**Q1. (a) Discuss a few limitations of image scanners? How Optical Character Recognition (OCR) device overcomes these limitations?**

**Ans:-**

**Image Scanner:-**

An image scanner—often abbreviated to just scanner, is a device that optically scans images, printed text, handwriting or an object and converts it to a digital image. Commonly used in offices are variations of the desktop flatbed scanner where the document is placed on a glass window for scanning.



**Limitations of image scanner:-**

Images produced by the scanner can take up a lot of memory space.

Image lose some quality in the scanning and digitising process.

The quality of the final image is dependent on the quality of the original image.

* Quality can vary before and after the scan because it cannot generate 100% result due to various flaws.
* The maintenance of scanners can be expensive and costly.
* Scanners are relatively slow.
* The result is stored as image not as texture form.
* Storage is consumed more than the storage of texture.
* Don’t support characters more than 200.

**OCR:**

* Enables word processing of input text and also require less storage for storing the document.
* Is a text rather than image.
* It can easily read the image in which we can edit also.
* It can convert large or small font size to overcome the scanner limitations.

**(b). Elaborate the use of magnetic ink character recognition device (MICR)?**

**Ans:**

**MCIR:-**

MICR (magnetic ink character recognition) is a technology used to verify the legitimacy or originality of paper documents, especially checks. Special ink, which is sensitive to magnetic fields, is used in the printing of certain characters on the original documents. Information can be encoded in the magnetic characters.

The use of MICR can enhance security and minimize the losses caused by some types of crime. If a document has been forged - for example, a counterfeit check produced using a colour photocopying machine, the magnetic-ink line will either not respond to magnetic fields, or will produce an incorrect code when scanned using a device designed to recover the information in the magnetic characters. Even a legitimate check can be rejected if the MICR reader indicates that the owner of the account has a history of writing bad checks.

Retailers commonly use MICR readers to minimize their exposure to check fraud. Corporations and government agencies also use the technology to speed up the sorting of documents.





**Qno2. (a). Differentiate between printer and plotter?**

**Ans:**

**Difference between printer and plotter:**

|  |  |  |
| --- | --- | --- |
| **BASIS OF COMPARISON** | **PRINTER** | **PLOTTER** |
| **Description** | A printer is an external (peripheral) hardware output device that takes the electronic data stored on a computer or any other storage device and generates a hard copy of the data.   | A plotter is an output device commonly used for computer-aided design applications, to output large vector designs such as architectural blueprints.   |
| **Nature Of The Device** | Printer is a peripheral device in nature and creates a solid copy of the digital data that is represented on the computer screen.   | The plotter is either a peripheral component that you add to computer system or a standalone device with its own internal processor.   |
| **File Reading** | Plotters can read files in the DWG, CDR, Al and other vector formats.   | Printers can read BMP, PDF and JPG TIFF formats.   |
| **Software** | Software for printers includes Photoshop and any other image-editing program.   | Plotter software includes Adobe Illustrator, Corel, Flexi and CAD.   |
| **Cost** | Printers are less costly when compared to plotters.   | Plotters are relatively expensive when compared to printers.   |
| **Output Data Format** | A printer provides the output file data in a format such as bitmap or pixels.   | A plotter provides the output in a format that is similar to a vector graphic/ image created with lines.   |
| **Output Data Production Rate** | Printer produces the data in hardcopy format at a faster speed when compared to a plotter.   | Plotter produces the data in hardcopy at a relatively slower rate when compared to a printer.   |
| **Line Drawing** | Printer can only print a single line at a time.   | Plotters can easily draw continuous lines from point-to-point at same time.   |
| **Application** | Printers are mainly used to produce graphics and text on a physical medium such as paper. They are also, mostly used by graphic artists for posters, signs and other professional quality display.     | Plotters are mainly used in specialized fields such as drawing, architecture and engineering.   |
| **Pen Like Instrument** | A printer uses a needle or a pen to draw lines and figure on a page.   | In plotters, there is more than one automated pen like instrument that can create designs such as diagrams, blueprints etc.   |
| **Resolution** | Printers are resolution dependent, an image produced by a printer (raster image) is enlarged, the size of the pixels simply gets bigger resulting in distortion of the image.   | Usually, plotters are resolution independent, an image produce by a plotter can be enlarged to any size without losing clarity.   |
| **Types** | There two main type of printers, they include impact and non impact printers. | There are four main types of plotters; they include Drum plotter, Flatbed plotter, Inkjet plotter and Cutting  |

**(b).**

**Printing process of a LASER printer:-**

Laser printing is an electrostatic digital printing process. It produces high quality text and graphics (and moderate quality photographs) by repeatedly passing a laser beam back and forth over a negatively charged cylinder called a "drum" to define a differentially charged image.

