Obj 5: Types of Secondary Storage Devices

- **Magnetic Tape** - this is storage medium that consists of a plastic ribbon that has been coated with material that can be magnetized to represent data. It is no longer widely used, except for archival purposes, and it keeps a backup of important data.
  - **Advantages**
    - Provides archival or backup storage
    - They are reusable, light, compact and easy to store on racks
    - They are inexpensive
    - They can be used for large files or copying from disk files.
  - **Disadvantages**
    - Allows only sequential data access
    - Stored data cannot be easily updated
    - They must be stored in a suitable environment, vulnerable humidity and dust.

- **Floppy Disk** - the diskette is a flexible magnetic disk on which data is recorded magnetically. The device is used to read data from a disk or record data on a disk is called a floppy device.
  - **Advantages**
    - They allow to copy files from one computer to another
    - They are quite cheap
    - Widely used
    - Light/weight portable
    - Provides random data access
  - **Disadvantages**
    - They have a limited capacity (graphics files often don’t fit on a disk)
    - They are less care should be taken to prevent loss of data
    - Vulnerable to dirt
    - Susceptible to viruses
    - Data access relatively slow
    - Data is easily damaged/corrupted

- **Hard Disk** - a hard disk is non-removable, enclosed magnetic disk drive that reads data from and writes data to hard disk. The disks inside the hard drive are called platters.
  - **Advantages**
    - Stores and retrieves data at high speeds
    - More storage capacity than many other storage media
    - Storage is reliable
    - Provides random data access
  - **Disadvantages**
    - Very delicate
    - Not portable – cannot be easily moved from place to place without complications
    - Head crash can occur

- **CD-ROM** - Storage disk whose data is imprinted by the disk manufacturer and cannot be altered or erased by the user. They are used primarily for multimedia data and has a storage capacity of 650 MB – 700 MB (~ 450 floppy disk)
  - **Advantages**
    - Widely used
    - Stored more data in less space
    - Storage is extremely reliable
    - Very durable
    - Provides random data access
    - It is entirely unaffected by magnetic fields
  - **Disadvantages**
    - Allows slower data access than a drive
    - It is not easy to copy on optical disk
    - Optical disk technology is expensive but prices are falling

- **Digital Versatile Disc (DVD)** - also known as Digital Video Disc and even Digital Vapor Disc are identical in looks to a CD–ROM but are different in technology. DVD players use red laser CD – ROM uses infra-red laser. Marks burned on a dvd are packed twice as tightly as that of a CD – ROM
  - **Advantages**
    - They can store large amounts of data
    - They are dependable
    - Provides random data access
  - **Disadvantages**
    - The drives are relatively expensive
    - They are not as widely used as the other storage devices
**Structure of a Diskette**

- **Track**: is a circular ring on one side of the disk. Each track has a number.
- **Sector**: is a wedge-shaped piece of a disk. Each sector is numbered.
- **Track Sector**: is the area of intersection of a track and a sector. Data is recorded along a track within a sector.
- **Cluster**: a set of track sectors ranging from 2 to 32 or more depending on the formatting scheme.
- **Cylinder**: is a set of matching tracks in a vertical plane through a disk pack.
- **Read/Write Head**: a device that reads data from and writes data to a magnetic disk. For writing the surface of the disk is moved past the read/write head.
- **Access Arm**: this is a mechanical arm that moves the read/write head across the surface of the disk. It is directed by the OS to move the read/write head to a specific track or the disk.

**Variations of Hard Disk**

- **Fixed Disk**: is a high speed, high capacity disk drive that is housed in their own cabinets. They are not removable or portable. They have greater capacity than the external disk and are more reliable.

**Structure of a Hard Disk**

- **External Disk**: these are detachable which their own power supply and are not built into the system cabinet. They can store GB’s of data.
- **Fixed Head**: one read/writes head per track with heads mounted on fixed arm.
- **Moveable Head**: one read/write head per side with mounted on movable arm.

**Device Interface**

- SATA, SCSII, IDE, are all devices in the motherboard of a computer which provide an interface for devices such as internal hard disk. Drives and mass storage devices to connect to the computer.
  - **IDE**: Intelligent Drive Electronics or Integrated Drive Electronics. An IDE interface is an interface for mass storage in which the controller is integrated into the disk or CD-ROM drive.
  - **SATA**: Serial Advanced Technology Attachment. It is a computer bus primarily designed for transfer of data between a computer and mass storage devices such as hard disk drives and optical drives.
  - **SCSI**: Small Computer System Interface.

**Obj 6: Secondary Storage**

- **Storage**: is defined as all various media on which a computer can store programs and information.
- **Secondary Storage**: is also called Auxiliary, backing or mass storage. It contains data, instructions and information for future use. It is permanent and non-volatile.

  The Criteria for rating Secondary Storage Devices are:

  - **Storage Capacity**: this is determined by the type of program or amount of data to be stored.
  - **Access Speed**: this refers to the average time taken to locate data on a sec. storage device.
  - **Transfer Rate**: this refers to the speed and time taken for data to be transferred from a sec device to main memory in order for the data to be executed (processed).
  - **Size**: this is determined by the expected amount of data to be stored.
Cost – this is directly related to the other 4 factors. E.g. “floppy disk is cheaper than CD which is cheaper than a memory stick.”

Secondary Storage devices may be classified by either its Access method or by its Technology.

Access Method - refers to the way in which the data is retrieved i.e. sequentially or directly.

Technology – refers to technology/media used to retrieve the data i.e. magnetically or optically.

Access Method

Sequential Access Storage - this refers to reading or writing data consecutively; as the computer has to search the storage medium from beginning to end in order to find the required data.

Direct Access Storage (Random) – this is also called Random Access which means data can be located immediately without having to search consecutively through the storage medium.

Technology

Magnetic Media – reads data from the storage medium by magnetizing the iron particles on the medium. It is also cheap.

Optical Media – uses high-powered laser beams to burn microscopic spots represented in a disk’s surface. It is expensive.
Classification

Access Method
- SASD
  - Magnetic Tape

Technology
- Magnetic Media
  - Magnetic Tape
  - Floppy Disk
  - Hard Disk
- Optical Media
  - Optical Disk
    - Optical Disk (CD’s, DVD’S)
  - Memory Stick