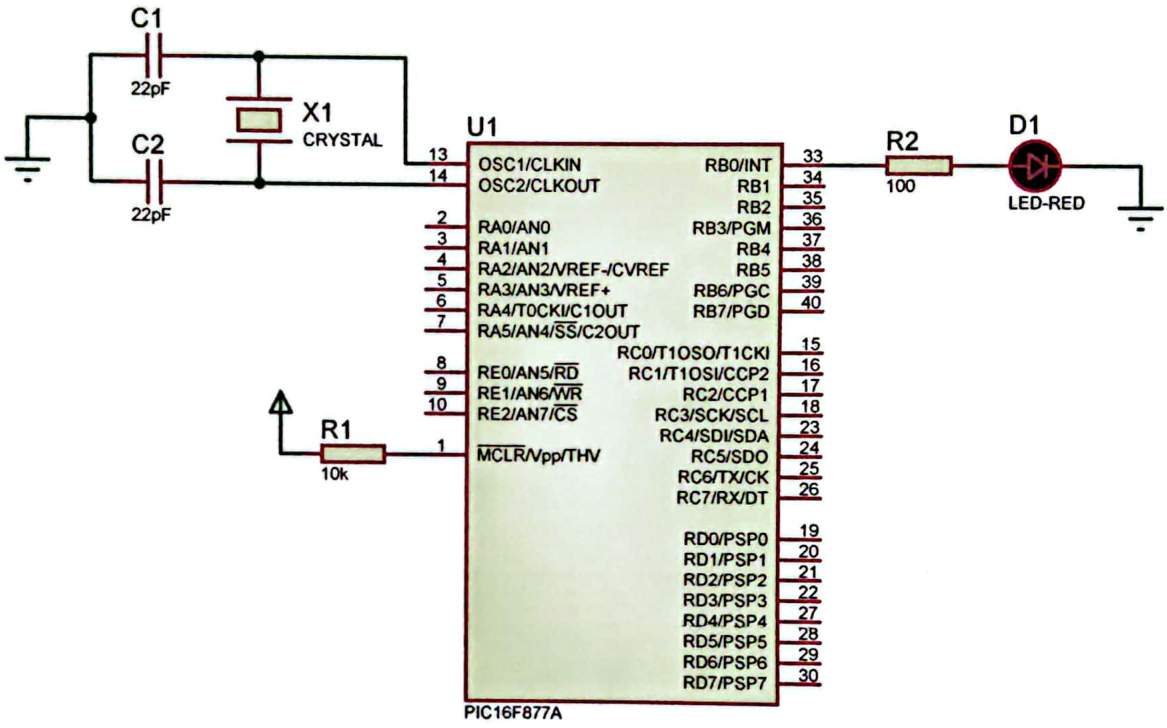

Figure: Interfacing the LED blinking using PIC16F877A.

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Mikro C code:

```
void main ( )
    {
        TRISB = 0 x 00 ;
        PORT B = 0 x 00 ;

        while (1)
                {
                PORT B f7 = 0x00
                delay-ms (300);
                PORTB.f7 = 0xff ;
                delay. ms (300);
                }

    }
```

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Result and discussion :

This is the experiment of interfacing on LED with the microcontroller PIC16F877A IC. We have sucessfully done this experiment. After completing all the simulated circuit connection on proteus we put the code into the IC and got the expected result. After simulation we brunt the IC to the micro-c code and got the final output that we desired. In this experiment we also know that how to write code on micro-c and how to upload the code to the IC. So, finally we can say, we have done this experiment successfully.

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Precautions :

(I) IC was connected with the AVR burner properly in the right direction.

(II) Necessary value of components were taken when simulated.

(III) All connections were given carefully when simulated.

(IV) AVR burner was not touched with wet hand and carefully handled.

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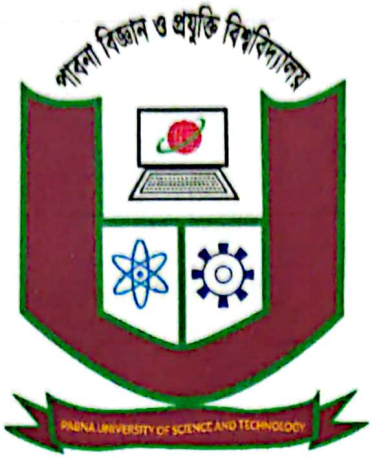

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Department of

Electrical, Electronic & Communication Engineering

Course Code: EECE 3232

Course Title: Sessional Based on Microprocessor and Embedded System

Lab Report

Experiment No:	02
Experiment Name:	Interfacing the 7 segment LED display using PIC16F877A microcontroller.

Submitted by:
Name: S. M. Habibullah
Roll: 180528
Year: 3rd Semester: 2nd
Session: 2017-18
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Date of Submission: 18-01-2023

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Name of the experiment :

Interfacing the 7 segment LED display using PIC16F877A micro controller.

Objectives :

1. To design the circuit diagram for 7 segment LED display using PIC16F877A.
2. To perform interfacing with 7 segment display.

Theory :

A seven segment display module is an electronic device that is used to display digital numbers and it is made up seven LED segments. LEDs are special type of p-n junction diode which can emitt light. Because of the small size of the LED, it is very useful and it works efficiently. When LEDs are connected in forward biased condition, then it emits light. A seven segment display can display only 0 to 9 numbers.

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There are two types of seven segment display.

(i) Common cathode.

(ii) Common Anode.

Common Cathode: If all the LEDs cathode terminal are common and connected to the ground then it is called common cathode.

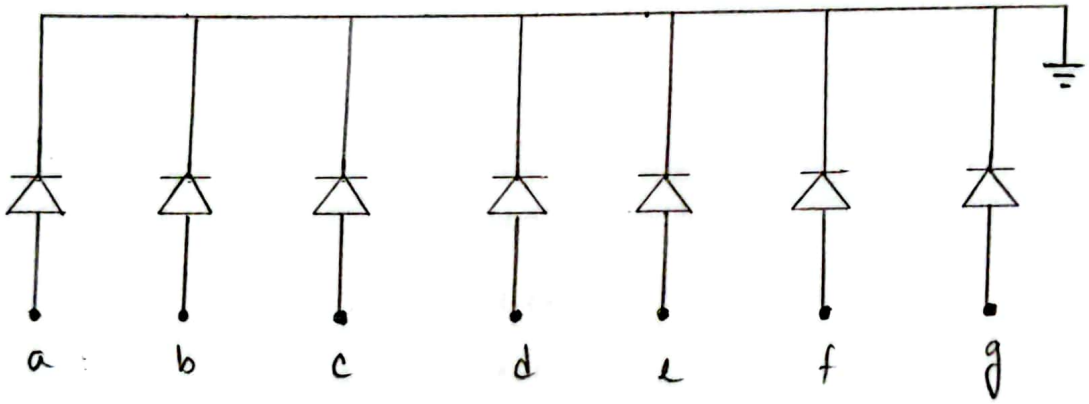

Fig-a: Common Cathode

Common Anode: If all the LEDs anode terminals are common and connected together the it is called common Anode connection.

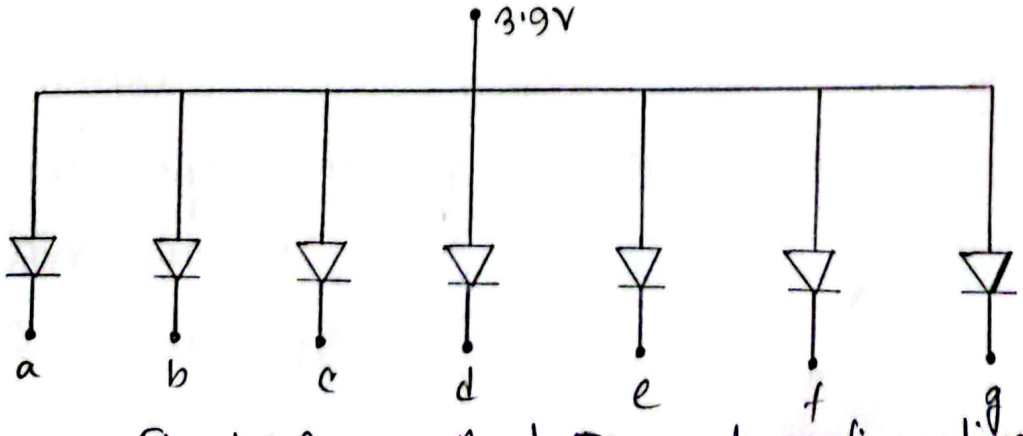

Fig-b: Common Anode 7segment configuration

Hex value of '0' to '9' for common cathode is given below :—

Digit :	Hex value :
0	0x3f
1	0x06
2	0x5b
3	0x4f
4	0x66
5	0x6d
6	0x7d
7	0x07
8	0x7f
9	0x6f

Appratus :

Hardware :