The laser printing process can be broken down into seven major steps:

## **Step 1: Sending**

To begin the laser printing process, the document is sent from the respective computer to the laser printer and the sent document is processed by the laser printer.

## **Step 2: Cleaning**

Cleaning is a physical and electrical process carried out in order to remove the previous print job and prepare the photosensitive drum for the new print job. Remnants of toner on the drum are scraped away by a rubber-cleaning blade into a debris cavity. Remnants of electrical charges on the drum from the previous print job are defused by electrostatic erase lamps. Lubrication is then applied to the heat roller in order to make sure an adequate amount of heat is evenly applied to transfer the incoming image.

## **Step 3: Conditioning**

Conditioning involves applying a negative charge to the drum unit and the paper as it passes through the corona wire or transfer roller. The application of a negative charge to the paper allows an image to be electrostatically transferred to the page.

## **Step 4: Exposing**

Laser time! The next step is exposing. In this step, the photosensitive drum is exposed to a laser beam, (possibly a laser beam refracted from a spinning mirror inside the printer). Every area of the drum exposed to the laser beam has its surface charge reduced to about 100 volts DC. An invisible latent image is generated as the drum turns.

## **Step 5: Developing**

In the developing step, toner is applied to the latent image on the drum. The toner is comprised of negatively-charged powdered plastics — black, cyan, magenta, and yellow. The drum is held at a microscopic distance from the toner by a control blade.

## **Step 6: Transferring**

The next step is transferring. The secondary corona, or transfer, applies a positive charge to the paper. The negatively-charged toner on the drum is magnetically attracted to the now positively-charged paper. The image is transferred to the paper and maintains its position due to its positive charge.

## **Step 7: Fusing**

The final step is fusing. Heat and pressure are applied to the toner by the fusing rollers. The toner generates a permanent bond as it is pressed and melted into the paper. Teflon covers the fusing rollers as a light silicon oil is applied in order to remove any possibility of the paper sticking to them.

**Qno3. (a). Explain metropolitan area network with multiple examples.**

**Ans:**

**Metropolitan Area Network with Examples:-**

A metropolitan area network (MAN) is a network that interconnects users with computer resources in a geographic area or region larger than that covered by even a large local area network (LAN) but smaller than the area covered by a wide area network (WAN). The term is applied to the interconnection of networks in a city into a single larger network (which may then also offer efficient connection to a wide area network). It is also used to mean the interconnection of several local area networks by bridging them with backbone lines. The latter usage is also sometimes referred to as a campus network.

Examples of metropolitan area networks of various sizes can be found in the metropolitan areas of London, England; Lodz, Poland; and Geneva, Switzerland. Large universities also sometimes use the term to describe their networks. A recent trend is the installation of wireless MANs.

Typical examples of a MAN are a network of fire stations or a chain of community colleges within the same county. MANs are also used in large cities, such as New York.

For example, a company can use a MAN to connect the LANs in all of its offices throughout a city.

**(b). Define topology? Which topology would you chose to setup a local area network and why?**

**Ans:**

**Topology:-**

A Network Topology is the arrangement with which computer systems or network devices are connected to each other. Topologies may define both physical and logical aspect of the network. Both logical and physical topologies could be same or different in a same network.

**Which topology would you chose to setup a local area network and why?**

I would choose star topology to setup a local area network because In local area networks where the star topology is used, each machine is connected to a central hub. In contrast to the bus topology, the star topology allows each machine on the network to have a point to point connection to the central hub and there is no single point of failure. All of the traffic which transverses the network passes through the central hub. The hub acts as a signal booster or repeater which in turn allows the signal to travel greater distances.

**Qno4:- In your opinion, what are the different types of common media used for storage, access and transmission of information? Explain each type in detail?**

## **Backups and Archives**

One thing to consider when deciding the storage media, you are going to use, is whether it is for archiving or backups. A backup is a copy of data (typically stored in an alternate location) that can be used to recover in the event of disaster. An archive can be seen as a collection of long-term records designed to archive data usually to cover a possible future requirement for historical data Typically, archives will be stored for longer than 5 years, whilst backups are updated over time and will not usually be kept for this long.

