KEY POINTS

- Computer memory is a storage device that holds instructions, data and the results produced after processing by the computer.
- Main memory is high-speed IC chip memory that stores programs and data that the computer is currently executing
- Cache memory is small amount of high-speed semiconductor memory, which exists inside the microprocessor and it is faster than main memory
- Registers are small memory units inside the processor, used to temporarily store binary information and pass it on to the other parts of the processor or main memory during execution of instructions
- ROM is Read Only-Memory used to store small programs that are frequently required and are not to change during the operation of the computer.
- Secondary memory, also known as backing storage, has huge storage capacity and stores information permanently
- Optical disk is a plastic-coated disk that can store data in digital form using laser technology as tiny bumps etched on the surface.
- Flash memory is a type of EEPROM. It is solid-state storage device having no moving parts and it is used as hard disk

EXERCISE

Q.1 Select the best answer for the following MC Qs.

i. Which of the following is the fastest memory?
A. RAM B. ROM C. Cache memory D. USB flash drive

ii. How much is 1 MB memory equal to?
A. 1024 Bytes B. 1024TB C. 1024KB D. 1024GB

iii. Which of the following is volatile memory?
A. RAM B. ROM C. PROM D. EEPROM

iv. Which of the following has highest storage capacity?
A. DVD B. Blu-ray Disk C. CD D. Floppy Disk

v. USB flash drive is what type of memory?
A. Magnetic memory B. Optical memory
C. Electronic memory D. Primary memory

vi. Which of the following memory devices has the smallest storage capacity?
A. RAM B. Cache memory
C. CD D. Memory card

vii. Which of the following storage device is obsolete now days?
A. Hard disk B. CD C. Memory card D. Floppy disk

viii. Which memory communicates directly with the CPU?
A. Main memory B. Secondary memory
C. Hard disk D. USB flash drive

ix. Which of the following memory devices has sequential access to data?
A. Magnetic disk B. Optical memory
C. Magnetic tape D. Chip memory

x. Where are the registers located?
A. Inside hard disk B. Inside DVD
C. Inside RAM D. Inside Microprocessor

Answers

i.	C	ii.	C	iii.	A	iv.	B	v.	C
vi.	B	vii.	D	viii.	A	ix.	C	x.	D

Q2. Write short answers of the following questions.

i. State three differences between primary and secondary memory.

Answer

Differences between primary and secondary memory:

Primary Memory	Secondary Memory
1. In primary memory, the processing unit directly accesses data	1. In secondary memory, data is first transferred to main memory and then routed to processing unit.
2. Information stored is temporary and it can be lost when there is a sudden power cut.	2. Information stored is permanent unless one deletes it intentionally.
3. Primary memory has limited storage capacity.	3. Secondary memory can store bulk amounts of data in a single unit.

ii. Differentiate between sequential access and direct access memory.

Answer

Differences between sequential access and direct access memory:

Sequential Access Memory	Direct Access Memory
1. It is a type of memory in which data is accessed sequentially one after the other. A particular stored data is found by sequencing through all locations until the desired data is reached	1. In this type of memory, the data is accessed directly or randomly. Semiconductor memories, disk memories and optical memories are direct access memories. Direct access memory is also known as random access memory.
2. Examples of sequential access memory devices include magnetic tapes and audio/video tapes.	2. Hard disk, compact disk and flash memory are examples of direct access memory.

iii. Why data access time in sequential access devices is more than the random access devices?

Answer

Data access time in sequential access devices is more than the random access devices because in sequential access devices, memory can be accessed only in serial order i.e. if we have to access 4th memory location then first we would have to move to first three locations and skip them and only then we can access the 4th location. Whereas, in Random access devices, memory location can be accessed at random i.e. if we have to access 4th location then we can directly go to 4th location and access it.

iv. If cache memory is removed from a computer, what will happen to it?

Answer

If cache memory is removed from a computer, the computer hardware does not store copies of information currently used by programs (data and instructions), loaded from the main memory.

v. Define memory word.

Answer

Memory Word

In computing, the smallest chunk or size of data that a computer can process is called memory word. It is a fixed-sized piece of data handled as a unit by the processor.

vi. Differentiate between RAM and ROM.

Answer

Differences between RAM and ROM:

RAM	ROM
1. The data is not permanently stored in it but it can be altered any number of times.	1. The data is permanently stored in it. It can be altered but only a limited number of times that too at slow speed.
2. It is a high-speed memory.	2. It is much slower than the RAM.
3. The CPU can access the data stored on it.	3. The CPU cannot access the data stored on it.
4. It has large size with higher capacity.	4. It has small size with less capacity.

vii. What is the purpose of secondary memory?