(I) PIC16F877A IC
(II) Capacitors
(III) Resistors
(IV) Crystal
(V) Seven segment display (common cathode)
(VI) AVR burner
(VII) DC power Supply

Software :

(I) Proteus 7s7s
(II) Mikro C
(III) PIC kit 2

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Circuit Diagram:

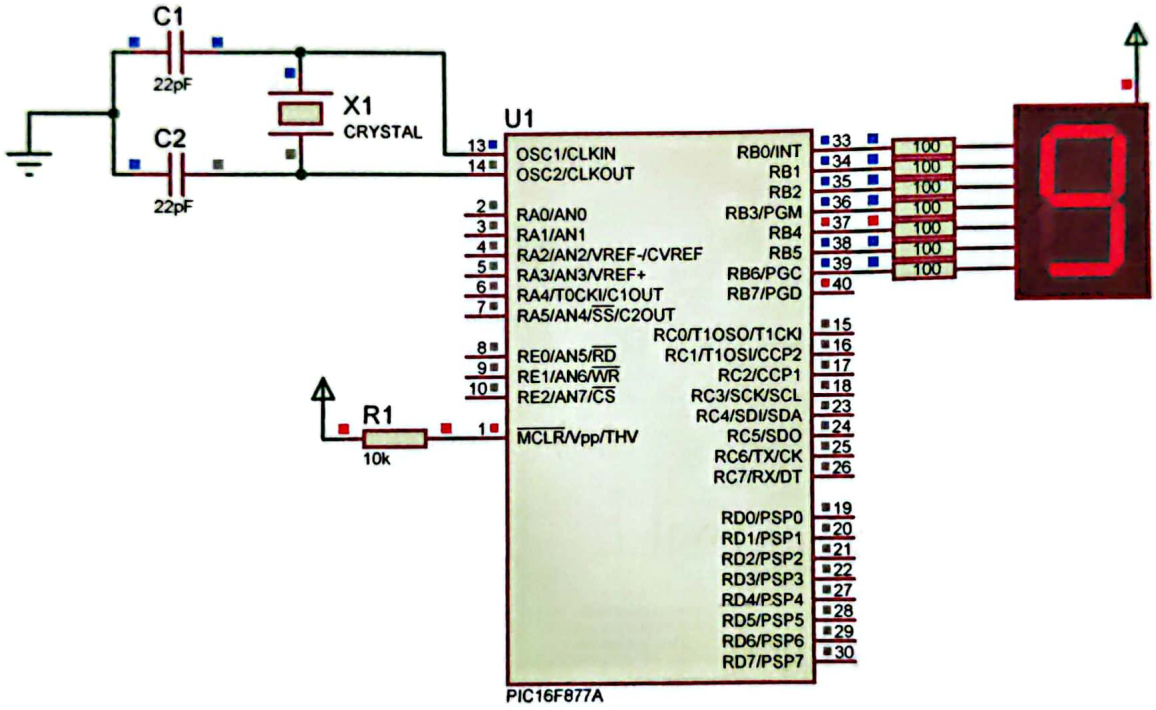

FIgure: Interfacing 7 segment LED display using PIC microcontrooler.

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Micro C program:

```
char A[] = {0x3F, 0x06, 0x5B, 0x4F, 0x66,
            0x6D, 0x7D, 0x07, 0x7F, 0x6F};

int i;
void main()
{
  TRISB = 0;
  PORTB = 0;
  while(1)
  {for (i=0; i<=9; i++)
   { PORTB = A[i];
     delay_ms(500);
   }
  }
}
```

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Result and discussion:

This is the experiment of seven segment LED display using PIC microcontroller. We have successfully done this experiment. In this ex-periment we have come to know the construction and working of seven segment display. Firstly we constructed the circuit diagram in proteus, then upload the mikro-c code to the IC and observed. the simulated result. After this we burned the code to the IC in practical result. We find that the digit was changing continuously with a given time delay. So, we can say we have done this experiment successfully and completely.

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Precautions:

(i) IC was connected with the AVR burner properly in the right direction.

(ii) Necessary value of components were taken when simulated.

(iii) All connections were given carefully when simulated.

(iv) AVR burner was not touched with wet hand and carefully handled.

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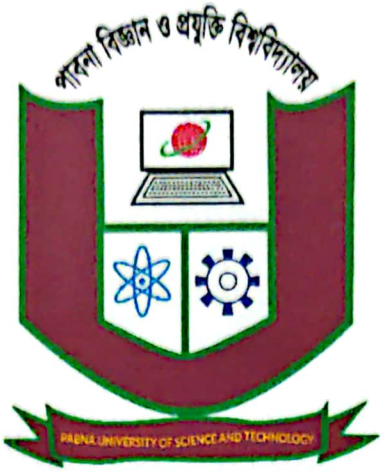

Faculty of Engineering and Technology

Department of

Electrical, Electronic & Communication Engineering

Course Code: EECE 3232

Course Title: Sessional Based on Microprocessor and Embedded System

Lab Report

Experiment No:	03
Experiment Name:	Multiplexing of Seven segment display using PIC16F877A microcontroller.

Submitted by:
Name: S. M. Habibullah
Roll: 180528
Year: 3rd Semester: 2nd
Session: 2017-18
Department of EECE, PUST

Submitted to:
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Lecturer
Department of ICE, PUST

Date of Submission: 18-01-2023

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Name of the experiment:

Multiplexing of 7-segment LED Display using PIC microcontroller.

Theory:

This is the experiment of multiplexing seven segment LED display using PIC microcontroller. A single digit seven segment display can only show number from 0 to 9. A two digit display can show numbers between 0 to 99. Three digit display can show 0 to 999 and so on.

When more digits are required to be displayed. we need to come up with a better technique to connect more than single digit seven segment display to a microcontroller. If we connect them like the ordinary way than we need more pins and that is not appropriate. So the special technique we are going to use is called multiplexing. This is the common and widely used technique. By using this technique we can interface two or more seven segment display to a microcontroller.

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Two types of seven segment display are in use:

(i) Common Anode type:

Anodes of all LEDs are connected to a common pin, by applying low voltage to the segment input on each segment.

(ii) Common Cathode type:

Cathodes of all LEDs are connected to a common pin called common cathodes. To turn on the segment we need to apply high voltage compared to the common pin of the segments We have to keep in mind that the value of the voltage should be supported by the segments.

Figure-1 shows a 2-digit and 4-digit seven segment common cathode LED display respectively.

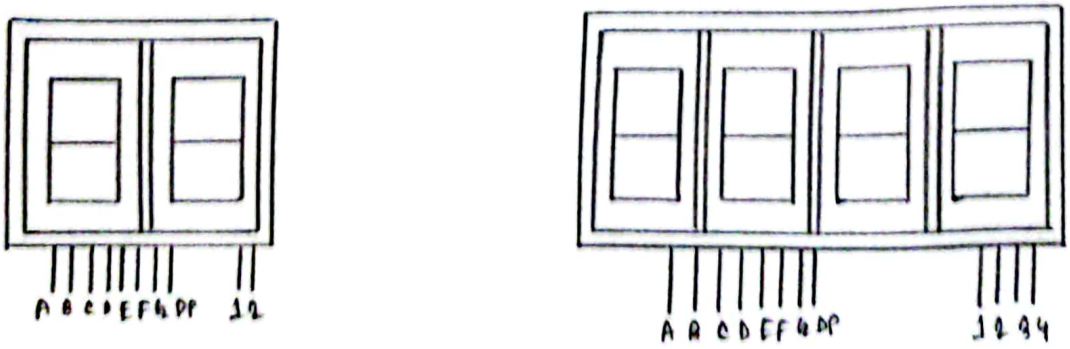

Fig-1 : 2-digit and 4-digit seven segment display.

Apparatus :-

Hardware :

(i) PIC16F877A IC

(ii) Crystal

(iii) Capacitors

(iv) Resistors

(v) Two digit seven segment LED display

(vi) Power supply

Software :

(i) Proteus

(ii) Mikro c pro

(iii) PIC kit 2.

