MODEL PAPER

EL-309

Q.1 Write down difference between memory mapped input/output and peripheral input/out.

Ans. Memory Mapped I/O

1. 16-bit device address
2. Data transfer between any general-purpose register and I/O port.
3. The memory map (64K) is shared between I/O device and system memory.
4. More hardware is required to decode 16-bit address.
5. Arithmetic or logic operation can be directly performed with I/O data.

6. Control Signals used are like MEMR(bar), MEMW(bar).

7. Instructions used are like STA,STAX,LDA,LDAX

Peripheral Mapped I/O

1. 8-bit device address.
2. Data is transfer only between accumulator and I.O port.
3. The I/O map is independent of the memory map; 256 input device and 256. Output device can be connected.
4. Less hardware is required to decode 8-bit address.
5. Arithmetic or logical operation cannot be directly performed with I/O data.

6. Control signals used are like IOR(bar), IOW(bar).

7. Instructions used are like IN,OUT.

## Q.2 Draw timing diagram of MVI 43H.
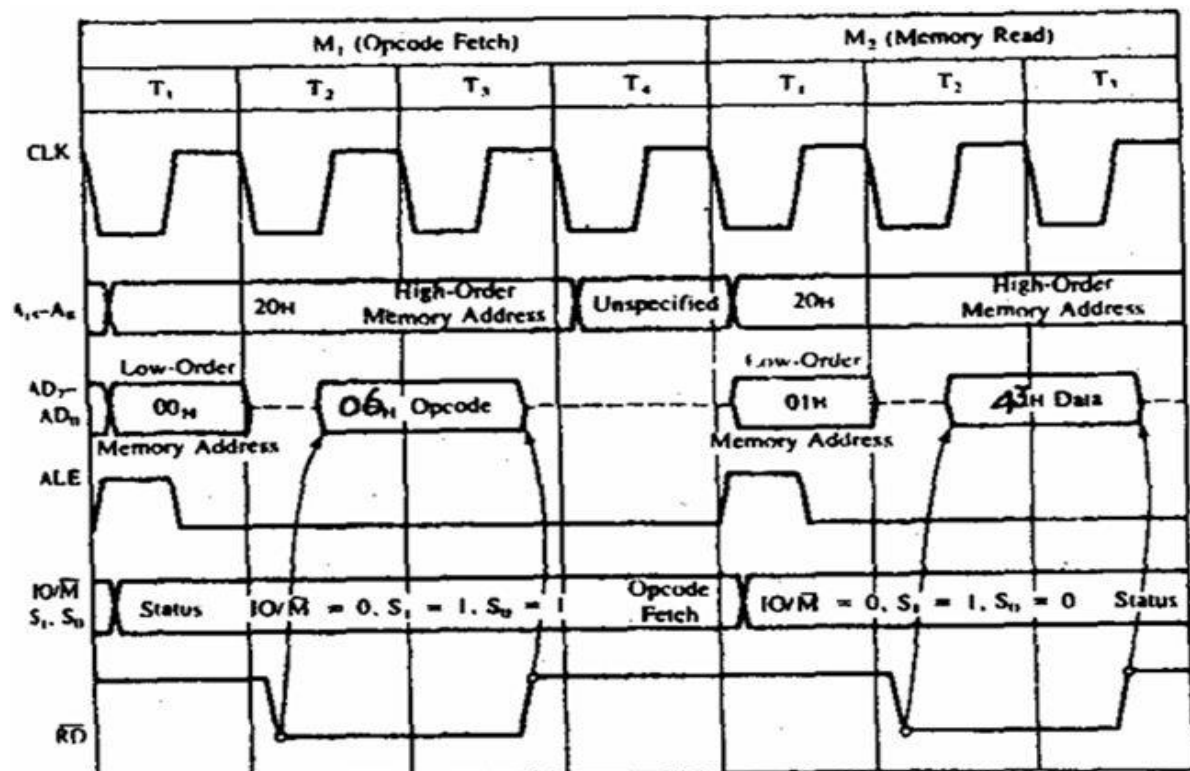
Q.3 Explain Memory Organization.

Ans. **Memory Organization**

A memory unit is the collection of storage units or devices together. The memory unit stores the binary information in the form of bits. Generally, memory/storage is classified into 2 categories:

- **Volatile Memory**: This loses its data, when power is switched off.
- **Non-Volatile Memory**: This is a permanent storage and does not lose any data when power is switched off.