Answer

Purpose of Secondary Storage

The purpose of secondary storage is the long-term retention of data in a computer system. Secondary storage is non-volatile and not cleared when the computer is powered off and back on.

viii. Give few advantages of using flash memory?

Answer

Advantages of using Flash Memory

1. It allows fast read/write operations.
2. It is non-volatile semiconductor memory
3. It is very light and very small in size.
4. It is very reliable.
5. Its operation is noiseless since it has no moving part.

ix. How the size of RAM affects the processing speed of a computer system?

Answer

With more RAM, more of the program instructions can be loaded and there is less need to keep swapping data in and out to the swap file on the hard disk drive.

The constant swapping of data slows down the speed at which applications can run, so Increasing RAM will increase the speed of operation of the computer.

An increase in RAM will improve the multitasking capabilities of the computer as the instructions of several programs will be able to be stored in RAM at the same time.

Q3. Write long answers of the following questions.

i. What is internal processor memory? Explain different types of internal processor memories used in computers.

Answer

Internal Processor Memory

Internal processor memories are directly accessible to the CPU. These are extremely fast memories

Types of Internal Processor Memory

Types of internal processor memory are as follows:

- Cache Memory
- Processor Registers

1. Cache Memory

Cache memory is small amount of high-speed semiconductor memory, which exists inside the microprocessor or on the motherboard of the computer. This memory stores some active portion of main memory. It lies between the main memory and the processor. When the processor requires any information, first it will look up in the cache memory, and if it is not available in the cache then it will fetch it from the main memory.

Types of Cache Memories

There are three types of cache memories, Level 1(L1), Level 2(L2) and Level 3(L3) as shown is Fig.2.6.

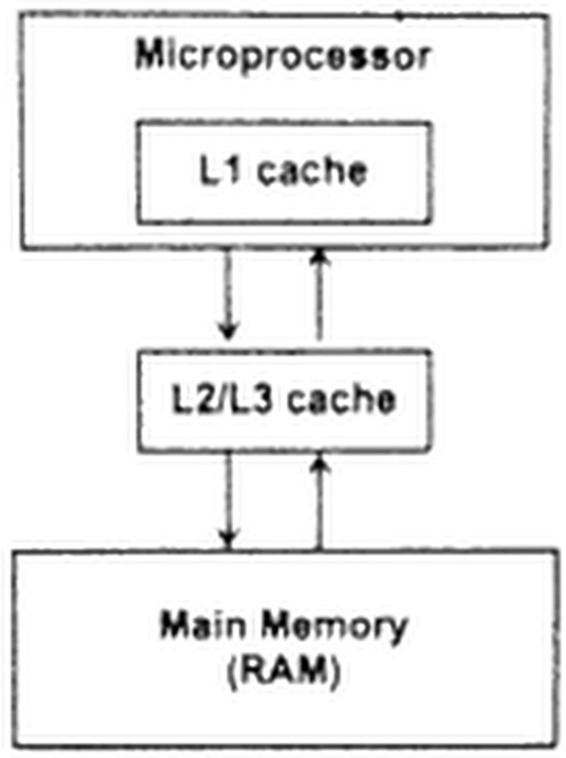

Fig 2.6 L1, L2 and L3 cache memory

L1 cache memory is built inside the microprocessor chip. It has the fastest access time. L2 and L3 cache memories are separate chips on the motherboard. These can be accessed more quickly than the main memory

2. Processor Registers

Registers are small memory units There are a large number of registers inside the processor. There function is to temporarily store binary information and pass it on to the other parts of the processor or main memory during the execution of program instructions.

Commonly Used Registers

Some commonly used registers inside the microprocessors are:

- Accumulator
- Instruction Register
- Data Register
- Program Counter Register
- Memory Address Register

ii. Explain magnetic tape and hard disk.

Answer

Magnetic Tape

Magnetic tape is a plastic strip with a magnetic coated material. Bits are recorded as magnetic spots on the tape along several tracks Usually 7 or 9 bits are recorded simultaneously to form a character. Read/write heads are mounted one in each track so that data can be recorded and read as a sequence of characters. Magnetic tape is either in the form of cassette or big reels as shown in Fig.2.7.

Fig.2.7 Magnetic Tape Cassette and Reel

Magnetic tape is slow in operation as it has sequential access to data but it is a cheap storage device. Magnetic tape drive is used to write data to and read data from a magnetic tape. Tapes are

used for storing large amount of data. Modern tapes can store data up to 5 TB. It is used with minicomputers and mainframes for backups and archives.

