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**CSIS 1800:** Introduction to Computer Science and Information Systems

**Chapter number:** 5 Computing Components

**Assignment number:** 5

1. **What is the stored program concept and why it is important?**

The stored program concept is the storage of data and instruction in the memory to do a variety of tasks. The stored program architecture was proposed by von Neumann but probably originated from J. Presper Eckert and John Mauchly. The von Neumann architecture has five components: Memory Unit, Arithmetic/Logic Unit, Input Unit, Output Unit, and Control Unit. The data stored in the memory are executed in sequence by referring the data values. The stored program concept is important because human cannot perform the instructions without the help of machine.

*(Dale and Lewis, Computer Science Illuminated, p. 119-131)*

1. **Describe in details at least 5 components of a Von Neumann machine and their functions.**

* Memory Unit:

Memory is a collection of cells, each with a unique physical address. It is a part of the memory which holds both the data and the information.

* Arithmetic/Logic Unit:

The arithmetic/logic unit is used to perform the computation of arithmetic and logical operations on data. It is capable of adding, subtracting, multiplying, and dividing two numbers. It is also capable of logical operations such as AND, OR, and NOT.

* Input Unit:

The input unit is the inbound channel through which the computer communicates with the outside world. It is a device through which data ad programs from the outside world are entered into the computer. Thus, it is used to get the data or information from the keyboard or mouse into the computer.

* Output Unit:

The output unit is the outbound channel through which the computer communicates with the outside world. It is a device through which results stored in the computer memory are made available to the outside world. Thus, it is used to produce the result from the computer such as printer, monitors and so on.

* Control Unit:

The control unit is the organizing force in the computer. It is in charge of the fetch-execute cycle, responsible for fetching code of all the instructions within the program. Because the Arithmetic/Logic Unit and the control unit work so closely together, they are often thought of as one unit called the Central Processing Unit (CPU).

*(Dale and Lewis, Computer Science Illuminated, p. 119-124)*

1. **Punched cards and paper tape were early input/output mediums. Discuss their advantages and disadvantages.**

Advantages of punched card and paper tape:

* The punched card and paper tape are utilized as input/output devices in early computers.
* They are used for storing data.
* They use a separate machine to prepare the input.
* They give an enduring record of the input and output.
* They provide powerful and consistent mediums to store a large amount of data.
* In punched cards, the erroneous card can be replaced easily.
* The computer executes the output based on the input read from the machine.
* The data stored are available for a long time.

Disadvantages of punched card and paper tape:

* They are slow while reading the input from the card.
* Data compactness is low.
* To get a human readable copy of the data, the cards have to be transferred to another device.
* They are highly inconvenient to work in offline mode.

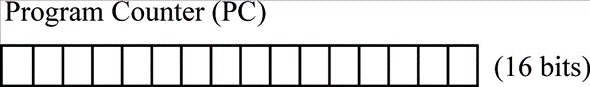
*(Dale and Lewis, Computer Science Illuminated, p. 127-131)*

*(http://www.eetimes.com/author.asp?doc\_id=1285484)*

1. **What are the functions of the following registers:**

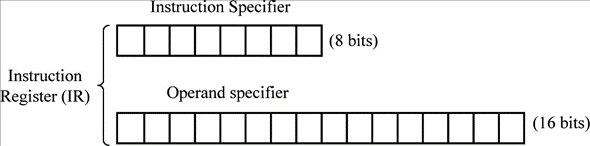
* Program Counter:

A program counter is a special register located in the control unit that contains the address of the subsequent instruction to be performed. After retrieving each instruction, the program counter value is increased repeatedly and then the value changes to zero when the computer resumes. See the representation of Pep/8’s virtual machine below.



* Instruction Register:

An instruction register is a special register located in the control unit that holds the current instruction to be performed or decoded. It takes considerably less time to access. In complex processors, a pipeline of instruction registers is used. See the representation of Pep/8’s virtual machine below.



* Accumulator:

An accumulator is a special register located in the control unit that is used to hold data and the results of operations. It is the register in which intermediate arithmetic and logic results are stored.