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Circuit Diagram:

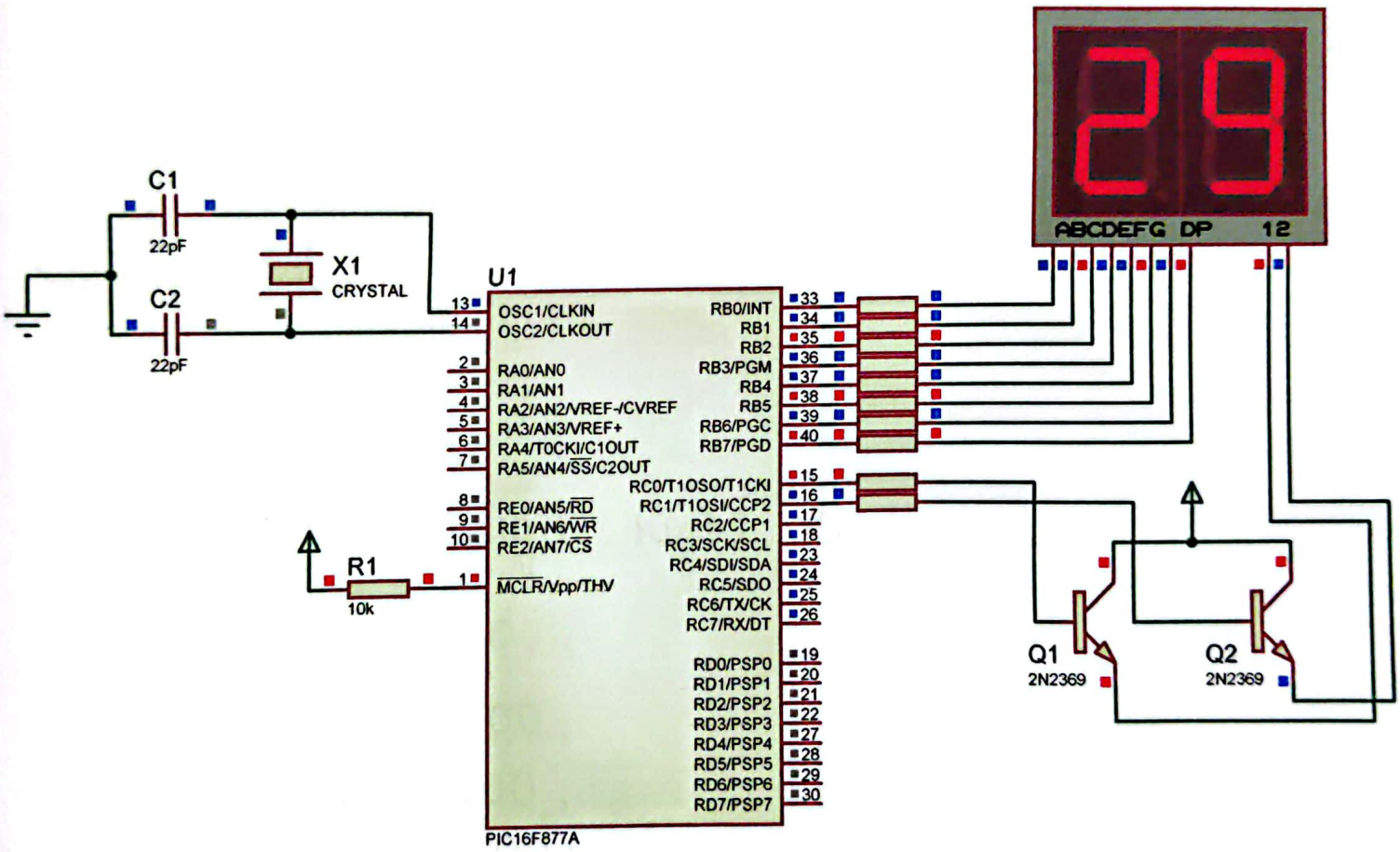

Figure: Multiplexing(2 digit) of 7 segment LED display using PIC microcontroller.

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Mikro C Code:

```
# Define digitL portc.f1
# Define digitR portc.f2

char array[] = {0x3f, 0x06, 0x5b, 0x4f, 0x66,
                0x6d, 0x7d, 0x07, 0x7f, 0x6f};

void main()
 {
    int i=0;
    int Left_digit, Right_digit, j;
    TRISB = 0x00;
    TRISC = 0x00;
    portb = 0x00;
    portc = 0x00:
    while(1)
     {
       Left_digit = i/10;
       Right_digit = i % 10;
       for(i=1; i<=50; j++)
        {
          portb = array[Left_digit]
          digitL = 0:
          delay_ms(10);
          digitL = 1;
```

```
portb = array[Right_digit];
digitR = 0;
delay_ms(10);
digitR = 1;
}
i++;
if(i>999)
{ i=0;
}
}
```

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Result and discussion:

This is the experiment of multiplexing seven segment LED display. We have successfully done this experiment. Our main purpose was to show number from 0 to 99 in a 2-digit seven segment display. We use portb as digit output and portc as the control output. The controll output makes an illusion to our digit in the same time. Here the control output portc.f1 and portc.f2 are getting turned off and on simultaneously with in 10 ms. So an illusion forms to our eyes and we see two different digits. This process is known us as multiplexing.

In this experiment we have reached our destination. So, we can say that, this experiment is completed successfully.

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Precautions :

(i) All pin connections was given properly.

(ii) All values were taken carefully when simulating on proteus.

(iii) Appropriate Mikro c programme was written and uploaded to the PIC microcontroller.

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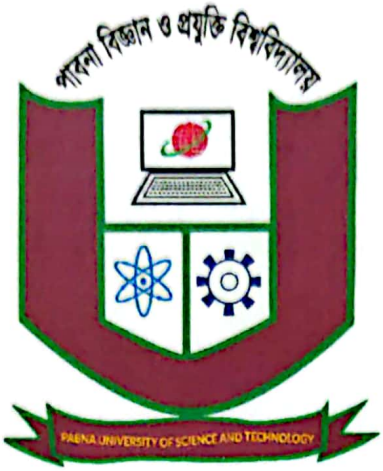

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Electrical, Electronic & Communication Engineering

Course Code: EECE 3232

Course Title: Sessional Based on Microprocessor and Embedded System

Lab Report

Experiment No:	04
Experiment Name:	Interfacing the Seven segment LED display with push button using PIC16F877A microcontroller.

Submitted by:
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Roll: 180528
Year: 3rd Semester: 2nd
Session: 2017-18
Department of EECE, PUST

Submitted to:
Tarun Debnath
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Department of ICE, PUST

Date of Submission: 18-01-2023

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Name of the experiment:

Interfacing the seven-segment LED display with push button using PIC micro-controller.

Objective:

(i) To interface the seven-segment display with push button using PIC microcontroller.

(ii) To observe the output changing through push button.

Theory:

This is the experiment of interfacing seven-segment LED display with push button using micro-controller. In this experiment we will show how change occurs when we press the push button. A push button is a simple type of switch that controls an action in a machine or some type of process.

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The push button can be normally open or normally closed. Push button switchs have three parts. The actuator stationary contacts and the grooves.

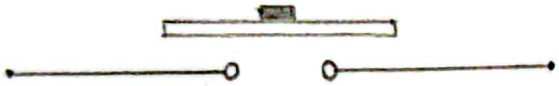

Fig 1 : Push button.

In this experiment we are going to know that is. when we push the switch, the digit that is shown in the led display will change. It will increase by one switch and decrease by another switch.

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Apparatus required :

Hardware part:

(i) PIC 16F877A IC
(ii) Crystal
(iii) Capacitors
(iv) Resistors
(v) LED display (7-segment)
(vi) Push button
(vii) Power supply
(viii) Jumper wires.

Software part:

(i) Proteus
(ii) Mikro-C pro
(iii) PIC kit 2.

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Circuit Diagram:

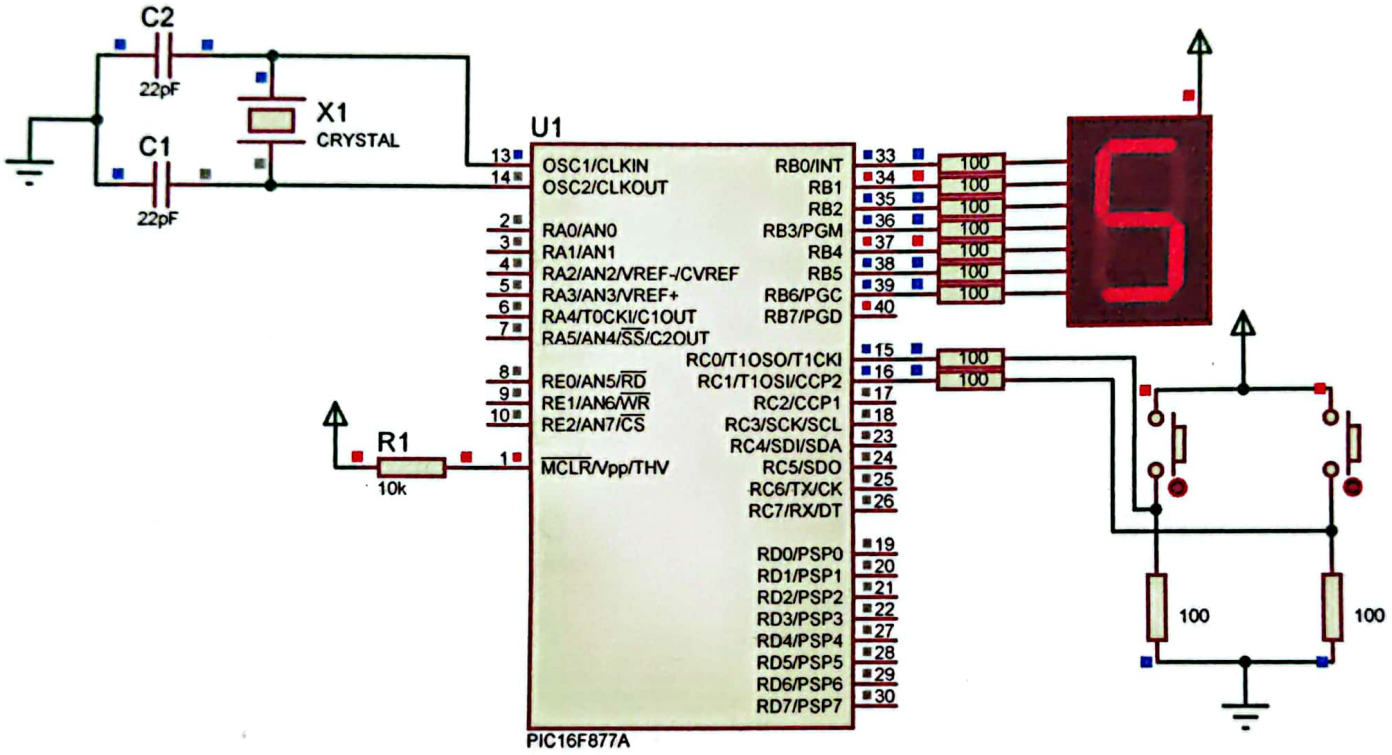

Figure: Interfacing 7 segment LED with push button using PIC microcontroller.

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Mikro-C Code:

```
char array [] = {0x3f, 0x06, 0x5b, 0x4f, 0x66,
    0x6d, 0x7d, 0x07, 0x7f, 0x6f};
void main ( )
{   int i = 0;
    TRISB = 0x00;
    TRISC = 0xff;
    portb = 0x00;
    portc = 0x00;
    while (1)
    {  portb = array [i];
       if (portc.f4 == 1)
          {
            delay-ms (100);
           if (portc.f4 == 1)
             {
               i++;
               if (i>9) i=0;
               portb = array [i];
               delay-ms(1000);
             }

          }
```

```
if (port.f5 =1)
  { delay-ms(100);
    if(porte.f5 == 1)
      {
        i...i
        if(i<0) i=9;
        port b = array[i];
        delay-ms (1000);
      }
  }
}
```

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Result and discussion:

We have successfully done this experiment. This is the experiment of interfacing 7 segment LED display with push button using PIC microcontroller. Here we use two push button. One is for increasing the digit that is shown on the display. A signal digit display can show only '0' to '9' digit. Here when we press 1st switch the digit starts to change from 0 to 1. After every pressing it changes one digit. Maximum value that it reach is 9. After 9 it comes back to '0' again. The second switch does just reverse of the 1st switch. So, we can say, we have successfully done the experiment.

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Precautions :

(I) All the connections were made properly.

(II) All the values that is given in the code were carefully.

(III) Appropriate mikro C program was written and uploaded to the IC.

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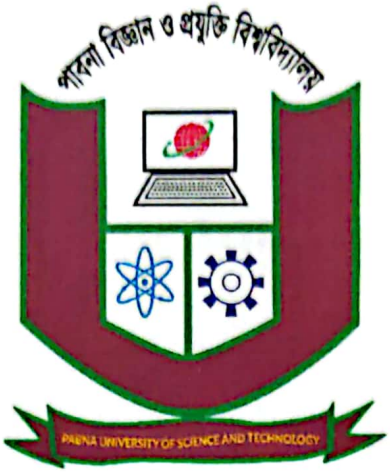

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Lab Report

Experiment No:	05
Experiment Name:	Interfacing the Relay using PIC16F877A microcontroller.

Submitted by:
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Year: 3rd Semester: 2nd
Session: 2017-18
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Date of Submission: 18-01-2023

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Name of the experiment:

Interfacing the relay with PIC microcontroller.

Objectives:

(i) To interface the relay with PIC micro-controller.

(ii) Switching the AC device by relay with PIC microcontroller.

Theory:

A relay is an electromagnetic switch which is used to switch High voltage or current using low power circuit. Relay isolates low power circuits from high power circuits. It is activated by energizing a coil wounded on a soft iron core. A relay should not be connected directly to a micro controller, it needs a driving circuit.

A relay can be easily interfaced with micro-controller using a transistor as shown in the

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circuit diagram. Transistor is wired as a switch which carries the current required for operation of the relay. When the pin Rb0 of the PIC microcontroller goes high, the transistor turns on and current flows through the relay. The diode is used to protect transistor and the microcontroller from back EMF generated in the relays coil. Normally 1N4007 is preffered. This diode is also known as freewheeling diode.

Appratus:

Hardware:-

(i) PIC16F877A IC
(ii) Crystal
(iii) Resistors
(iv) Capacitors
(v) Relay
(vi) Transistor
(vii) Diode
(viii) Bulb (DC 24V)
(ix) 24 DC power supply
(x) Jumper wires

Software:-

(i) Proteus
(ii) Mikro C pro
(iii) PIC kit 2

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Circuit Diagram:

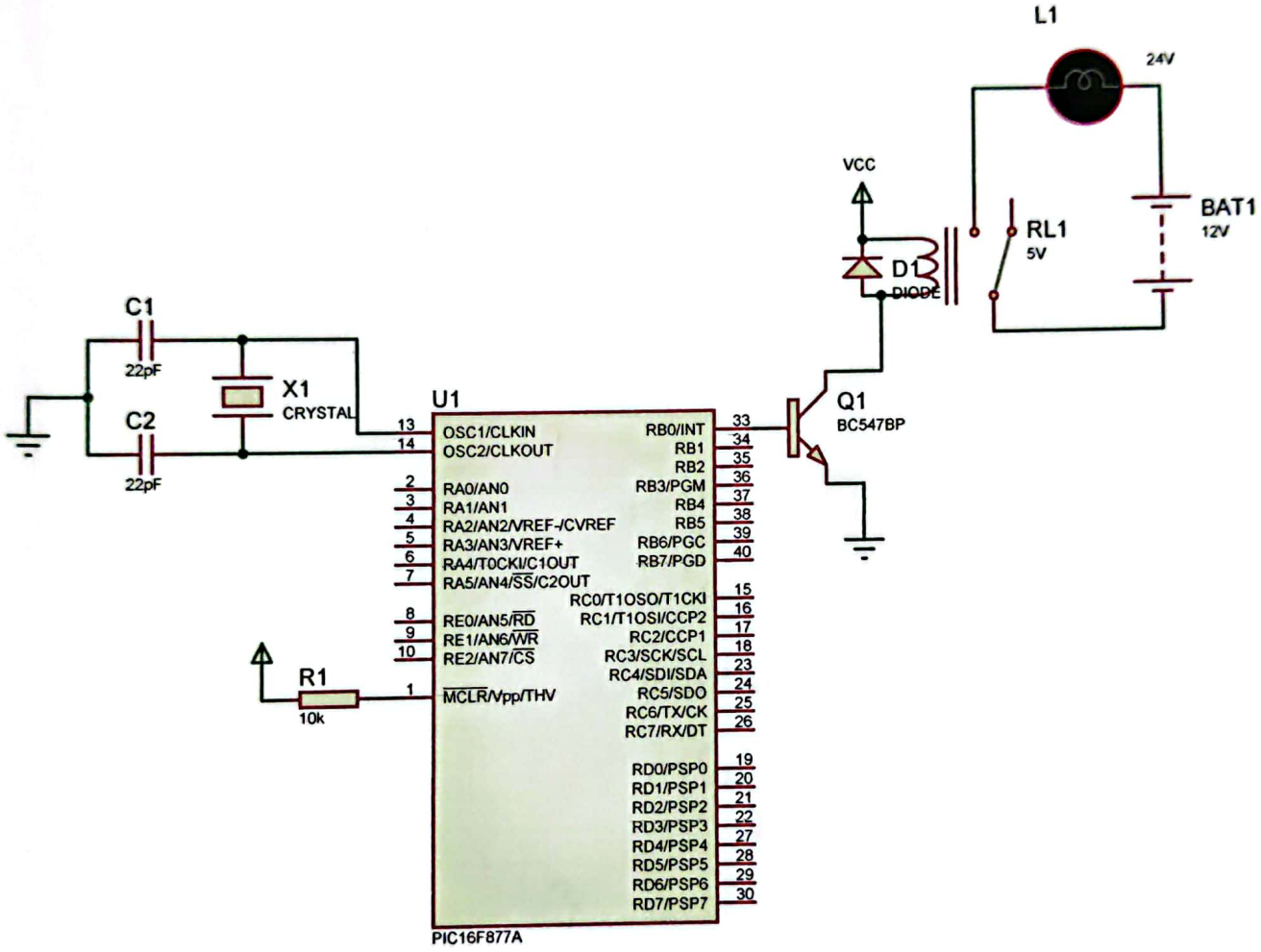

Figure: Interfacing the Relay using PIC microcontroller.