Hard Disk

Hard disk contains one or many platters (disks) coated with magnetic material on both sides. The platters are attached to a spindle holding them in parallel with equal gap. All the platters rotate together at high speed. Bits are stored on the magnetic surface in spots along concentric circles called tracks. Hard disks contain thousands of tracks. Track is divided into sections called sectors. Each platter has two read/write heads for writing data to and reading data from both surfaces of the platter. Hard disks are manufactured in very clean environment. They must be kept dust free. Dust particles can create scratches on the surface of the platters and damage the data stored in it. The storage capacity of modern hard disks is in Tera bytes. A hard disk is shown in Fig.2.8

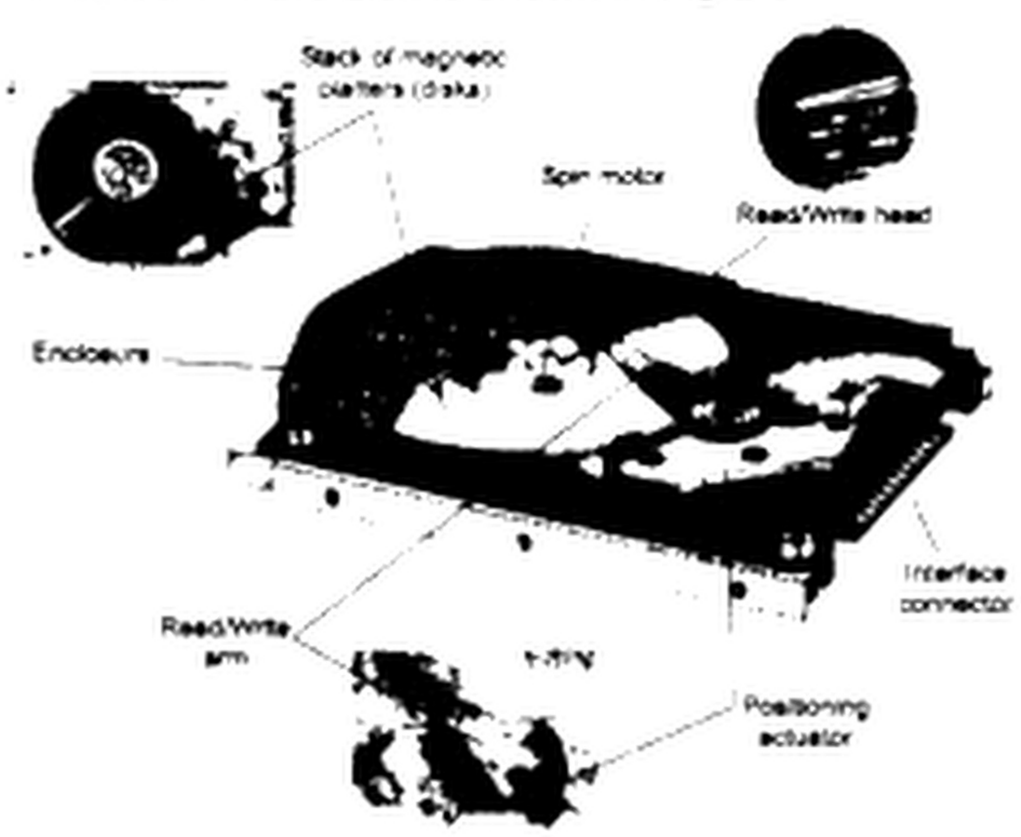

Fig.2.8 Hard Disk

iii. What is optical disk? Describe its types.

Answer

Optical Disk

Optical disk is a plastic-coated disk that can store digital data. Data is stored in optical disk in digital form by laser technology as tiny bumps etched on the surface.

Types of Optical Disks

The following are types of optical disks:

- CDs
- DVDs
- Blu-ray Disk

1. Compact Disks (CDs)

CD is an optical disk used for storing digital data. It was originally developed for storing and playback of sound recording but later on its use expanded to computer data storage.

Structure of CD

A CD is 1.2 millimetres thick with a diameter of 120 millimetres. It is made up of polycarbonate plastic and weighs 15 to 20 grams.

Storage Capacity of CDs

The storage capacity of CDs ranges from 350 MB to 800MB.

Use of CDs

CDs are popular for storing data, application programs, device drivers, Windows operating system, images and videos.

Fig.2.11 A CD inside a CD Player

Storing Information in CD

A CD has a single spiral track that spirals from the center to the outside edge. Information is stored on a CD in the form of lands and bumps A binary 0 is represented by a bump and a 1 by a land.

