MODULE 2:MULTIPLE REPRESENTATIONS/ LAYERS OF INTERPRETATION
WEEK 2

Learning Outcomes:

After completing this course you are expected to demonstrate the following:

1. Illustrate an abstract view of computer system
2. Understand the concept of memory hierarchy

A. Engage

Trivia

It was in the 1940s when Jay Forrester and friends began finding non-volatile memory. They produced magnetic core memory. It's useful to bring back memory after power loss. The newest technology is called virtual memory. It's the system where the entire physical memory is managed by the operating system.

B. Explore

Video title:Inside your Computer
YouTube Link:https://www.youtube.com/watch?v=AkFi90lZmXA
Module VideoFilename:**Week 2 – Inside your Computer**

C. Explain

1. **Overview of Computer Abstraction (**Multiple Representation/Layers of Interpretation)
   Computer spans many levels of detail which we call levels of abstraction. The different components as illustrated in the image in Fig. 2.1:

   1. ***Operating System*** - Provides a convenient interface between (a) the user and his/her application software, and (b) the hardware (sometimes called the *bare machine*).
   2. ***Assembler*** - Translates *assembly language*, a primitive type of programming language, into *machine code*, which is a stream of ones and zeroes.
   3. ***Instruction Set Architecture*** **(ISA)** - Interfaces the software to the hardware, and provides support for programming.
   4. ***Processor, Memory, and I/O System*** - These components support the execution of machine code instructions expressed in terms of the ISA.
   5. ***Data path and Control*** - Provide a convenient abstraction for connecting the processor, memory, and I/O system and controlling their function efficiently.

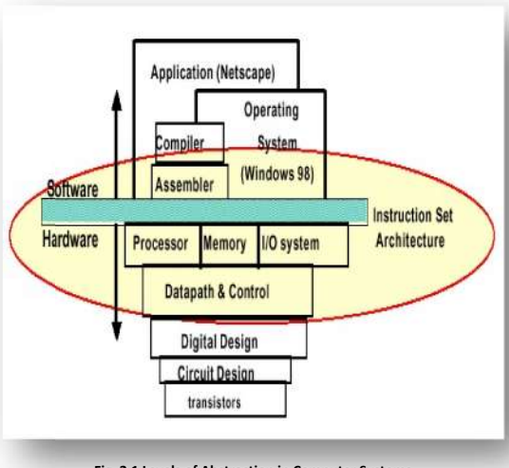

Fig. 2.1 Levels of Abstraction in Computer Systems

2. **Five Components of a Computer:**

   a. *Input* - Provides data and program information
   b. *Datapath* - Mediates I/O
   c. *Control* - Implements control of calculation and communication or I/O processes
   d. *Memory* - Storage and retrieval of programs or data
   e. *Output* - Result of running program on processor using input

D. Elaborate

3. **Memory Hierarchy in Computer Architecture**

   In the design of the computer system, **a processor**, as well as a large amount of memory devices, has been used. However, the main problem is, these parts are expensive. So the **memory organization** of the system can be done by memory hierarchy. It has several levels of memory with different performance rates.

4. **Memory Hierarchy**

   The memory in a computer can be divided into five hierarchies based on the speed as well as use. The processor can move from one level to another based on its requirements. The five hierarchies in the memory are registers, cache, main memory, magnetic discs, and magnetic tapes. The first three hierarchies are volatile memories which mean when there is no power, and then automatically they lose their stored data. Whereas the last two hierarchies are not volatile which means they store the data permanently.

   A memory element is the set of storage devices which stores the binary data in the type of bits. In general, the storage of memory can be classified into two categories such as **volatile** as well as **non- volatile**.

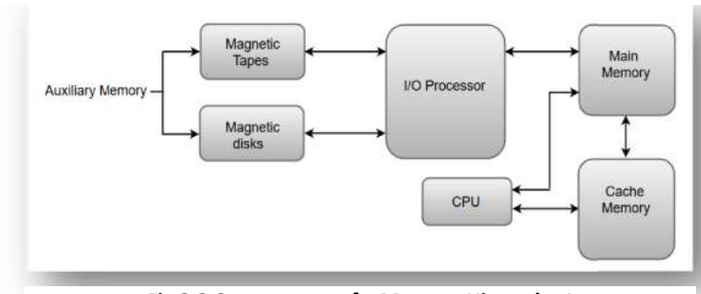

Fig 2.2 Components of a Memory Hierarchy 1

5. **Different Types of Memory**
   a. Auxiliary Memory - known as the lowest-cost, highest-capacity and slowest-access storage in a computer system. Auxiliary memory provides storage for programs and data that are kept for long-term storage or when not in immediate use. Ex. (Magnetic tape and magnetic disks)

Magnetic disk is a digital computer memory that uses a magnetization process to write, rewrite and access data. For example, hard drives, zip disks, and floppy disks.
Magnetic tape is a storage medium that allows for data archiving, collection, and backup for different kinds of data.

b. Main Memory

The main memory in a computer system is often referred to as **Random Access Memory (RAM)**. This memory unit communicates directly with the CPU and with auxiliary memory devices through an I/O processor.

The primary technology used for the main memory is based on semiconductor integrated circuits. The integrated circuits for the main memory are classified into two major units.

1. RAM (Random Access Memory) integrated circuit chips
2. ROM (Read Only Memory) integrated circuit chips

c. Cache Memory

The data or contents of the main memory that are used frequently by CPU are stored in the cache memory so that the processor can easily access that data in a shorter time.

E. Evaluate

ASSESSMENT:
Instructions: You may write your answer on the Answer Sheet (AS) provided in this module.

CONTENT FOR ASSESSMENT:

I. TRUE or FALSE. Indicate whether the following statements are TRUE or FALSE. Write 'true' or 'false' next to the question number. Correct the statement if it is FALSE.

1. Without **ROM**, your computer would need to read and write all data it is using to your hard drive, which is much slower and as a result, your CPU would spend a lot of time waiting for data to be loaded.
2. The reason why BIOS settings can be stored on the ROM, is because the CMOS continues to store the BIOS settings when the computer is switched off as it is connected to a small battery.
3. Since RAM is only used for short-term memory storage, it is **saved** the moment you turn off your computer.
4. Magnetic tape and hard disk drives use magnetic properties to store and retrieve information, allowing large amounts of information and programs to be stored **temporarily**.

5. Hard drive has a large capacity and normal speed. It can be a **permanent storage device** and is user controlled.
6. Caching refers to the use of a **faster** medium to prevent a **slower** medium from slowing down the performance of a computer.
7. The cache is the fastest component in the memory hierarchy
8. The hard drive is much slowerthan either RAM or cache, but it allows you to permanently store a lot more data.
9. The primary technology used for the main memory is based on semiconductor integrated circuits.
10. The data or contents of the main memory that are used frequently by CPU are stored in the cache memory

References:

1. *Inside your computer:* https://www.youtube.com/watch?v=AkFi90lZmXA
2.

Facilitated By:		
Name	:	
MS Teams Account (email)	:	
Smart Phone Number	:	