* Stack Pointer:

A stack pointer is a special register located in the control unit that stores the address of the last program request in a stack. A stack is a specialized buffer which stores data from the top down. As new requests come in, they push down the older ones.

*(Dale and Lewis, Computer Science Illuminated, p. 191)*

*(http://whatis.techtarget.com/definition/accumulator) (*[*http://whatis.techtarget.com/definition/stack-pointer*](http://whatis.techtarget.com/definition/stack-pointer)*)*

1. **List the steps in the fetch-execute cycle.**

The steps in the Fetch-Execute Cycle are:

* Fetch the next instruction
* Decode the instruction
* Get data if needed
* Execute the instruction

(Dale and Lewis, Computer Science Illuminated, p. 124-125)

1. **Describe in details the RAM, ROM, EPROM, and EEPROM memories**

* RAM:

RAM stands for random-access memory. It is memory in which each cell (usually a byte) can be directly accessed. RAM also has the ability to change the contents of each location. That is, storing something else into that place can change the bit pattern in each cell.

* ROM:

ROM stands for read-only memory. It is similar to RAM with the exception that the contents in locations in ROM cannot be changed. Their contents are permanent and cannot be altered be altered by a stored operation. Placing a bit pattern in ROM is called burning because the bit pattern is burned either at the time the ROM is manufactured or at the time the computer parts are assembled.

* EPROM:

EPROM stands for erasable-programmable-read-only memory. It is PROM (programmable-read-only memory) that can be erased and re-used. Erasure is caused by shining an intense ultraviolet light through a window that is designed into the memory chip

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* EEPROM:

EEPROM stands for electrically erasable programmable read-only memory. It is user-modifiable-read-only memory the can be erased and reprogrammed repeatedly through the application of higher than normal voltage. Unlike EPROM chips, EEPROMs do not need to be removed from the computer to be modified. However, an EEPROM chip has to be erased and reprogrammed in its entirety, not selectively.

*(Dale and Lewis, Computer Science Illuminated, p. 132-133)*

*(*[*http://whatis.techtarget.com/definition/EPROM*](http://whatis.techtarget.com/definition/EPROM)*)*

*(*[*http://whatis.techtarget.com/definition/EEPROM-electrically-erasable-programmable-read-only-memory*](http://whatis.techtarget.com/definition/EEPROM-electrically-erasable-programmable-read-only-memory)*)*

1. **What are secondary storage devices and why are such devices important? Give a couple of examples.**

Secondary storage device is used to r storage purpose and are called external memory or auxiliary storage. They are a non-volatile and permanent memory which serve as a location to store the information outside of the main memory. Secondary storage device is important because it holds the information in a separate storage medium instead of RAM and ROM, because RAM IS volatile memory and ROM cannot be altered. Some examples of Secondary storage devices are magnetic tape, floppy disk, hard disk, optical disk (CD, DVD etc.), flash drive, and flash memory cards.

*(Dale and Lewis, Computer Science Illuminated, p. 133-137)*

1. **Discuss the pros and cons of using magnetic tape as a storage medium.**

Pros:

* Very reliable
* Cheapest medium used for storage
* Stores massive quantity of data, at more than one hundred GB

Cons:

* Requires sequential access
* Relatively slow while processing
* Requires an equipment to read and store the information on the tape
* Head to search for information

*(Dale and Lewis, Computer Science Illuminated, p. 133-137)*

1. **Define the tracks, sectors, cylinders of a magnetic disk**

* Track:

A track is a concentric circle around the surface of a disk with each track divided into sectors.

* Sectors:

A sector is a section of a track that holds a block of information as a continuous sequence of bits.

* Cylinders:

A cylinder a collection of tracks that line up under one another. It is the set of concentric tracks on all surfaces.

*(Dale and Lewis, Computer Science Illuminated, p. 133-137)*

1. **Define the steps that a hard disk drive goes through to transfer a block of data from the disk to memory.**

* Position the read/write head over the particular track via the arm.
* Position the correct sector under the read/write head via an input/output instruction.
* Start reading the block once the read/write head is over the proper track.

*(Dale and Lewis, Computer Science Illuminated, p. 133-137)*