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Mikro - C Code :-

```
void main ( )
    {
        TRISB = 0x00 ;
        portb = 0x00 ;
            while (1)
            {
                portb.f0 = 1 ;
                delay_ms (1000) ;
                portb.f0 = 0 ;
                delay_ms (1000) ;
            }
    }
```

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Result and discussion :

This is the experiment of interfacing relay with PIC microcontroller. We have successfully done this experiment. Here we use a transistor to operate the relay. When we apply logical high to the base of the transistor it becomes saturated and becomes like a short circuit. And also the relay get its operating voltage i.e. 12V. The transistor becomes turn off and on after every one second and the relay also become switching after every one second. So, we can say that, we have done this experiment completely and successfully.

Precautions :

(i) All connections were made accurately.

(ii) Appropriate code was written and uploaded to the IC.

(iii) Mikro C code was written so accurately and precisely.

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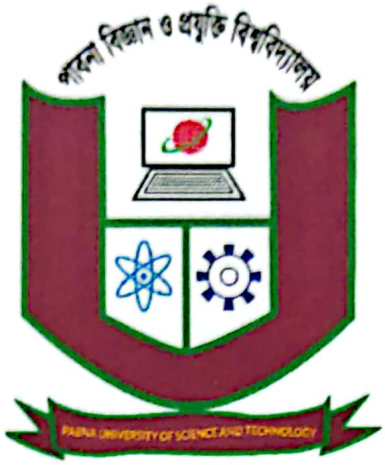

Faculty of Engineering and Technology

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Electrical, Electronic & Communication Engineering

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Lab Report

Experiment No:	06
Experiment Name:	Interfacing PWM and speed control of DC motor using PIC16F877A microcontroller.

Submitted by:
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Date of Submission: 18-01-2023

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Name of the experiment:

Interfacing PWM and speed control of DC motor with PIC micro-controller.

Objectives:

(i) Interfacing pulse width modulation.

(ii) To interface the speed control of a DC motor with PIC micro controller.

Theory:

In this experiment we will learn how to control the speed of a DC motor using pulse width modulation (PWM). By using PWM we can easily control the average power delivered to a load and by thus we can easily control the speed of a DC motor.

The speed of a dc motor is related to the variation of the duty cycle of the PWM signal. The DC motor reaches its maximum speed when the duty cycle is equal to 100% (255 for 8-bit resulation).

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PWM:

This is a method to control the output voltage with constant frequency switching and by adjusting on the duration of switching and in other words by changing the duty cycle of switching.

Here,

$$\text{duty cycle} = \frac{\text{on time}}{\text{on time} + \text{off time}} \times 100\%$$

The duty cycle can not be greater than 1 or 100%. Because on time will always be less than the total time period of switching frequency. The relation-ship of input-output voltage and the duty cycle is

Output voltage = duty cycle * input voltage

Hence the output voltage and duty cycle is directly related to each other. However, their output also depends on switching frequency of the switch.

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Duty cycle:

When the signal is high, we call this 'on time'. To describe the amount of 'on time', we use the concept of duty cycle. Duty cycle is measured in percentage. The % duty cycle describes the % of time a digital signal is on over an interval or period of time.

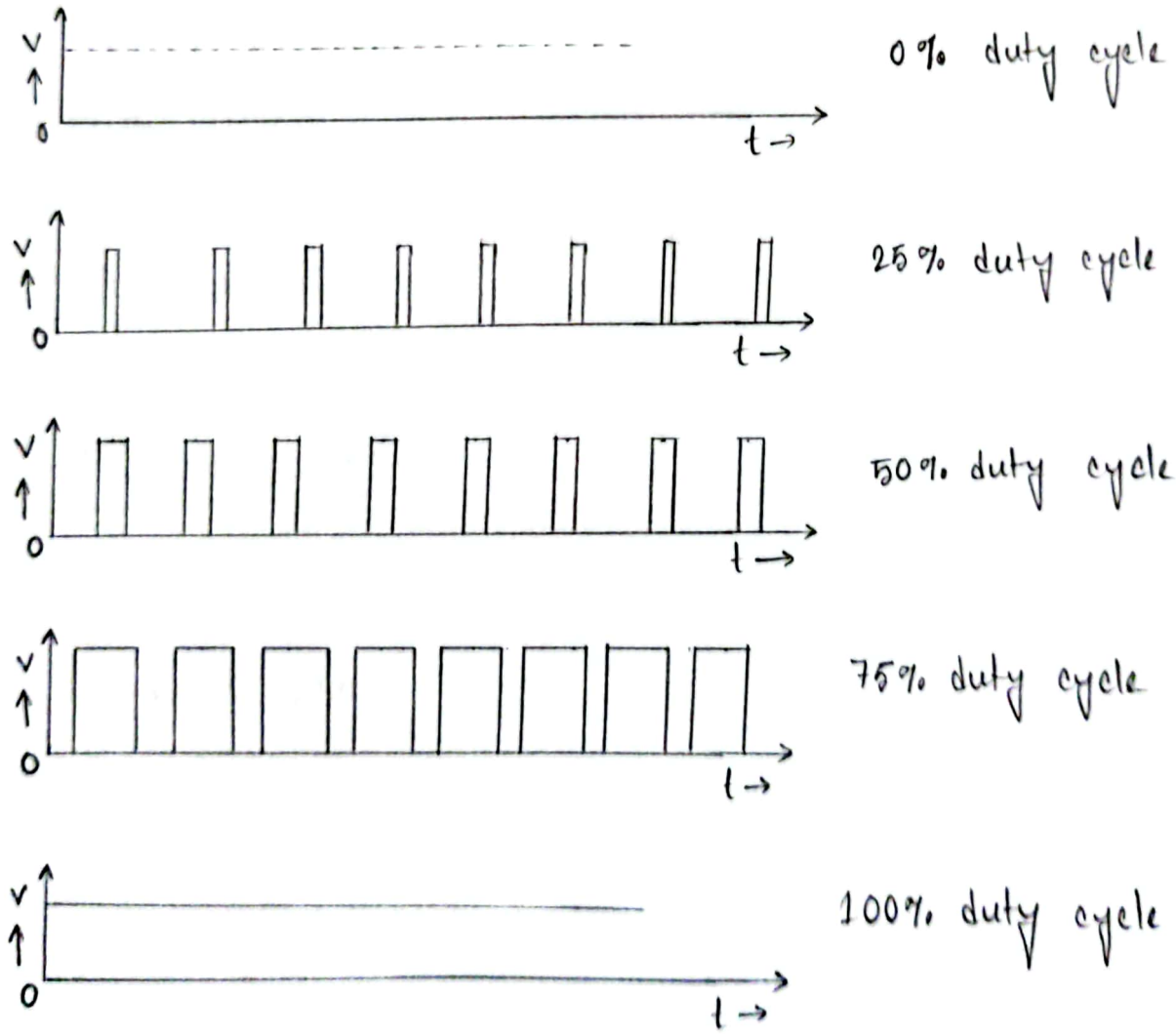

Fig-1 : Duty cycle

Appratus required:

Hardware part:-

(I) PIC16F877A IC
(II) crystal
(III) Resistors
(IV) Capacitors
(V) motor (DC)
(VI) L293D motor driver
(VII) Push button
(VIII) Power supply (DC)
(IX) Jumper wires.

Software part:-

(I) Proteus Is Is
(II) Mikro c pro
(III) PIC kit 2

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Circuit Diagram:

