COMPUTER SYSTEM

What is a Computer System?

A system is a group of related components and operations that interact to perform a task. Computer System in made up of three components:

- Hardware:
- Software
- People

Computer system contd

1. Hardware: Physical components/equipments
2. Software: or programs that run on the computer. The set of step-by-step instructions that direct the hardware to perform particular tasks

Computer system contd

- Systems Software: the underlying software that the computer uses to manage its own internal activities and run applications software. Programs that are related to controlling the actual operations of the computer equipment.
- Applications Software: software that people use to perform a specific task, such as word processing software used to prepare documents or a game software used to entertain.

Computer system contd

3. People

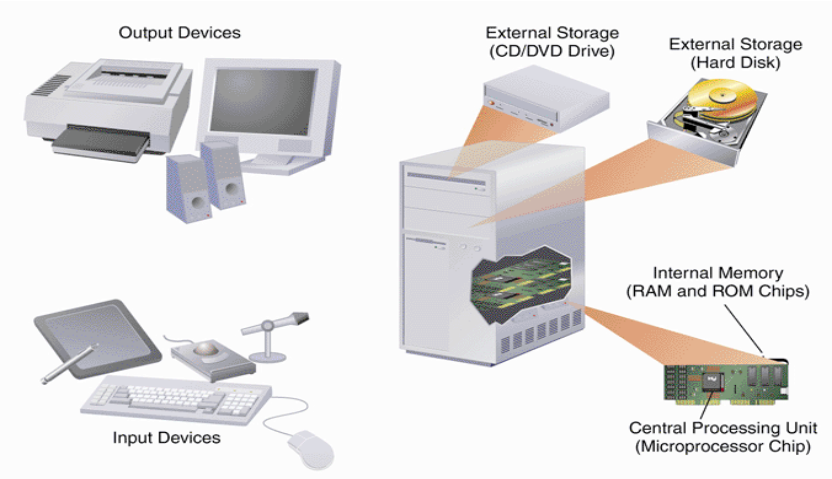
- Computer Professional: a person who has had extensive education or considerable experience in the technical aspects of using a computer-and-communications system.
- End-Users: someone with moderate technical knowledge of information technology who uses computers for entertainment, education, or work-related tasks.

OTHER NEW TERMS

- Procedures/protocols: Descriptions of how things are done-steps for accomplishing a result or rules and guidelines for what is acceptable.
- Connectivity/Communications devices: Refers to the electronic transfer of data from one place to another.

