**Central Processing Unit**

**1. Explain the functions of the CU and ALU in the CPU of a computer.**

**Answer:** CU-Control Unit, charge of all the operations being carried out, responsible to direct the system to execute instructions and work as a communicator between the memory and the arithmetic logical unit.

ALU - Arithmetic and Logic Unit, responsible for performing all logical and arithmetic operations. Some of the arithmetic operations are as follows: addition, subtraction, multiplication and division.

**2. Briefly explain the types of data storage and its relation with the CPU.**

**Answer:**

**Primary /Temporary/Volatile storage:** This type of storage is primarily used to store information temporarily. The CPU does not directly access the secondary memory; instead it always relies on the primary memory.

**Secondary/Permanent/Non-Volatile storage:** This type of storage is primarily used to store data for long periods. This type of memory is stored in external devices such as hard drives etc.

**3. Explain what you understand by registers, briefly explain the various types of registers. – CPU**

**Answer**:

CPU registers perform a variety of functions, a primary one of which is to offer temporary storage for the CPU to access information stored on the hard drive. Every CPU register has a distinct function and the registers are essential components of CPU commonly recognized for memory allocation purposes.

**Instruction Register (IR):** The [instruction register](http://en.wikipedia.org/wiki/Instruction_register) holds the instruction currently being executed.

**Memory Data Register (MDR):** The [memory data register](http://en.wikipedia.org/wiki/Memory_data_register) (also known as the [memory buffer register](http://en.wikipedia.org/wiki/Memory_buffer_register) or data buffer) holds the piece of data that has been fetched from memory.

**Memory Address Register (MAR):** The [memory address register](http://en.wikipedia.org/wiki/Memory_address_register) holds the address of the next piece of memory to be fetched.

**Program Counter (PC): The** [program counter](http://en.wikipedia.org/wiki/Program_counter) holds the location of the next instruction to be fetched from memory. It is automatically incremented between supplying the address of the next instruction and the instruction being executed.

**Accumulator:** The accumulator is an internal CPU register used as the default location to store any calculations performed by the arithmetic and logic unit.

**4. What are the different ways in which data can be represented? – CPU**

**Answer:**

There are three ways in which data can be represented namely Bit, Byte and Word:  
  
 **Bit:** This is also the short name for binary digits. A characteristic of BIT is that it can never be empty. Zero implies a power off state whereas one means on state.  
  
 **Byte:** A byte is a collection or group of 8 bits. A byte can store a single character which can either be an alphabet, a number or a special character.

**Word:** The number of bits that a CPU possess indicates the power of the computer. It also indicates how many numbers of bytes are present. In today`s date most computers can handle 32 or 64 bit length.

**5. Mention briefly the steps involved in the execution of a program. – CPU**

**Fetch:** The control unit is given an instruction.

**Decode:** The control unit then decodes the newly received instruction.

**Execute:** Once that is found out the control is handed over to the hardware. Now the task is performed.

**Store:** Once the task is saved successfully the end result is stored. After the cycle is complete the Control unit is again handled the control.

**6. Explain the characteristics of instruction and execution time. – CPU**

**Answer:**

It is the time taken by the Control Unit to get an instruction from memory and to load it to the register. The time also includes the taken by the CU for instruction decoding and to find out the location of the required data .It is the time required by the control unit to move data from the memory to the registers in the ALU, the ALU is responsible for the execution of instructions on this data.

**7. What do you understand by system clock? What is System Unit? – CPU**

**Answer:**

The system clock is used to produce a specific pulse at a fixed rate of time.  
The machine cycle of a system can be completed in a single or multiple clock pulses. A single program instruction could be multiple instructions for the CPU. Any central processing unit has a predefined set of instructions also known as the instruction set. These are the instructions that it can process and understand.