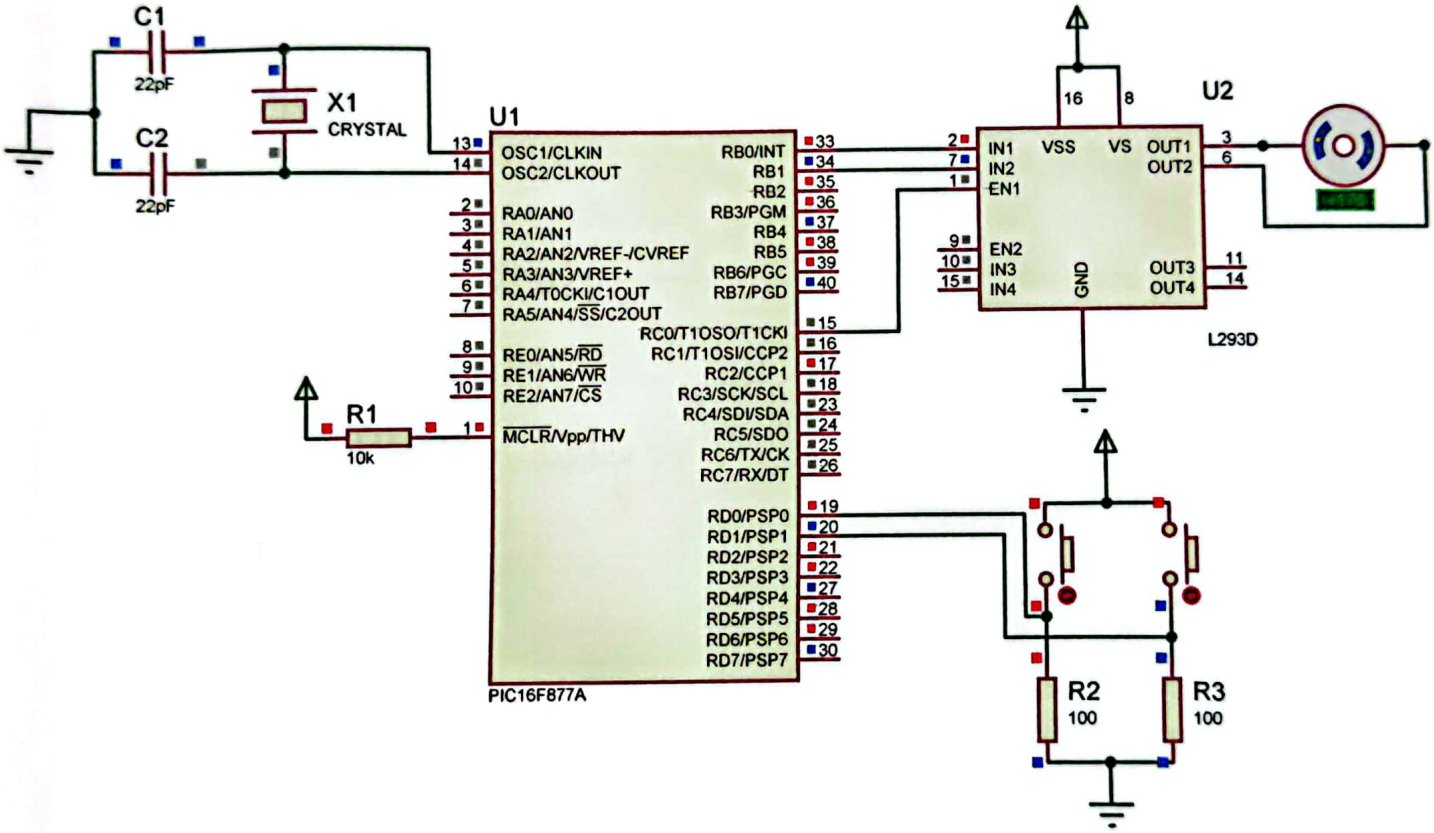

FIgure: Interfacing PWM and speed control of DC motor using PIC microcontroller.

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Mikro C Code :

```
Void main () {
Short duty =0 ;
TRISD =0xff;
TRISB = 0x00;
portb.f0 = 1 ;
portb.f1 = 0;
PWM1 - Init (1000);
PWM1 _ start ( );
PWM _ set _ Duty (duty)
while (1)
        {
      if (portd. f1 = = 1){
         delay.ms (100);
         if (portd. f1 = = 1){
                duty = duty + 20;
                PWM1 _ set _ Duty (duty); } }
    if (portd.f0 = = 1){
       delay . ms (100);
       if (portd . f0 = = 1 ){
          duty = duty - 20 ;
          PWM1 _ set _ Duty (duty); } }
        }
    }
```

Result and discussion:

This is the experiment of interfacing pwm signal and control the speed of a DC motor We have successfully done this experiment. Two push button switches are connected to 1st and 2nd pins of port D which is used to control the duty ratio of the generated PWM. Pressing the up switch increase the duty cycle. which increases the motor speed while pressing the down switch, decreases the motor speed. Here we use ccp1 model of PIC16F877A to generate PWM and it is given to the enable pin of L293D. The direction of rotation of motor can be control using 1st and 2nd pin of port B.

Precautions:-

(i) All the connections were made properly.

(ii) Appropriate mikro c code was written and uploaded to the PIC16F877A IC.

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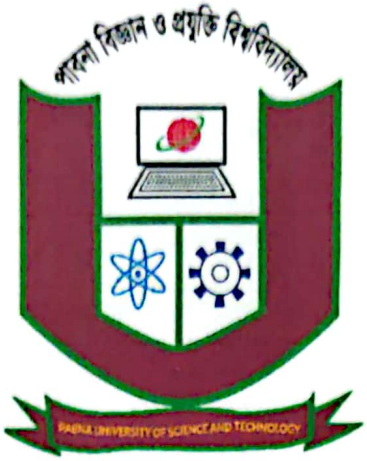

Faculty of Engineering and Technology

Department of

Electrical, Electronic & Communication Engineering

Course Code: EECE 3232

Course Title: Sessional Based on Microprocessor and Embedded System

Lab Report

Experiment No:	07
Experiment Name:	Interfacing the LM35 temperature sensor with LCD display using PIC16F877A microcontroller.

Submitted by:
Name: S. M. Habibullah
Roll: 180528
Year: 3rd Semester: 2nd
Session: 2017-18
Department of EECE, PUST

Submitted to:
Tarun Debnath
Lecturer
Department of ICE, PUST

Date of Submission: 18-01-2023

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Name of the experiment:

Interfacing the LM35 temperature sensor with LCD display using PIC microcontroller.

Objectives:

(I) To interface the LM35 sensor with LCD display using PIC microcontroller.

(II) Making of temparature measuring device.

(III) To use of microcontroller to measure temperature and display value on LCD.

Theory:

This is the experiment of Interfacing the LM35 temperature sensor with LCD display using PIC16F877A microcontroller. Here LM35 temperature sensor converts temperature into its proportional analog voltage value. Here every 1° increase in temparature there will be a increment of 10m volt in output voltage of LM35 sensor. Here PIC

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PIC16F877A microcontroller is used to measure analog voltage value. The buiting ADC is used to measure analog voltage. PIC16F877A PORT A have seven built in ADC channels. ADC has been used to read analog voltage. After reading ADC value, using voltage and temperature relation. Ship voltage is converted back into temperature. All these conversion has been done through programming. LCD is connected to PORT B of microcontroller to display to the value of the temperature.

LM35 temperature Sensor:

LM35 is an electrical sensor. which is used to measure temperature of its surroundings. Its output is generated in the form of electrical signal and this electrical signal is proportional to the input temperature which it detects. LM35 is much more sensitive than other temperature measuring devices and that's why it is most widely used temperature detection device nowadays.

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LM 35 is a 3 pin IC and it is used for temperature detection. The physical appearance of LM 35 is shown in the fig-1 given below:

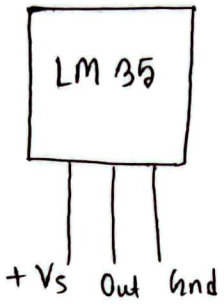

Fig-1: LM 35 pin configuration

Apparatus:

Hardware part:-

(i) P16F877A IC
(ii) LM 35 temp. Sensor
(iii) 16×2 LCD display
(iv) Crystal
(v) Capacitors
(vi) Resistors
(vii) Power supply
(viii) Jumper wires

Software part:-

(i) Proteus
(ii) Mikro c pro
(iii) PIC kit 2

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Circuit Diagram:

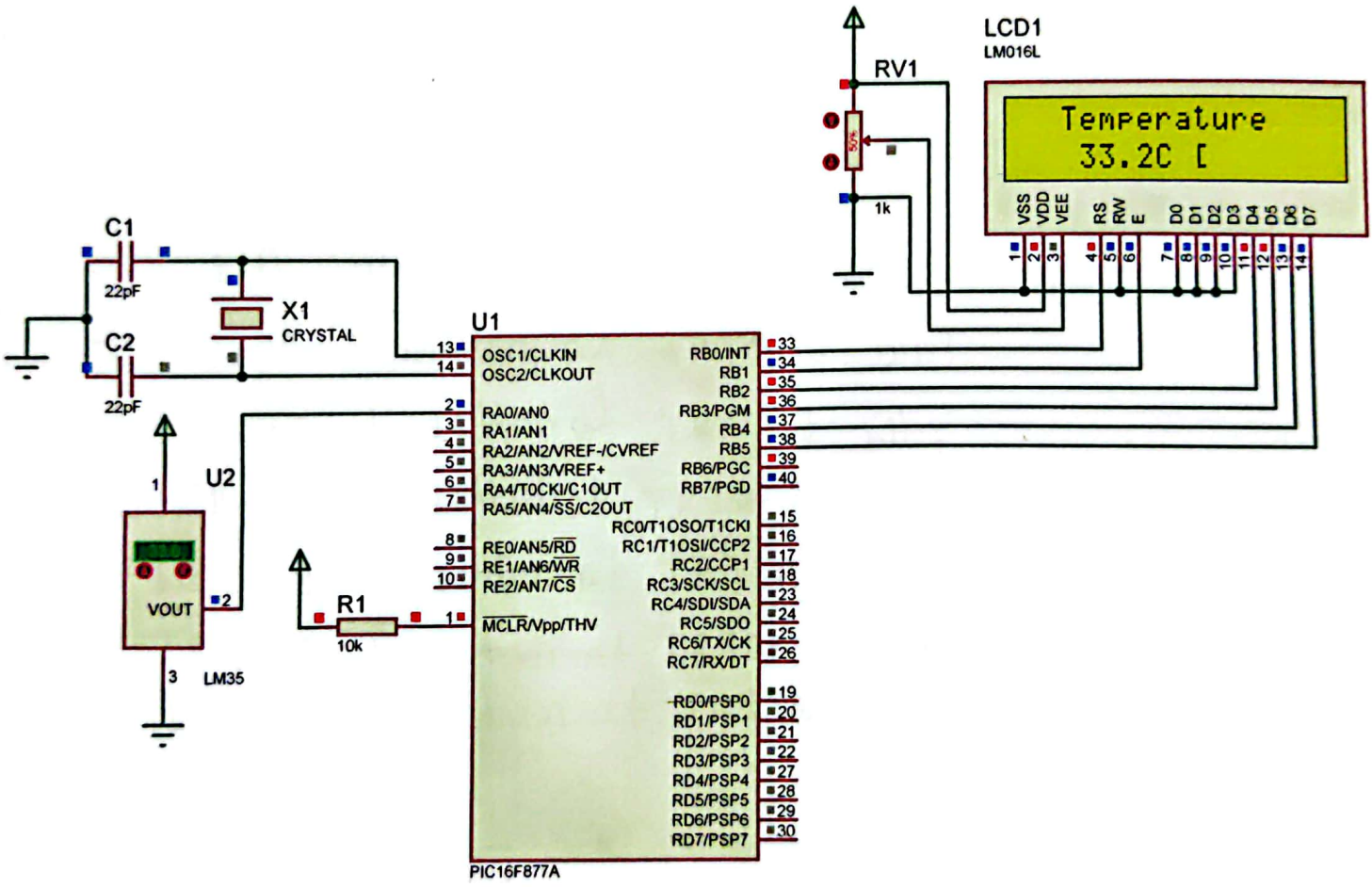

Figure: Interfacing the LM35 temperature sensor with LCD display using PIC16F877A

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Mikro C code :

```
// LCD pin out settings :
sbit LCD_RS at RB0_bit;
sbit LCD_EN at RB1_bit;
sbit LCD_D4 at RB2_bit;
sbit LCD_D5 at RB3_bit;
sbit LCD_D6 at RB4_bit;
sbit LCD_D7 at RB5_bit;

// LCD pin direction

sbit LCD_RS_direction at TRISB0_bit;
sbit LCD_EN_direction at TRISB1_bit;
sbit LCD_D4_direction at TRISB2_bit;
sbit LCD_D5_direction at TRISB3_bit;
sbit LCD_D6_direction at TRISB4_bit;
sbit LCD_D7_direction at TRISB5_bit;

char display [16] = "  ";
void main ()
{
    Unsigned int result;
    floating volt, temp;
    TRISB = 0x00;
    TRISA = 0xff;
    adcon1 = 0x80;
```

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```
lcd_int();
lcd_cmd(_lcd_clear);
lcd_cmd(_lcd_cursor_off);
    while(1)
    {
        result = adc_read(0);
        volt = result * 4.88;
        temp = volt / 10;
        lcd_out(1,1," Temp= ");
        floattostr(temp, display);
        lcd_out_cp(display);
        lcd_chr(1,14,223);
        lcd_out_cp("C");
    }
}
```

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Result and discussion:

This is experiment of interfacing LM35 temperature sensor with lcd display using PIC microcontroller. We have successfully done this experiment. Here, the temperature sensor provide output voltage with repeat to the temperature that it detects. This analog value is taken as input by the RA0 port of the PIC microcontroller. It convert the value of the voltage to the temparature respectively and that is shown on the output display through part Rb. We have done this simulation through proteus software. So, we have done this experiment completely.

Precautions:

(i) All pin connections were given properly.

(ii) All values were taken carefully when simulating on proteus.

(iii) Appropriate Mikro C programme was written and uploaded to the PIC16F877A microcontroller.

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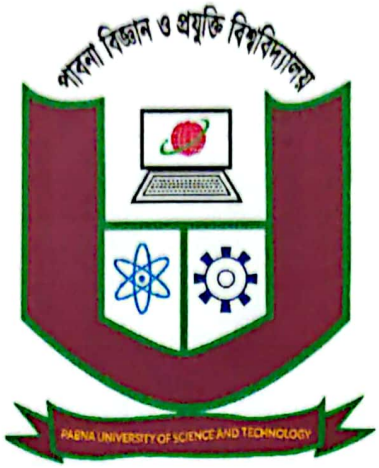

Faculty of Engineering and Technology

Department of

Electrical, Electronic & Communication Engineering

Course Code: EECE 3232

Course Title: Sessional Based on Microprocessor and Embedded System

Lab Report

Experiment No:	08
Experiment Name:	Implementing Analog to Digital conversion (ADC) using PIC16F877A microcontroller.

Submitted by:
Name: S. M. Habibullah
Roll: 180528
Year: 3rd Semester: 2nd
Session: 2017-18
Department of EECE, PUST

Submitted to:
Tarun Debnath
Lecturer
Department of ICE, PUST

Date of Submission: 18-01-2023

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Name of the experiment:

Implementing Analog to Digital conversion (ADC) using PIC microcontroller.

Objectives:

(I) To implement Analog to Digital converter using PIC microcontroller.

(II) Make use of sensor that provides analog data.

(III) Taking analog input through PIC microcontroller and display digital value repeat to the analog value.

Theory:

Analog to digital converter is a device that converts an analog quantity to discrete digital values. This is very useful when we want to do some processing on physical quantities which are normally analog in nature. The analog to digital converter converts analog voltage to binary numbers. These binary numbers can be in different length - 2, 4, 8, 10 bit. The more

the bit the binary number has the higher the resulation of the converter.

The ADCON module located within the PIC micro-controller has a resulation of ten bit length. Therefore, the converter can divide the analog input voltage between 0v to 5v into 2^{n} 10 levels, which are 1024 levels. So, we can say that the resulation of this component is very high.

Apparatus :-

Hardware part:

(I) PIC16F877A IC
(II) Crystal
(III) Capacitors
(IV) Resistors
(V) Variable resistors
(VI) Power supply
(VII) Jumper wires

Software part:

(I) Proteus
(II) Mikro c pro
(III) PIC kit 2

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Circuit Diagram:

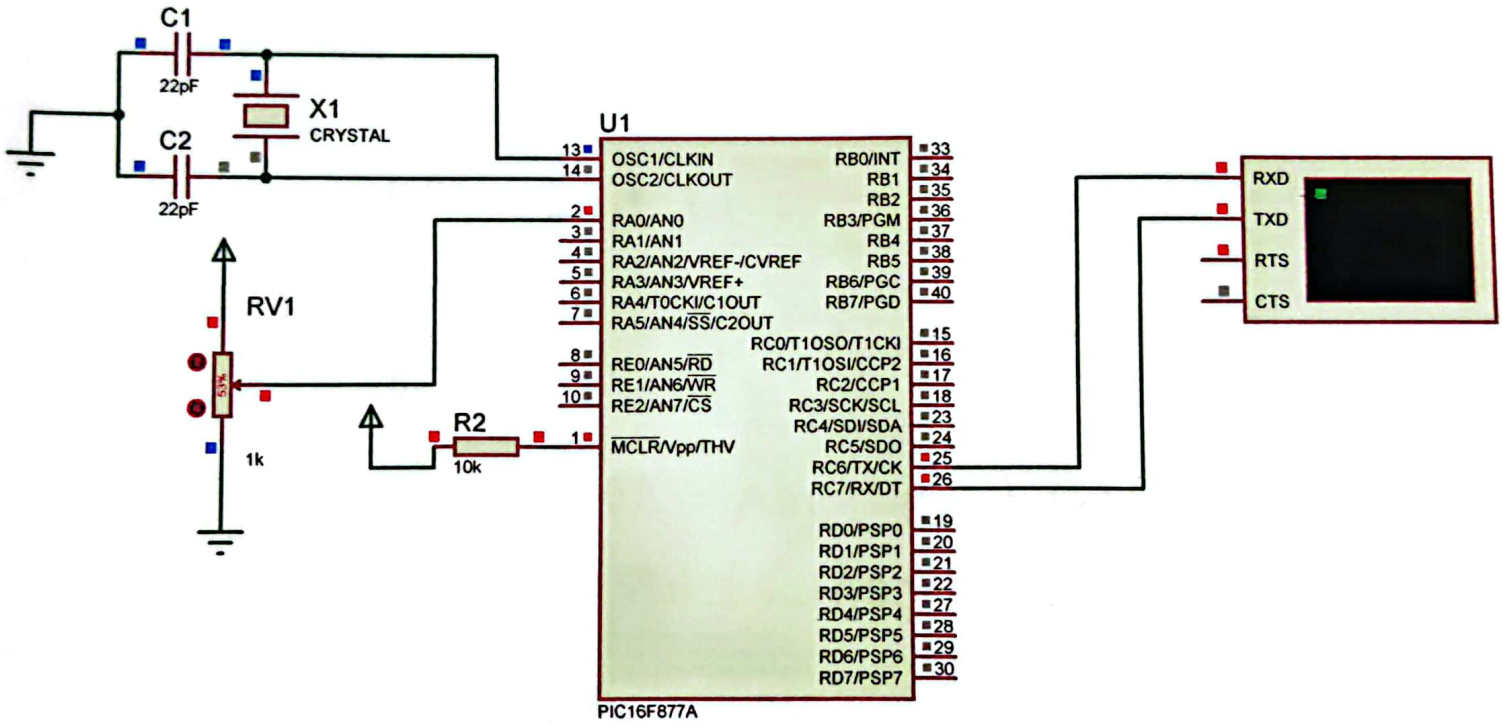

Fig: Implementing Analog to digital conversion (ADC) using PIC16f877A

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Micro C Code:

```
int valADC
char x[4];
void main()
    {
        UART1_Init(9600);
        ADC_Init();
    while(1)
        {
            valADC= ADC_Read(0);
            inttostr(valADC, x);

            UART1_write_Text("ADC value=");
            UART1_write_Text(x);
            strcpy(x, "  ");
            UART1_write(13);
            delay_ms(500);
        }

    }
```

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Result and discussion:

This is the experiment of Analog to Digital conversion through PIC microcontroller. We have successfully done this experiment. Here, to take input i.e. analog input, we are the RA_1 pin. ADCON register converts this analog value into 10 bit digital value respectively. Using virtual terminal we can see this digital value. When we change the input value in the input pin respective digital value is shown on the virtual terminal. Here, we get the accurate value that is shown on the digital terminal. So, we can say that we have done this experiment successfully.

Precautions:

(i) All connections were given properly.

(ii) All values were taken carefully.

(iii) Appropriate Mikro C programme was written and uploaded to the PIC16F877A microcontroller

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Faculty of Engineering and Technology

Department of

Electrical, Electronic & Communication Engineering

Course Code: EECE 3232

Course Title: Sessional Based on Microprocessor and Embedded System

Lab Report

Experiment No:	09
Experiment Name:	Servo motor interfacing with PIC16F877A microcontroller.

Submitted by:
Name: S. M. Habibullah
Roll: 180528
Year: 3rd Semester: 2nd
Session: 2017-18
Department of EECE, PUST

Submitted to:
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Lecturer
Department of ICE, PUST

Date of Submission: 18-01-2023

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Experiment No - 9

Experiment Name: Servo motor interfacing with PIC16F877A microcontroller.

Objectives: To interface servo motor using PIC16F877A microcontroller.

Theory:

The microcontroller is an electric device. A microcontroller is a compact intregrated circuit designed to govern a specific operation in an embeded system. A typical microcontroller has processing unit along with fixed sized ROM, RAM and other required peripheral components.

Servo Motor:

A servo motor is a special kind of motor that operates upon the given instructions. It provides angular precision, which means unlike other electrical motors that keep on rotating untill power is applied to them and stops only when the power is switched off

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The servo motors rotates only to a certain degree or untill it is required to and then the motor stops and waits for the next instructions to carry out further action. Servo motors are controlled with the help of servomechines. Its angular rotation and final movement is dedicated by position feedback. The input to its control line determines the position demanded for the output shaft.

The proteus and Mikro-C :

The proteus design suite is a proprietary software tools suite used premanil for electronic design automation. The all circuit desig with microcontroller is made by using this useful software tools. Opening proteus Is Is capture and picking components and connecting them, we can desig all of the circuit in proteus.

Mikro-C is a powerful, feature rich development tool for PIC micros. It is designed to provide the

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programmer with easiest possible solution for developing application for embedded system, without compromising performance or control.

Required Apparatus:

Hardware :—

1. PIC16F877A IC
2. Power Supply
3. Crystal oscillator (8 MHz)
4. Capacitors (22pF, 2 piece)
5. Resistor (10 kΩ)
6. MOTOR - PWM SERVO

Software :—

1. Proteus Is Is
2. Mikro-c pro.
3. Pic kit-3.

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Circuit Diagram:

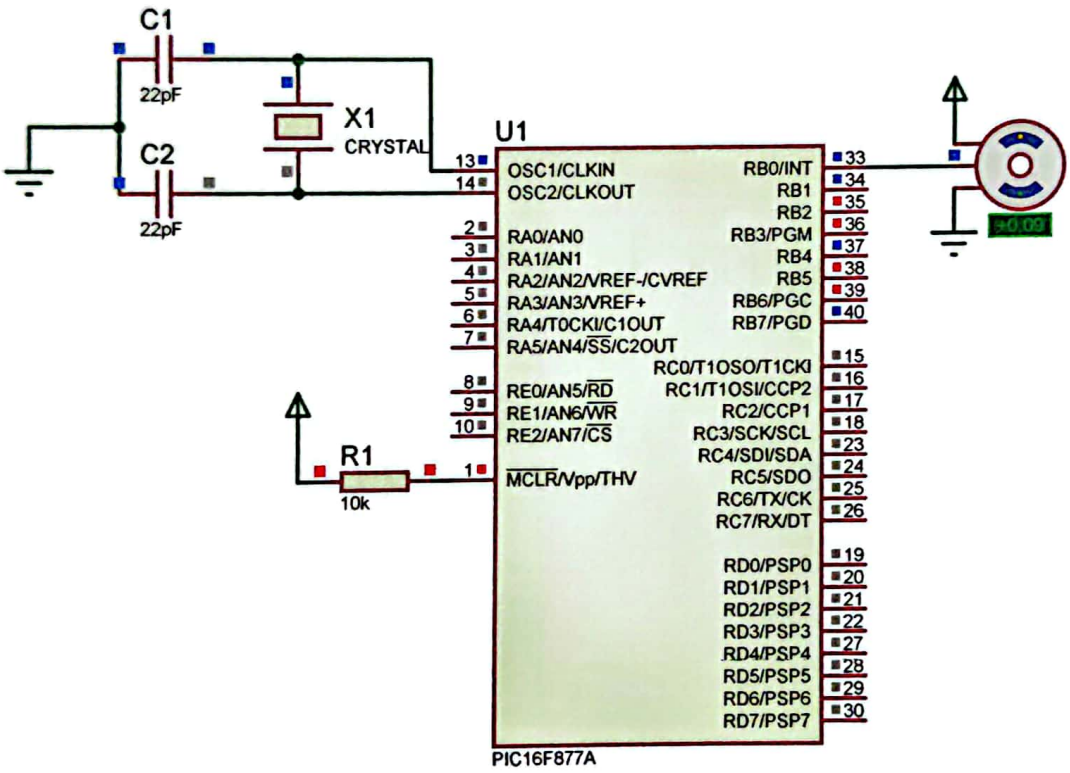

FIg: Servo motor interfacing using PIC16F877A

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Micro C Code:

```
void Rotation00// 0 Degree
{
unsigned int i;
for (i=0; i<50; i++)
{
PORTB.F0 = 1;
Delay_us(800); // pulse of 800 us
PORTB.F0 = 0;
Delay_us(19200);
}
}
void Rotation90 0// 90 Degree
{
unsigned int i;
for(i=0; i<50; i++)
{
PORTB.F0 = 1;
Delay_us (1500); // pulse of 1500 us
PORTB.F0 = 0;
```

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```
Delay_us(18600);
}
}
void Rotation180 0// 180 Degree
{
Unsigned int i;
for(i=0; i<50; i++)
{
PORTB.F0 = 1;
Delay_us(2200);// pulse of 2200 us
PORTB.F0 =0;
Delay_us(17800);
}
}
void main()
{
TRISB =0;// PORTB as Output Port
do
{
```

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```
Rotation 0 0; // 0 Degree
Delay_ms(2000);
Rotation 90°; // 90 Degree
Delay_ms (2000);
Rotation 180°; // 180 Degree
} while (1);
}
```

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Result and Discussion:

From this experiment we come to know how to interface a servo motor with PIC16F877A microcontroller, Programming to control servo motor and hardware connections of servo motor with PIC16F877A microcontroller.

At first designing the circuit using microcon-troller IC in proteus IsIs correctly. Then write the programme for corresponding circuit diagram shown in the circuit diagram figure. Then from proteus IsIs, select the PIC16F877A IC and select the hex file for the programe and circuit connections. Finally the interfacing of servo motor successfully done. So the experiment is successfully verified.

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Precautions:

(i) All the connections were made properly.

(ii) Appropriate Mikro-c code was written and uploaded to the IC.

(iii) Micro-c code was written accurately.

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