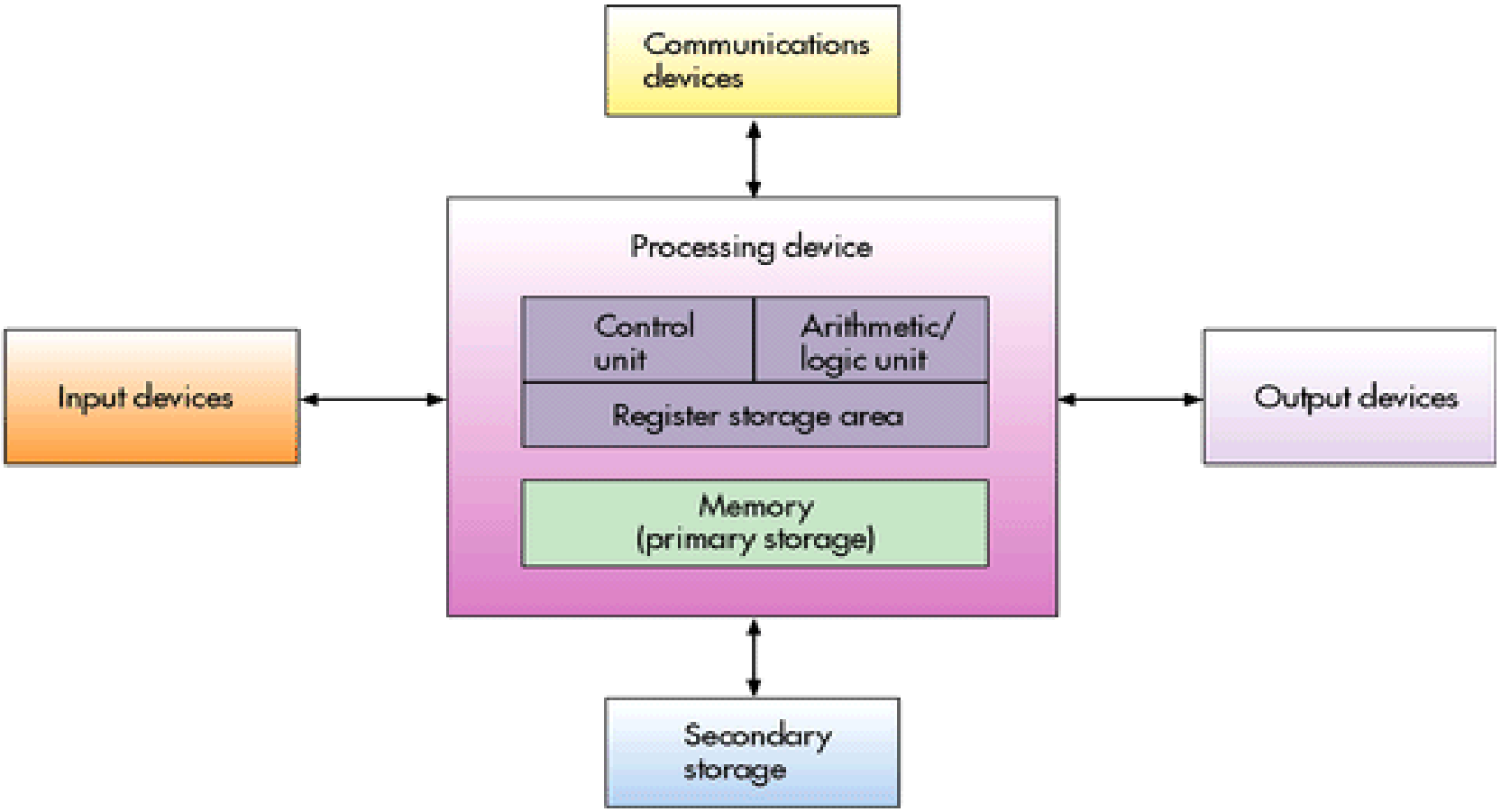
1. Computer Hardware

These are the physical components of a computer. There are divided into four (with one more) categories.



- Input Hardware
- Processing hardware
- Storage hardware
- Output hardware
- Communications adds an extension capability to each category of hardware through communication devices

Hardware Components



H/W-Desktop Computer consists of:

- System Unit
- Peripheral devices:

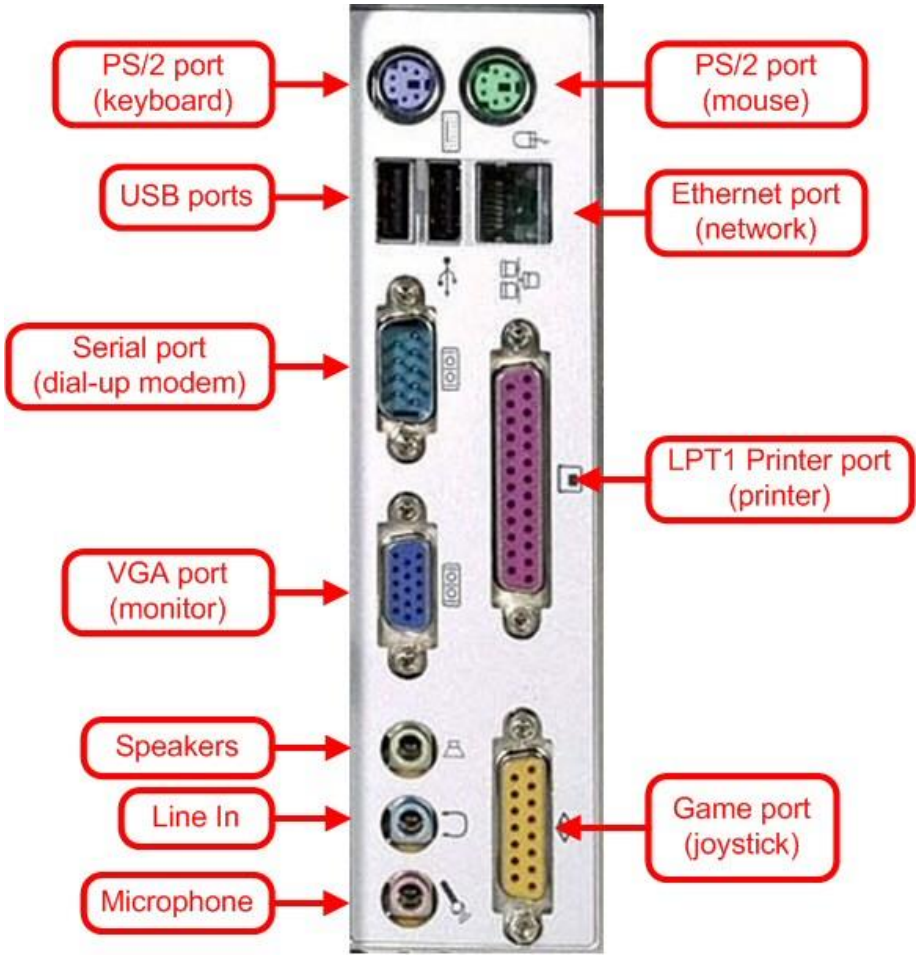
Inside the System Unit

- The **system unit** of a PC is the case that houses processing hardware and other hardware.
- All of the hardware contained within the system unit is connected to the **system board** or **motherboard**.
- **Buses** are electronic paths that data travels around on a computer system.
- Qn- state the function each of the 3 buses below