The clock speeds are nowadays measures in GHz, 1 GHz = 1000 MHz

**Central processing unit (CPU)** is the [electronic circuitry](https://en.wikipedia.org/wiki/Electronic_circuit) within a [computer](https://en.wikipedia.org/wiki/Computer) that carries out the [instructions](https://en.wikipedia.org/wiki/Instruction_(computing)) of a [computer program](https://en.wikipedia.org/wiki/Computer_program) by performing the basic arithmetic, logical, control and [input/output](https://en.wikipedia.org/wiki/Input/output) (I/O) operations specified by the instructions.

**8. What do you understand by coding schemes? – CPU**

**Answer:**

Coding schemes are a common way of representing a character of data. It is required in computers for exchanging data. The following are a few common coding schemes:

ASCII: It stands for the American Standard Code for Information Interchange. It is used on almost all computers, hence considered as a standard coding scheme.

EBCDIC: It stands for Extended Binary Coded Decimal Interchange Code. It is primarily used in IBM and IBM-compatible mainframes.

Unicode: It is designed to accommodate alphabets (- 256). It uses 16 bits to represent one character and requires twice as much space to store data. It can have a maximum of 65,536 possible values.

**9. What does a Microprocessor mean? What all does a Microprocessor comprise of? - CPU**

**Answer:**

A Microprocessor is a miniature CPU unit that is etched on a silicon chip. A CPU (Central Processing Unit) hardware which carries out the instructions of a computer system. The Microprocessor unit consists of millions of tiny transistors. It has multi purposes and is programmable. They operate on numbers and symbols represented in Binary Numeral Language.

They comprise of the following key components-

Central Processing Unit: It carries out the instructions of a computer system

Registers: They store bits of information in a way that all the bits can be written to or read out simultaneously.

System clock: simple count of the number of ticks that have transpired since some arbitrary starting date, called the Epoch.

**10. What do you understand by the term ‘Transistors’? – CPU**

**Answer:**

Transistors are electronic switches that may or may not allow the flow of current in a current path. When it allows current to flow, the switch is ON. This represents 1 bit. When it does not allow current to flow, the switch is OFF. This represents 0 bit.

Transistors are placed into chips also known as IC. They measure in mm`s and are known contain millions of transistors.

Microprocessors these days are created using microns as their measuring size.

**11. Explain some Memory Components. – CPU**

**Answer:**

Some of the memory components are-

**Semiconductor Memory:** It is used by most by most modern computers. It is reliable, inexpensive and compact. However, it requires continuous power supply and data is lost if current is interrupted.

**RAM and ROM:** They stand for Random Access Memory and Read Only Memory respectively.

**Flash Memory:** This memory is electrically erasable and reprogrammable

**12. What do you mean by RAM? – CPU**

**Answer:**

RAM is **r***andom* **a***ccess* **m***emory*, a type of [computer memory](http://www.webopedia.com/TERM/M/memory.html) that can be [accessed](http://www.webopedia.com/TERM/A/access.html) randomly; that is, any [byte](http://www.webopedia.com/TERM/B/byte.html) of memory can be accessed without touching the preceding bytes. RAM is the most common type of memory found in [computers](http://www.webopedia.com/TERM/C/computer.html) and other [devices](http://www.webopedia.com/TERM/D/device.html), such as [printers](http://www.webopedia.com/TERM/P/printer.html).

**13. What is System Bus? Explain a few related terms. – CPU**

**Answer:**

System Buses are parallel electrical paths that transport data between the CPU and Memory.

Bus Width: The number of electrical paths that to carry the data. It is measured in Bits. With larger Bus Widths, a CPU can transfer more data at a time.

Bus Speed: The speed of the bus is measured in megahertz (MHz), refers to how much data can move across the bus simultaneously. Personal computers have a bus speed of 400 MHz or 533 MHz

**14. What is cache memory? – CPU**

**Answer:**

Cache memory, also called CPU memory, is random access memory (RAM) that a computer microprocessor can access more quickly than it can access regular RAM. This memory is typically integrated directly with the CPU chip or placed on a separate chip that has a separate bus interconnect with the CPU.

**15. What do you mean by Parallel Processing? – CPU**

**Answer:**

Parallel processing a mode of computer operation in which a process is split into parts that execute simultaneously on different processors attached to the same computer.

