**Chapter 2**

**Questions and Assignments**

**2.1 What is a MCU?**

MCU stands for microcontroller. It is a small computer on a single integrated circuit.

**2.2 List the major components of a MPU.**

* Microprocessor unit (MPU).
* Program memory for instructions.
* Data memory for data.
* I/O ports.
* Support devices such as timers.

**2.3 Explain the special features of the Harvard architecture.**

The Harvard architecture has all store location and pathway for instructions and data are separated, so it can read and write simultaneously.

**2.4 What is the function of an address bus?**

The address bus transfer information creating a communication between all components of the MCU.

**2.5 If a MPU has 19 address lines, calculate the addressing capacity of the MPU.**

2^19 = 524288 bits = 512 KB.

**2.6 If a MPU is capable of addressing 128 Kb of memory, calculate the size of its address bus.**

2^17 = 128KB. The MPU has 17 address lines.

**2.7 As shown in Q. 2.6: 131, 072 registers, PIC18F MCU has a 12-bit address bus for its data memory. If we increase the size to 14 bits, what is the size of the data memory?**

2^14 = 16KB of data memory.

**2.8 PIC16F MCU has a 13-bit address bus. Calculate the addressing capacity of its MPU.**

2^13 = 8KB of memory.

**2.9 What is the function of the W register in the PIC18 MCU?**

Move literal values from one register to another. It is involved in the execution of many instructions.

**2.10 What is the function of a program counter (PC) and its size in the PIC18 MCU?**

It contains the address of the next instruction to be executed. On the PIC18 MCU, it is 21-bit, which is a memory size of 2MB.

**2.11 What is the size and the function of the BSR?**

The BSR stands for Bank Select Register. It will determine on what bank will be working, this help to avoid errors. It is a 4-bit register.

**2.12 What is the size of the FSR? Explain the significance of its size.**

They are 16-bit registers. They are 16-bit size because they are divided in two of 8 bits, FSRH and FSRL.

**2.13 What is the size address bus for the data memory in the PIC18F MCU and how many data registers can be accessed by this bus?**

The size of the address bus for the data is 12-bit with a capacity of 4KB of memory. It can access to 4096 different registers, from 000 to FFFH.

**2.14 What are the special function registers and their address range in the 18F MCU?**

Special function registers are used to control the operation of peripheral. The address range for the special function register goes from F60H to FFFH.

**2.15 What is an I/O port and what is the size of the address of an I/O port in the PIC18 MCU?**

An I/O port is a port that control the pins for input / output peripherals. They are 8-bits long.

**2.16 Explain multiplexing and how I/O ports are set up to perform a given function.**

It selects the function used on the pin.

Bit set to 0 = Pin used for Digital I/O.

Bit set to 1 = Other function.

**2.17 What is an advantage of EEPROM over flash memory?**

The EEPROM can be erased one location, one row, or whole chip in one operation, while the flash can only be erased in bulk (either a block or the whole chip).

**2.18 List the two primary modes of data transfer.**

* Parallel data transfer.
* Serial data transfer.

**2.19 What is the data transfer mode used for transferring information via modem?**

It is used to create a type of communication between different devices and the MCU.

**2.20 Is a fax machine a serial or parallel device?**

Parallel.

**2.21 Explain the reason the MPU should check the readiness of a peripheral device such as a printer.**

To do not interrupt a current process unexpectedly.

**2.22 What is an interrupt process?**

A process that is going to executed when something in specific happens.

**2.23 Why is an interrupt process classified as an externally initiated process?**

If it is requests from external devices it will be classified as externally initiated process.

**2.24 List sources that can interrupt the PIC18F MPU.**

There are two location address that are used for this purpose, 0x08, 0x18.

**2.25 Can the interrupt process be disabled?**

Yes.

**2.26 List typical support devices included on the MCU chip.**

* Timers
* Master Synchronous Serial Port (MSSP)
* Addressable USART
* A/D converter
* Parallel Slave Port (PSP)
* Capture, Compare and PWM (CCP Module)

**2.27 What is a timer and how is it used in MCU-based systems?**

The timer is a mechanism that is used to count down in certain frequency. In a MCU we have different timer that are used to activate a flag when the countdown is over, so we can use it to interrupt a process.

**2.28 What is the function of an A/D converter and why is it necessary in MCU-based systems?**

It is used to convert an analog signal into digital. It is necessary because the MCU works with HIGHs and LOWs or 1 and 0, ant the A/D convertor will translate that signal so that it can work with it.

**2.29 Specify the number of instructions in a PIC18 MCU and the bit size of most instructions.**

It has 77 instructions. Most of the instructions are 16-word length.