- **Bus lines**
  - **A Bus line or simply BUS is an electrical pathway through which bits are transmitted within the CPU and between other devices and the CPU in the system.**
  - **Types:**
    - **Address bus**
    - **Control bus**
    - **Data bus**
- **Bus resemble a multi-lane highway the more lane it has the faster the bits can be transferred.**
- **The old fashioned 8-bit bus of early microprocessors which had only 8 pathways.**
- **It was therefore 4 times slower than the 32 bits bus of later microprocessors which had 32 pathways.**
- **Intel Pentium chip is a 32 bit processor.**
- **Some super computer contains carry 128 bits**

desktop

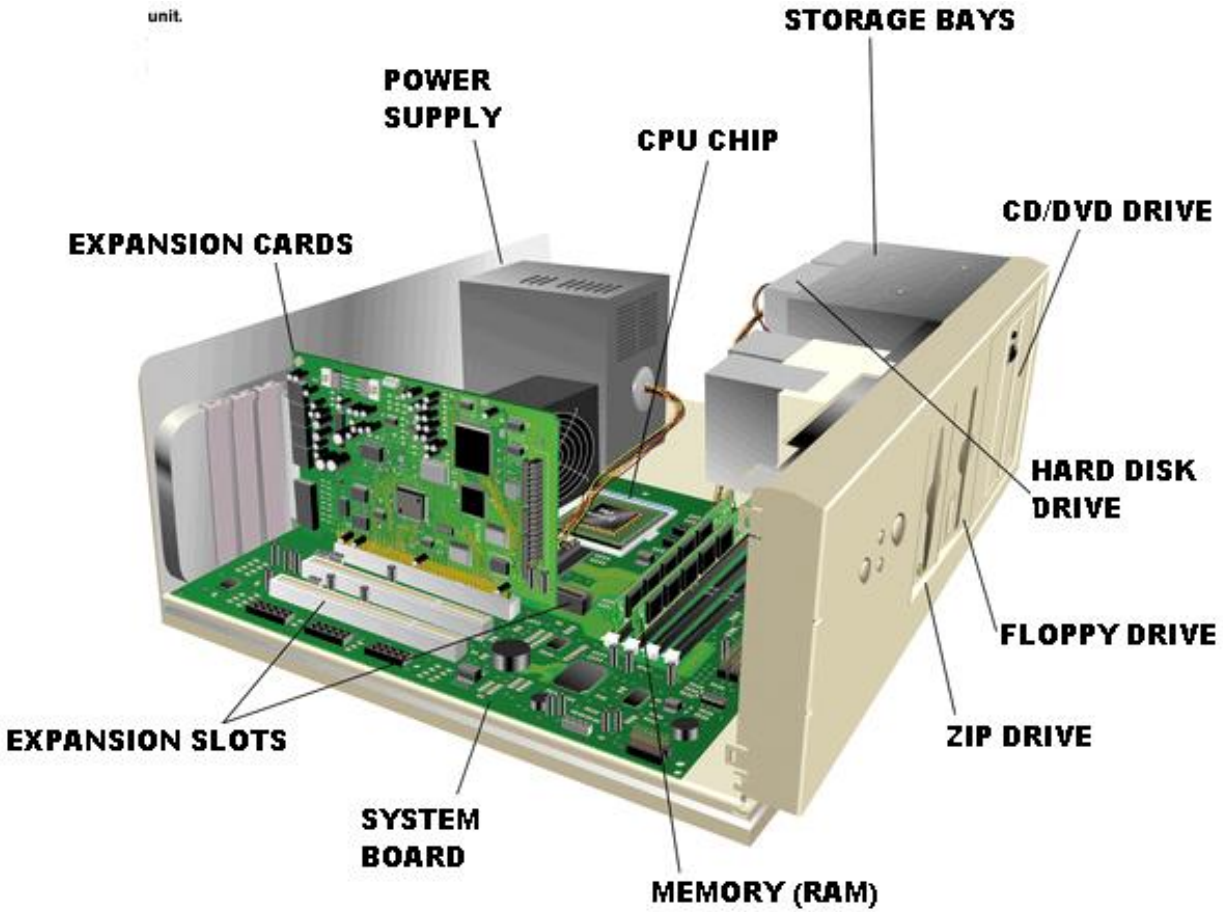
Computer Ports-sockets at the back of the computer