**16. What are the steps involved in following a particular instruction given by the CPU?**

**Answer:**

The instruction pointer tells the instruction fetch where in the memory the instruction is.

The fetch takes the instruction and gives it to the decoder, which determines the steps that are necessary to fulfill the instructions.

The information is then sent to the ALU, which performs the instructions that need to be performed. This includes adding, subtracting, or manipulating the data further.

Finally, the instructions are sent out into the computer where they are needed.

**17. What is RISC technology? - CPU**

**Answer:**

RISC (reduced instruction set computer) is a [microprocessor](http://searchcio-midmarket.techtarget.com/definition/microprocessor) that is designed to perform a smaller number of types of computer [instruction](http://searchcio-midmarket.techtarget.com/definition/instruction)s so that it can operate at a higher speed (perform more millions of instructions per second, or [MIPS](http://searchdatacenter.techtarget.com/definition/MIPS)). Since each instruction type that a computer must perform requires additional transistors and circuitry, a larger list or set of computer instructions tends to make the microprocessor more complicated and slower in operation.

**18. Are there any problems that the CPU faces? Have any measures been taken to make it more efficient?**

**Answer:**

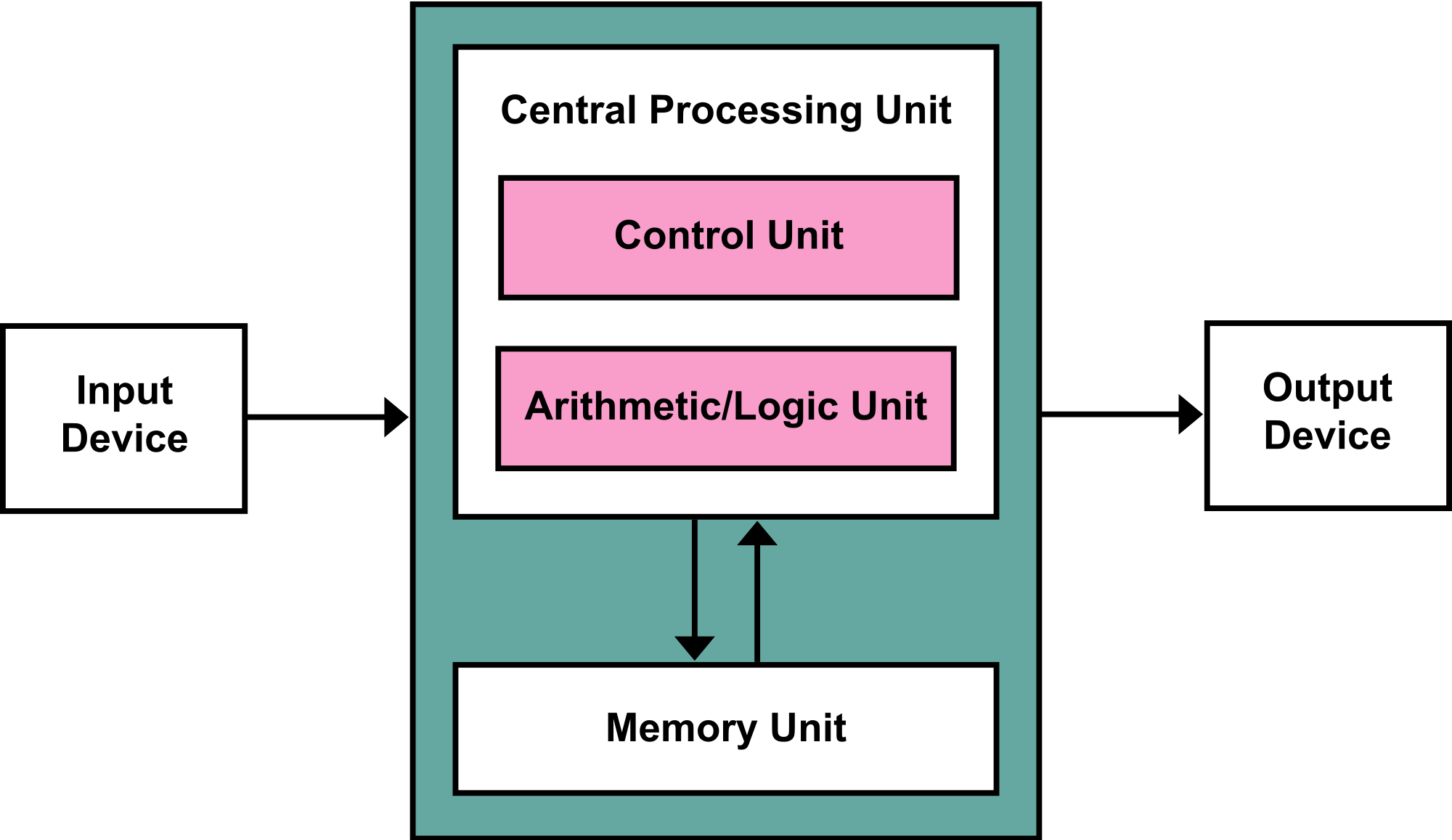
One of the weaknesses of the basic CPU was that it was not doing any processing during the time that it fetches an instruction from the computer memory. To reduce this, a memory storage area was created inside the CPU called Cache or L1 type Cache. The Cache is very fast, and is used to store information that the CPU needed to access the most. Level 2 Cache was also developed.

