Chapter 4
Questions and Assignments

4.1 What is a flowchart?

4.2 What is an assembler?

4.3 What is the function of a header file in an assembly language program?

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4.4 Explain the term pseudocode in an assembler and describe its function.

4.5 What does a label (excluding labels used for equates) represent in a program?

4.6 What is the function of the ORG statement in an assembly language program and can the program have more than one ORG statement?

4.7 List the parts of an assembly language statement and indicate the parts that are optional.

4.8 List the number of files generated by an assembler after assembling a program.

4.9 What is the purpose of the List file of an assembled program and what does it include?

4.10 Specify the memory location where the program will be assembled if the address in ORG statement is as follows: ORG 0040

4.11
```
START:  MOVLW   0x67
        ADDLW   0x33
        SLEEP
```

a. Specify the result you expect in the W register:

b. Specify the flags that are set after the addition:
c. Specify the byte you would observe in the STATUS register:

Assemble the program using the editor and the assembler of MPLAB starting at location 0020_H. Build the project and execute the instructions using the single step and verify your answers.

4.12
```
START:  MOVLW   0x42
        SUBLW   0x33
        SLEEP
```

a. Specify the result you expect in the W register:
b. Specify the flags that are set after the subtraction:
c. Specify the byte you would observe in the Status register.

Assemble the program using the editor and the assembler of MPLAB starting at location 0020_H. Build the project and execute the instructions using the single step and verify your answers.

4.13 The following set of instructions is expected to load two bytes ($A7_H$ and 92_H) in data registers 01_H and 02_H, add the bytes, and save the sum in register 03_H. Calculate the sum of these two bytes and identify the flags that are set.

```
1.      MOVLW   0xA7        ;
2.      MOVWF   0x01, 0     ;
3.      MOVLW   0x92        ;
4.      MOVWF   0x02, 0     ;
5.    ADDWF     0x01, 1, 0  ;
6.    MOVWF     0x03, 0     ;
```

4.14 In Q. 4.13, the add instruction sets overflow and carry flag. Explain why the overflow flag is set and interpret the result if the numbers are signed numbers.

4.15 In Q. 4.13, explain why registers W and 03_H have the byte 92_H at the end of the program?

4.16 In Q. 4.13, identify the location where the sum is saved.