Memory Hierarchy
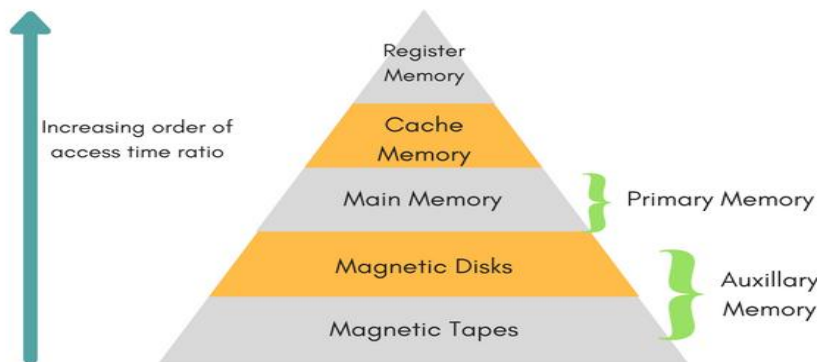
The total memory capacity of a computer can be visualized by hierarchy of components. The memory hierarchy system consists of all storage devices contained in a computer system from the slow Auxiliary Memory to fast Main Memory and to smaller Cache memory.

Auxiliary memory access time is generally **1000 times** that of the main memory, hence it is at the bottom of the hierarchy.

The **main memory** occupies the central position because it is equipped to communicate directly with the CPU and with auxiliary memory devices through Input/output processor (I/O).

When the program not residing in main memory is needed by the CPU, they are brought in from auxiliary memory. Programs not currently needed in main memory are transferred into auxiliary memory to provide space in main memory for other programs that are currently in use.

The **cache memory** is used to store program data which is currently being executed in the CPU.
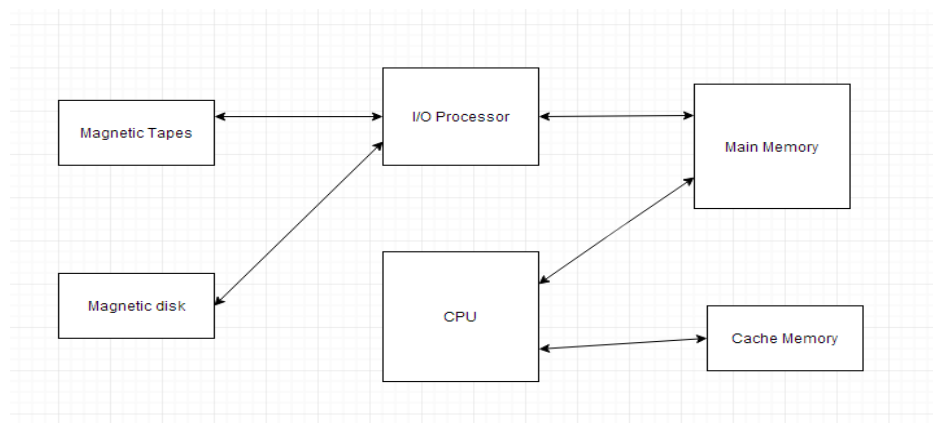
Main Memory

The memory unit that communicates directly within the CPU, Auxillary memory and Cache memory, is called main memory. It is the central storage unit of the computer system. It is a large and fast memory used to store data during computer operations. Main memory is made up of **RAM** and **ROM**, with RAM integrated circuit chips holing the major share.

1. RAM- Random Access Memory a type of computer memory that can be accessed data randomly. A <u>random-access</u> memory device allows <u>data</u> items to be <u>read</u> or written in almost the same amount of time irrespective of the physical location of data inside the memory.

   DRAM:. [Dynamic RAM](#) is a volatile memory which is relatively inexpensive (compared to static RAM) memory, but slower than static RAM.Dynamic RAM cells are constructed from a transistor and a capacitor, which must be refreshed very frequently (capacitors leak charge rather quickly). This need for continuous refreshing is the basis for the name "dynamic RAM"

   SRAM: [Static RAM](#) is a volatile memory constructed from true latches (flip-flops), and hence consists of more circuitry per bit than dynamic RAM. Static RAM is significantly more expensive and less dense (fewer bits per volume). Static RAM is capable of achieving lower access times than dynamic RAM, so it is used in applications where speed is critical.

2. ROM: Read Only Memory, is non-volatile and is more like a permanent storage for information. It also stores the **bootstrap loader** program, to load and start the operating system when computer is turned on.

   PROM (Programmable ROM): these types of non-volatile memory can be altered and are often referred to as programmable ROM. One of the original forms of non-volatile memory was mask-programmed ROM. It was designed for specific data such as bootstrap, which contains the startup code. Mask-programmed ROM can never be changed. A PROM can only be changed/updated once.

   EPROM (Erasable PROM) : This type of ROM can have its contents erased by ultraviolet light and then reprogrammed by an RPROM programmer. This procedure can be carried out many times; however, the constant erasing and rewriting will eventually render the chip useless.

   EEPROM (Electrically Erasable PROM) : This type of ROM works in a similar way to Flash memory in that it can its contents can be 'flashed' for erasure ad then written to without having to remove the chip from its environment. EEPROMs are used to store a computer system's BIOS, and can be updated without returning the unit to the factory. In many cases, BIOS updates can be carried out by computer users wishing a BIOS update.