T62 Tutorial 2

Enter the following program and save as "T62-tut2-2.asm". **X** is the last digit of your student ID number. **Y** is the second last digit of your student ID number. Make sure that the simulation clock frequency is set to 4 MHz.

```
LIST   P=18F4520
       #include <P18F4520.INC>

       ORG   0x0000
Main:  movlw 0x20
       xorlw  0x04
       addlw  0x16
       movlw 0x60
       andlw  0x49
       movlw 0x00
       nop
       nop
       bra    Main
       END
```

1. Copy the contents of the program memory.

(2 marks)

	Line	Address	Opcode	Disassembly
➡	1	0000	0E20	MOVLW 0x20
	2	0002	0A04	XORLW 0x4
	3	0004	0F16	ADDLW 0x16
	4	0006	0E60	MOVLW 0x60
	5	0008	0B49	ANDLW 0x49
	6	000A	0E00	MOVLW 0
	7	000C	0000	NOP
	8	000E	0000	NOP
	9	0010	D7F7	BRA 0

2. Use "Step Over" button to run the program in the step-by-step manner for one round. Write a table to show, for each step, all the observations in WREG and PC (*in Watch window*), Instruction Cycles and Time (*in Stopwatch window*).

(9 marks)

step	WREG	PC	Instruction Cycles	Time (us)
1	**20H**	02H	1	1
2	**24H**	04H	2	2
3	**3AH**	06H	3	3
4	**60H**	08H	4	4
5	**40H**	0AH	5	5
6	00H	0CH	6	6
7	00H	0EH	7	7
8	00H	10H	8	8
9	00H	00H	10	10

3. Explain why in question 2, you observe the specific value in WREG in step 3.

(1 mark)

add 24H and 16H is equal to 3AH

4. Explain why in question 2, you observe the specific value in WREG in step 5.

(1 mark)

60H and 49H is equal to 40H

5. Explain why in question 2, you observe the specific values in PC, Instruction Cycles and Time in step 9.

(6 marks)

PC becomes 0 because of the branch instruction (branch to Main)
bra spends 2 instruction cycles, therefore Instruction Cycles increases to 10, Time increases to 10 us

6. What is the clock period of the processor? Show the calculation.

(1 mark)

1/4 MHz = 0.25 us

7. What is the duration for one instruction cycle?

(1 mark)

1 us

8. How many clocks cycles for the instruction movlw? Show the calculation.

(2 marks)

1 us/0.25 us = 4 clock cycles

9. How many clocks cycles for the instruction bra? Show the calculation.

(2 marks)

2 us/0.25 us = 8 clock cycles