# Assignment-3

# Define RAM and ROM with heir working mechanism. Explain the memory hierarchy.

# Random Access Memory (RAM)

RAM stands for random access memory is the main memory used in computer system. It allows the computer to store data for immediate manipulation and to keep track of what is currently being processed. It is the place in computer with the operating system, application programs, and data in current use are kept so that they can be accessed quickly by the computer’s processor. RAM is made up of several small storage areas called cell. Each of cells is identified by a number, called address of particular cell. RAM is called main memory because it is the first memory that works with first processor if the processor has to receive some data, and then it receives from RAM.

RAM is also called volatile memory because the data and instruction will remain there only as the computer has electric power. As soon as the electricity cut off, the data and instruction stored in RAM disappears.

Therefore, it is also called the loading memory.

* RAM is used to store data and instructions during execution.
* RAM loses information when the computer is powered off. It is a volatile memory. When the power is turned on, again, all files that are required by the CPU are loaded from the hard disk to RAM. Since RAM is a volatile memory, any information that needs to be saved for a longer duration of time must not be stored in RAM.
* RAM provides random access to the stored bytes, words, or larger data units. This means that it requires same amount of time to access information from RAM, irrespective of where it is located in it.
* RAM can be read from and written to with the same speed.
* The size of RAM is limited due to its high cost. The size of RAM is measured in MB or GB.
* RAM affects the speed and power of a computer. More the RAM, the better it is.

# Read Only Memory (ROM)

A ROM operates like an array. ROM chips contain a grid of rows and columns to turn ON or OFF. It uses a diode to connect the lines if the value is 1. If the value is 0, then these lines are not connected at all. Each element of the array corresponds to one strong element in the memory chip.

* There is some sort of information to be stored in the special chip which enables the computer system to perform start operation and transfer the control to the o/s, this special chip where initial start of instruction is stored is called the ROM.
* It is called read only memory because it is impossible or needs a special device to write the ROM.
* It is non-volatile memory and programmed by the manufacturer and it comes first.
* ROM is an ideal place to put the computer set of instruction that is s/w that boots the system so it is necessary to contain the s/w that enables the computer to boot up.
* The ROM memory chip store the basic I/O system (BIOS), which provides the processor with the information required to boot the system..

# Memory Hierarchy

The memory is characterized on the basis of two key factors-capacity and access time. Capacity is the amount of information (in bits) that a memory can store. Access time is the time interval between the read/ write request and the availability of data. The lesser the access time, the faster is the speed of memory. Ideally, we want the memory with fastest speed and largest capacity. However, the cost of fast memory is very high. The computers use a hierarchy of memory that is organized in a manner to enable the fastest speed and largest capacity of memory. Thus, the cost versus access time has led to a hierarchy of memory where we supplement fast memories with larger, cheaper and slower memories.

The hierarchical arrangement of memory in computer in such a way that the smallest and fastest memory gets placed near to CPU and largest and slowest memory get placed far from CPU is called the memory hierarchy. The memory unit may have different physical and operational characteristics. Therefore, memory system may have different types, costs, organizations, technologies and performances. This memory hierarchy will be fruitful if the frequency of access to slower memories is significantly less than faster memories.

Faster access time,

smaller capacity and

higher cost per bit stored

Register

Cache

Main Memory (RAM)

Optical Disk

Magnetic Disk

Magnetic Tape

Slower access time,

larger capacity and

lower cost per bit stored

Figure: Memory Hierarchy

# Explain briefly the working of the magnetic disk. Differentiate between PROM, EPROM and EEPROM.

**Working mechanism of magnetic disk**

* The surface of disk is divided into circles known as tracks.
* Tracks are further divided into sectors. A sector is piece slice that cuts across all tracks.
* Data on disk is stored in sector, a disk has 8 or more sectors per tracks.
* Magnetic disk is inserted into a magnetic disk drive for access. The driver consists of a read write head which is connected to the disk arm, which moves the head.
* During reading and writing a disk, the motor of disk drive moves the disk at high speed and the following procedure is required for accessing the data on disk.

1. The read –write head is pointed to the desired tracks where the data is to be read or write. The time taken to move the read-write head desired tracks is called the seek time.
2. Once the read-write head is at the right track then the head waits for right sector to come under it. The time taken for desire sector of the track to come under read-write head is called latency time.
3. Once the read-write head is positioned at the right track and sector, the data has to be written to disk or read from disk. The rate at which data is written to disk or read from disk is called the data transfer rate.
4. The sum of seek time, latency time and time for data transfer is the access time of the disk.

# Difference between PROM, EPROM and EEPROM are given below:

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| **PROM** | **EPROM** | **EEPROM** |
| 1. It is a programmable read only  Memory. | 1. It is erasable programmable read only memory. | 1. It is electrically erasable programmable read only memory. |
| 2. The user can write instructions on PROM only once. | 2. The user can write instructions on EPROM many times. | 2. The instructions written in EEPROM can be erased and reprogrammed using electrical charge. |
| 3. The instructions written by the user cannot be erased from PROM. | 3. The instructions written by the user can be erased from EPROM using UV rays. | 3. The content is erased byte by byte. |
| 4. If there is an error while writing on PROM, it becomes unusable. | 4. If there is an error while writing on EPROM, it can still be used again. | 4. Selective programming can be done. |
| 5. It provides less usability as instructions are written only once. | 5. It provides more usability as instructions are many times. | 5. EEPROM chip need not be taken out the computer or device to erase the content. |

# 3. Define register. What is the purpose of the register?

Register are the type of computer memory which of high speed and a temporary storage location in the CPU, used to quick access, store and transfer data and instruction data that are being used immediately by the CPU. These are also called processor register.

A processor register may hold and instruction, a storage average or any data (bit sequence or individual character). Register are also used to hold the memory location, register holding the memory location is used to calculate the address of next instruction after the execution of the correct instruction is completed.

The purposes of the register are given below:

* Accumulator (ACC) contains the result of arithmetic and logic operations.
* Instruction Register (IR) stores the current instruction most recently fetched.
* Memory Address Register (MAR) stores the address of next location in the memory to be accessed.
* Program Counter (PC) stores the address of next instruction to be processed.
* Data Register (DR) stores the operands and any other data.
* Memory Buffer Register (MSR) temporarily stores data from memory or the data to be sent to memory.