EEE 407 Microprocessors and Microcontrollers Laboratory

EXPERIMENTAL WORK 3

PIC I/O PORT PROGRAMMING

Objective: The purpose of this experiment is to introduce **digital input/output (I/O) programming** on the PIC18F452 microcontroller.

In this experiment students will learn:

- How to configure a port pin as **input or output** using the **TRIS registers**
- How to write data to output pins using the **PORT registers**
- How to control individual bits using **bit-oriented instructions**
- How to monitor an input pin and respond to external signals

By the end of the experiment, students should understand how a microcontroller interacts with external hardware such as **LEDs and switches**.

Exercise 1 – Alternating LED Pattern

Write the following assembly program. Compile and download the generated HEX file to the PIC18F452.

Observe the LEDs connected to **PORTC**.

```
      list  p=18f452
      #include <p18f452.inc>

R1    EQU 0X07
R2    EQU 0X08
R3    EQU 0x09

      ORG  0X00
      goto START

      ORG  0x20

START

      CLRF  TRISC; PORTC is output

MAIN
      MOVLW 0X55
      MOVWF PORTC; PORTC =0x55
      CALL  DELAY
      MOVLW 0xAA
      MOVWF PORTC; PORTC=0xAA
      CALL DELAY
      Goto MAIN
```

```
; Delay Routine
      ORG 300H
DELAY MOVLW D'10'
      MOVWF R3
D3    MOVLW D'255'
      MOVWF R1
D1    MOVLW D'255'
      MOVWF R2
D2    NOP
      NOP
      DECF R2,F
      BNZ  D2
      DECF R1,F
      BNZ  D1
      DECF R3,F
      BNZ  D3
      RETURN
      END
```

Exercise 2 – Sequential LED Activation

Write and run the following program.

Observe how the LEDs connected to **PORTC** turn on one by one.

```
      list  p=18f452
      #include <p18f452.inc>
R1    EQU 0X07
R2    EQU 0X08
R3    EQU 0x09

      ORG 0 ; Starting point
      goto START

      ORG  0x20

START

      CLRF  TRISC; PORTC is output


MAIN
      MOVLW 0x00
      MOVWF PORTC
      CALL DELAY
      BSF  PORTC,0
      CALL DELAY
      BSF  PORTC,1
      CALL DELAY
      BSF  PORTC,2
      CALL DELAY
      BSF  PORTC,3
      CALL DELAY
      BSF  PORTC,4
      CALL DELAY
      BSF  PORTC,5
      CALL DELAY
      BSF  PORTC,6
      CALL DELAY
      BSF  PORTC,7
      CALL DELAY
      GOTO MAIN

;--------- Delay Routine------------
          ORG 300H
DELAY     MOVLW D'20'
          MOVWF R3
D3         MOVLW D'255'
          MOVWF R1
D1         MOVLW D'255'
          MOVWF R2
D2         NOP
          NOP
          DECF R2,F
          BNZ  D2
          DECF R1,F
          BNZ  D1
           DECF R3,F
           BNZ  D3
          RETURN
           END
```

Exercise 3 – Input Monitoring

In this exercise, a push button is connected to **RD3**.

Write a program that performs the following operations:

1. Continuously monitor the **RD3** input pin.
2. When RD3 becomes **HIGH**, execute the LED sequence from Exercise 2.
3. After the sequence is completed, return to monitoring RD3.

```
      list  p=18f452
      #include <p18f452.inc>

R1    EQU   0X07
R2    EQU   0X08
R3    EQU   0x09

      ORG   0
      CLRF  TRISC   ; PORTC is output
      BSF   TRISD,3 ; RD3 is input


REPEAT
      clrf  PORTC

HERE  BTFSS PORTD,3
      BRA   HERE

MAIN
      BSF   PORTC,0
      CALL  DELAY
      BSF   PORTC,1
      CALL  DELAY
      BSF   PORTC,2
      CALL  DELAY
      BSF   PORTC,3
      CALL  DELAY
      BSF   PORTC,4
      CALL  DELAY
      BSF   PORTC,5
      CALL  DELAY
      BSF   PORTC,6
      CALL  DELAY
      BSF   PORTC,7
      CALL  DELAY
      GOTO  REPEAT
```

```
; Delay Routine

          ORG 0x300

DELAY     MOVLW D'15'
          MOVWF R3
D3        MOVLW D'255'
          MOVWF R1
D1        MOVLW D'255'
          MOVWF R2
D2        NOP
          NOP
          DECF R2,F
          BNZ  D2
          DECF R1,F
          BNZ  D1
          DECF R3,F
          BNZ  D3
          RETURN
          end
```