## **Hard Disk Drive (HDD)**

Hard Disk Drives are everywhere. You will find these inside your servers, home computers, laptops and gaming consoles. But how do HDDs work and why are they still so popular? HDDs work by using two or more magnetic heads, attached to a moving arm, which reads the data from one or more rigid rotating disks coated with a magnetic material. These magnetic disks are very popular for several reasons. HDDs are relatively cheap when compared to other storage media, pairing this with their high capacity makes them perfect for storing large amounts of data when very high-speed random access is not required, e.g. performing backups and general home use. HDDs also have a long lifetime, making them an all-round reliable media. However, the moving parts will eventually lead to them degrading and can be damaged if the disk receives a shock.

## **Solid State Drive (SSD)**

Solid State Drives are rapidly becoming the preferred local storage device. SSDs work by storing persistent data on micro-chips (Flash Storage). Unlike HDDs, SSDs do not have any moving parts and do not contain any physical disk. Since SSDs do not need to wait for a reading arm to physically access data, there are vast performance improvements over HDDs. However, this performance increase comes at a greater cost and lower amount of storage for your money. This makes SSDs ideal for running an operating system off and storing ‘hot data’ (smaller amounts of data, accessed more regularly, e.g. work documents). SSDs were first introduced with a SATA interface, this being the standard for magnetic disks. This enables an SSD to be a drop-in replacement for magnetic disks but being designed around a data stream from a small number of magnetic heads, it doesn’t fully expose an SSDs higher bandwidth and parallelism. To correct this, NVMe was developed to better match SSD’s performance characteristics. The physical layer is PCIe with either a U.2 (which to date has gained little traction) or more commonly M.2. Alternatively, an NVMe storage device can be integrated directly onto a PCIe expansion card.

## **Magnetic Tape**

Magnetic tape is usually made of a thin, magnetised coating on a plastic film. Magnetic tape is less common than it used to be, although, new magnetic tape drives are still in production. The hardware required to write to and read from magnetic tape is expensive. Once this hardware has been purchased, the magnetic tape drives themselves (usually in the form of cartridges) are cheap. These cartridges can also hold massive amounts of data (up to 15TB). However, due to the linear nature of tape, the drives must move to the part of the tape where the data is stored to access it. This means that the sequential I/O of tape drives are extremely fast, while the random I/O is very slow. All these factors make magnetic tape the perfect media for archiving data at a reasonable price.

## **Optical Media — Dye Based**

A, now seldom-seen variation, of optical media is the magneto-optical drive. These devices contained a ferromagnetic material sealed inside a plastic casing. A laser is then used to read data from the magnetic disk based on the magneto-optic Kerr effect (an effect where light is reflected differently based on the magnetized state based on the surface of an object). Magneto Optical disks were hampered by a small maximum capacity (256MB to 9.2GB), making them inefficient for storing large amounts of data. The magneto-optical disks had a high longevity and were highly reliable, however, were superseded by cheaper optical media and flash memory devices.

## **Cloud**

A quickly growing storage media is Cloud Storage. This works by transferring your data over the internet to data centres that are owned and managed by the service provider you chose. Since data is being sent over the internet, this method of transfer is tied to your network speed and can often be slow. This also means that if you lose network connectivity, you also lose access to your files that are stored in the cloud. The plus side to this is that your data is safe from hardware failure. An example of this is Amazon Glacier, which is designed for archiving ‘cold data’, whereas Amazon S3 is designed for data that is accessed more often. This is reflected in the prices where, Amazon Glacier is cheaper to store data per GB, but also incurs a retrieval fee.

### **USB flash drives**

USB flash drives are also known as near line storage, a storage medium that is not continuously connected to network servers or the internet. Generally, this makes most removable media, such as encrypted cartridges or SATA drives, safe from infection by Trojan horses, viruses or worms.

A USB flash drive specifically refers to the housing for the device; the storage media is internal flash designed as an integrated memory circuit, similar to the design of SSDs but on a smaller scale. These thumb-shaped devices slide into any USB to transfer or copy data, and are variously called gum sticks, keychain drives and jump drives.

### **Tape**

Tape was a dominant backup storage medium until the 1990s but was gradually pushed aside by magnetic disk. Tape systems remain in use, but the use case now centres on high-capacity archiving for preserving data. Tape systems have continued to improve in density and endurance, largely due to advances in the Linear Tape-Open (LTO) format. LTO-8 pushes compressed capacity per tape to 32 TB and nearly 13 TB of uncompressed data.

### **Optical disk**

Optical disk technology uses lasers for write once, read many (WORM) data. The use of lasers allows high-density optical disk to store more data than magnetic HDDs. Types of optical storage media include Blu-ray, DVDs and CD-ROMs for read-only data.