**T62 Tutorial 5**

* 1. Change the highlighted instruction “**movlw 0x0F**” to “movlw 0xFF”. Build the machine code and then upload the program to the development kit again. What is your observation? Discuss the relationship between the modified instruction and your observation.

(4 marks)

The duration of the lighting cycle is longer after the modification.

As the delay value in the delay loop change from 0F to FF in command “movlw 0x0F”, the duration of the lighting cycle is longer.

* 1. Click the “Step Over” button a number of times. What are your observations on LEDs and the Watch window?

(4 marks)

When location0 increase for 1, the value will move from location0 to LATD and the LED will turn ON or OFF.

For example, location0 increases 1 from 00001101 to 00001110, LATD will change from 00001101 to 00001110 and the LED will change from “OFF OFF OFF OFF ON ON OFF ON” to “OFF OFF OFF OFF ON ON ON OFF”.

* 1. Discover the functions/effect of “Animate” and “Halt” buttons. Notice the change of green arrow location in source file window and the 8 LEDs blinking status on development kit. What is the function of the “Animate” button? What is the function of the “Halt” button?

(4 marks)

The function of the “Animate” button is that it will let the program to run automatically in its programming order.

The function of the “Halt” button is that it will let the program to pause the automating running program after the latest commend processed.

* 1. Write a program to display the last four digits of your student ID number in binary representation on the four rightmost LEDs continuously. Copy the program from the editor window.

(4 marks)

LIST P=18F4520 ; directive to define processor

#include <P18F4520.INC>; CPU specific variable definitions

;--------------------

;Configuration bits definitions

;

CONFIG OSC = XT

CONFIG WDT = OFF

CONFIG LVP = OFF

;--------------------

;Variable definitions

;

CBLOCK 0x000

DELAY\_H

DELAY\_L

ENDC

;------------

;Reset vector

;

ORG 0x0000 ; code origin, program starts from here

goto Main

; Start of main program

Main: movlw 0x0F

movwf ADCON1

clrf TRISD ; set Port D direction “output”

clrf PORTD

MainLoop: movlw 0x06 ; id = 6680

movwf PORTD

movlw 0x06

movwf PORTD

movlw 0x08

movwf PORTD

movlw 0x00

movwf PORTD

call Delay

bra MainLoop

;..........................

Delay: movlw 0x02

movwf DELAY\_H

LOP\_1: movlw 0x02

movwf DELAY\_L

LOP\_2: decf DELAY\_L, F

bnz LOP\_2

decf DELAY\_H, F

bnz LOP\_1

return

END ; End of program

* 1. Complete the 7-segment LED decoder table.

(2 marks)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Digit/Letter | dp | g | f | e | d | c | b | a | Hex |
| bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0x3F |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0x06 |
| 2 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0x5B |
| 3 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0x4F |
| 4 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0x66 |
| 5 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0x6D |
| 6 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0x7D |
| 7 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0x07 |
| 8 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0x7F |
| 9 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0x6F |
| A | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0x77 |
| b | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0x7C |
| C | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0x39 |
| d | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0x5E |
| E | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0x79 |
| F | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0x71 |

* 1. Write a program to display all digits of your student ID number (from the first to the last digit) on the 7-segment LED continuously. Each digit should hold for a certain delay time. Copy the program from the editor window.

(6 marks)

LIST P=18F4520 ;directive to define processor

#include <P18F4520.INC> ;CPU specific variable definitions

;------------------------------

;Configuration bits definitions

;

CONFIG OSC = XT

CONFIG WDT = OFF

CONFIG LVP = OFF

;--------------------

;Reset vector

DELAY\_REG EQU 0xF0

ORG 0x0000 ;code origin, program starts from here

goto Main

ORG 0x0100

Main: movlw 0x0F

movwf ADCON1

clrf TRISC ;Set Port C direction output

clrf PORTC

Loop: ; ID = 56046680

movlw 0x6D ;Display ‘5’

movwf PORTC

call Delay

movlw 0x7D ;Display ‘6’

movwf PORTC

call Delay

movlw 0x3F ;Display ‘0’

movwf PORTC

call Delay

movlw 0x66 ;Display ‘4’

movwf PORTC

call Delay

movlw 0x7D ;Display ‘6’

movwf PORTC

call Delay

movlw 0x7D ;Display ‘6’

movwf PORTC

call Delay

movlw 0x7F ;Display ‘8’

movwf PORTC

call Delay

movlw 0x3F ;Display ‘0’

movwf PORTC

call Delay

goto Loop

Delay: movlw 0x0F ; delay function with 0F

movwf DELAY\_REG

LOOP: decf DELAY\_REG, F

bnz LOOP

return

END

**Submission**

Enter your name, student ID number, and the answers in the MS Word document file. Re-name the file with your student ID number, e.g. 12345678.docx. **Deduct 4 marks for wrong file name.**

Submit the file by e-mail ([itklchan@cityu.edu.hk](mailto:itklchan@cityu.edu.hk)) before 3:00 pm. **Late submission will not be accepted.**