**Chapter 3**

**Questions and Assignments**

3.1 **In PIC18F programming model, what is the difference between the W register and data registers?**

The WREG is used to copy and modify values without affecting others register. The WREG is used as one of the 2 operands for ALU operations.

3.2 **Specify the size of the program counter and its function.**

It is a 21-bit register. Its function is as a pointer to program memory during program execution.

3.3 **List the registers and their addresses that are included in the access bank.**

The PIC 18 has 4 – bits Bank Address. Each bank has addresses from 00 – FF.

* From bank 0 to 5: General purpose registers
* From bank 6 – E: Unused Space.
* Bank F: Special function registers from 80 - FF

3.4 **If the BSR register holds the byte 01, identify the data register in which the following instruction copies the contents of W register: MOVWF 0x7F, 0**

The literal value in W will be copied in 17Fh. That location belongs to the bank 1, register 7Fh.

3.5 **If the BSR register holds the byte 04, explain the result of the following instruction:**

**MOVWF 0x7F, 1**

The literal value in W will be copied in 47Fh. That location belongs to the bank 4, register 7Fh.

3.6 **Explain the result of the following instruction and the status of the flags affected: MOVF 0x10, 0, 1 if the data register 10H holds the byte 9F H.**

The value in the register 10 will be copied into WREG. WREG = 9Fh.

The status register has the flag N on because the instruction MOVF is returning a negative value that is saved in the WREG.

3.7 **Explain the result of the following instruction and the flags affected: MOVWF 0x80, 0 if W contains 00. Identify the device that is associated with the address 80 H.**

The result of the instruction is copying the value 0 into the register 0x80. The Status register has no flag on.

The address 80h of the bank F, is related with the special function register (It is PORTA in specific).

3.8 **Explain the result after the execution of the following instructions if the BSR holds 01 H.**

**See comments:**

I don’t understand this question. What instructions? What comments?

1. **Specify the result you expect in W register after the execution of the above instructions. Specify the flags that are set after the addition.**

What instructions?

3.10 **Identify the contents of the W register and the status of the flags by filling in the blanks as these instructions are being executed.**

What instructions?

3.11 **In Q. 3.10, if the numbers are unsigned, explain the result after the addition.**

What instructions?

3.12 **In Q. 3.10, if the numbers are signed, explain the result.**

What numbers?

3.13 **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. Read the following instructions and calculate the sum of these two bytes.**

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

The sum = 1] 3 9 with carry.

Line 5 must have be “ADDWF 0x01, 0, 0” to save the result in W and then be moved to the 0x03.

3.14 **In Q. 3.13, the ADD instruction sets the overflow and carry flag. Explain why the overflow flag is set and interpret the result if the numbers are signed numbers.**

The overflow and carry flag are on because the sum of A7 and 92 generate a carry while the arithmetic operation is being processed, and it also have an overflow when it passed the value of FF having 39 after.

3.15 **In Q.3.13, what is the total sum if the numbers are unsigned.**

If the numbers are not signed number, the result still 39h.

3.16 **In Q. 3.13, explain why the W and 03H register have the byte 92H at the end of the program. Does the overflow discard the final answer and store the previous byte from W into register 03 H?**

It is having 92 in 0x03 and W because in line 5 the instruction specifies to store the value in the file 0x02 and not in W.

The overflow happens because the value returned from the instruction ADDWF passed the FF value. It doesn’t store the previous value in W into register 03h, it stores the current value that wasn’t changed after the instruction ADDWF.

3.17 **In Q. 3.13, identify the location where the sum is saved.**

The sum was saved in the register 0x01.

3.18 **Explain the concept and the advantages of pipelining instruction.**

Pipelining instructions consist in having as the input the output of the previous instruction. Thanks to this we can save lines of code.

3.19 **If each one-word instruction requires two clock cycles—fetch and execute—explain the statement that each one-word instruction (with a few exceptions) executes in one cycle.**

One-word instruction will be executed in 1 cycle, but it takes 1 cycle to be fetch.

3.20 **Explain why one-word branch instructions require two cycles for execution.**

It needs to read twice before it executes.