CD Drive/Player

A CD drive/player is used for reading the data stored on the CD as shown in Fig.2.11.

Job of CD player

The job of CD player is to focus the laser on the track of bumps. The laser beam passes through the polycarbonate layer, reflects off the aluminium layer and hits the censor that detects changes in light. The bump scatters the light and the land reflects it into the censor. The change in reflectivity is transmitted as 0s and 1s into the memory of the computer.

2. Digital Video/Versatile Disks (DVDs)

DVD is very similar to CD but has larger data storage capacity. Its data storage capacity is about seven times more than CD It has replaced the video tapes that were used in the past for storing movies.

DVD Writer/Player

A DVD writer or player is used to read the data stored on a DVD. DVD players are compatible with CD, which means they can play CDs also.

Structure of DVDs

DVDs have the same diameter and thickness as CDs and are made of the same material and manufacturing methods Data is also stored just like a CD on a spiral track in the form of lands and bumps.

Storage Capacity of DVDs

The storage capacity of DVDs ranges from 2GB to 16 GB. The MPEG (Moving Picture Experts Group) format is used for storing movies in a compressed form on the DVDs.

3. Blu-ray Disk (BD)

Blu-ray is a new type of optical storage device. Its main advantage over CD and DVD is that it has storage capacity up to 300GB and it is also faster. The bumps on the surface of Blu-ray that represent digital information are much smaller and very densely packed compared to DVD. This increased the storage capacity of Blu-ray.

Advantages of Blu-ray Disk

Blu-ray disks are better storage devices for storing movies because they require a lot more storage. Another advantage of Blu-ray disk is their durability. They have a special coating that helps prevent scratches and marks.

A Blu-ray disk is shown in Fig 2.12.

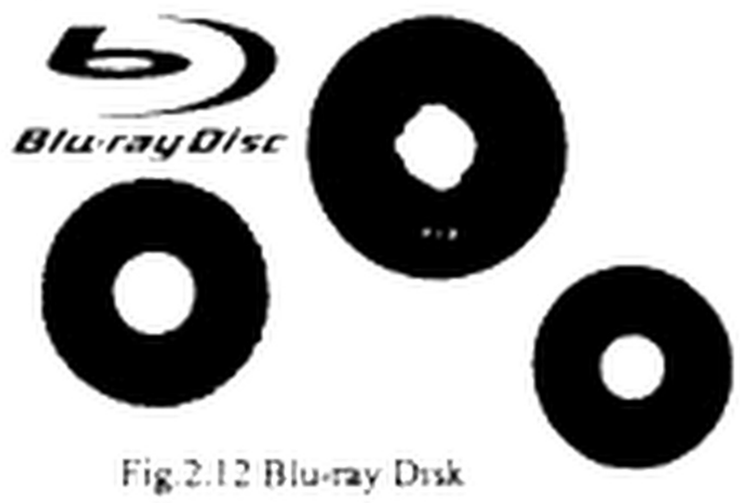

Fig.2.12 Blu-ray Disk

iv. What is Flash or Chip memory? Explain its types.

Answer

Flash memory or Chip memory

Flash memory or Chip memory is a type of EEPROM. It is solid-state storage device, which means that there are no moving parts in it. Everything inside the flash or chip memory is in electronic form. It got its name "Flash" from the fact that it can store chunks of data and also erase large chunks of data in a flash because it is a semiconductor IC chip memory.

Types of Flash Memory

Flash memory comes in two types:

- Flash Drive
- Flash Memory Cards

1. Flash Drive

Flash drives are also called USB flash drives. They are small and portable drives that are connected to computers through USB ports. The storage capacity of flash memory ranges from 2GB to 256GB. Flash drives are shown in Fig.2.13.

Fig-2.13 Flash Drive (USB Drive)

2. Flash Memory Cards

Memory cards are used with laptop computers and other electronic devices such as digital cameras, mobile phones and video games. They come in various sizes and with different storage capacity. Flash memory cards are shown in Fig.2.14

Fig 2.14 Flash Memory Cards

LAB ACTIVITIES

Following lab activities are to be carried out during the practical periods.

1) Different types of IC chips (like RAM chip) should be shown to the students. Students should know where these are fixed on the motherboard and their functions should also be explained.

Answer

Practical Work

2) Magnetic tape in cassette or reel form should be shown to the students and they should know how information is stored on it.

Answer

Practical Work

3) Internal and external hard disk should be shown and their operations should be explained.

Answer

Practical Work

4) Students should practically use different types of optical disks in the computer.

Answer

Practical Work

5) Working of USB flash drive and various types of memory cards is to be demonstrated to the students.

Answer

Practical Work