Now that the CPU has to wait much less for the data to be processed, the speed at which the data can be processed had to be enhanced. To do this, multiple ALUs (Arithmetic Logic Unit ) were placed on the CPU, so that many more calculation was done each clock cycle.

**20. Define the basic logical structure of a computer.Answer:**

The basic logical structure of a computer (also called block structure or block diagram) of a computer was proposed by **Von Neumann**. According to the logical structure of a digital computer there are four main units or types of components. They are:

1. Input Unit
2. Storage Unit
3. Central Processing Unit (CPU) and
4. Output Unit

   
**Block diagram of a Computer**

**Input Unit**

Input unit enables users to interact with the computer system. All data and instructions need to be entered into the computer system through the input unit. The major functions of the input unit are as follows:

* Accepts the data and instructions from the outside world (users).
* Converts the data and instructions into a form that a computer can understand.
* The converted data and instructions are sent to the computer system for further processing.

Examples of some input units are keyboard, mouse, scanner, microphone etc.

**Storage Unit**

The function of a storage unit is to store data. It can be temporary or permanent data. It basically stores:

* Data and instructions required for processing.
* Intermediate results of processing on a temporary basis.
* Final results needed to be stored permanently or before they are released to an output device.

Examples of storage device are RAM, ROM, hard-disks, CD-ROM, DVD, Pendrive etc.

**Central Processing Unit (CPU)**

CPU is responsible for activating and controlling the operations of other units of a computer system. It is also referred to as the brain of computer. CPU consists of two main parts:

1. Control Unit (CU)
2. Arithmetic Logic Unit (ALU)

**Control Unit**

Control Unit is responsible for coordinating various operations of a computer. It uses time signals to do that. The control unit determines the sequence in which computer programs and instructions are executed. It also acts as a switch board operator when several users access the computer simultaneously. In simple words, it acts like the supervisor seeing that things are done in proper fashion.

**Arithmetic and Logic Unit**

The actual processing of the data and instruction are performed by Arithmetic Logical Unit. ALU takes care of various calculations. The major operations performed by the ALU are addition, subtraction, multiplication, division, logic and comparison. Data is transferred to ALU from storage unit when required. After processing the output is returned back to storage unit for further processing or getting stored.

**Output Unit**

Output unit is responsible for transferring the processed data back to the outside world i.e the user. The processed data must be in the form that user understands. The major functions of the output unit are as under:

* Accepts results from the processing unit of computer.
* Converts those results into human acceptable form.
* Provides the result to outside world.

Examples of output devices are monitor, printer, speaker etc.