PC

- A port is a socket on the outside of the system that is connected to an expansion on the system unit.
- It allows you to use a cable to connect a peripheral device such external modem such as mouse etc so that it can be communicate with the computer system

desktop


unit.
STORAGE BAYS
POWER SUPPLY
CPU CHIP
CD/DVD DRIVE
EXPANSION CARDS
HARD DISK DRIVE
FLOPPY DRIVE
EXPANSION SLOTS
ZIP DRIVE
SYSTEM BOARD
MEMORY (RAM)

Peripheral devices

- Key board
- Mouse
- Monitor
- Printers and other devices

All the devices attached to the system unit are called **peripherals**. Peripherals are attached by cables that are plugged into sockets (ports) at the back of the computer

INPUT DEVICES

Input devices

- Used to key in data into the computer.
- Receive information for processing
- Allows people to supply information to computers
  Examples
  - Mouse, Track ball, Joystick
  - Electronic card reader
  - Voice recognition devices
  - Vision input system
  - Scanner
  - Keyboard
  - Document readers
  - Digitizers etc

Mouse

- As of today, mouse is the most popular point-and-draw device. It has become a must-have input device on personal computers and workstations, which have a GUI-based user interface.
- It’s a small hand-held device, which can comfortably fit in a user's palm. It rolls on a small bearing and has one or more buttons on the top.
- When a user rolls the mouse across a flat surface, such as on top of the table on which the computer is placed, the graphics cursor moves on the screen of the video display terminal in the direction of the mouse's movement.

Concepts of using the mouse

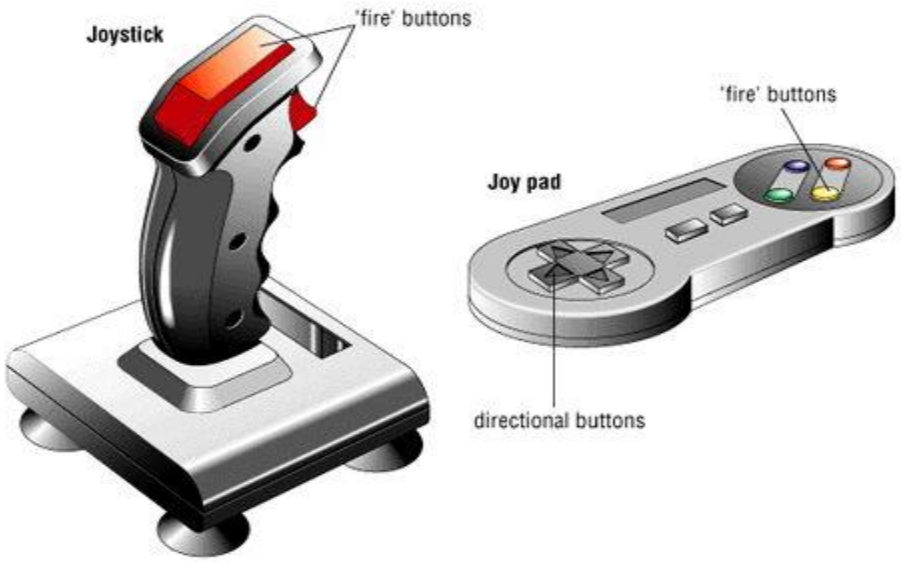
- Clicking – Pressing the left mouse button once and releasing it.
- Double clicking- Pressing the left mouse button twice very fast
- Dragging – Moving the mouse as you press the left mouse button

Trackball

- A trackball is a pointing device, which is similar to a mouse.
- The ball, which is placed in the base of a mouse, is placed on the top along with the buttons, in case of a trackball. To move the graphics cursor around the screen, the ball is rolled with the fingers.
- Because the whole device is not moved for moving the graphics cursor, a trackball requires less space than a mouse for operation. Since it need not be moved for moving the graphics cursor, it is often attached to or built into the keyboard.
- Trackballs built into the keyboard are commonly used in laptop (notebook) computers, because a mouse is not practical for laptop users in a small space.

Joystick

- Works in similar way to a mouse but usually used for playing action games. The "fire" button or trigger is used to shoot at the targets provided in the game.



Electronic-Card Reader

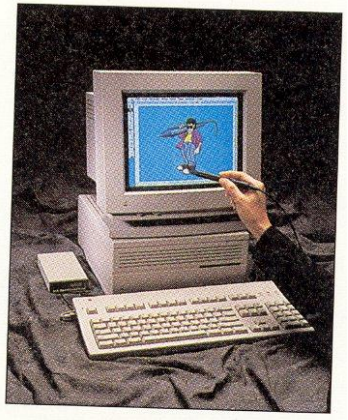
- Electronic cards and their associated readers offer another means of direct data entry into a computer system. Electronic cards are small plastic cards having encoded data, which are appropriate for the application for which they are used. An electronic-card reader, which is normally connected to a computer, is used to read the data encoded on an electronic card, and transfer it to the computer for further processing.
- Electronic cards are often used by banks, and issued to the customers for use in *automatic teller machines (ATMs).*

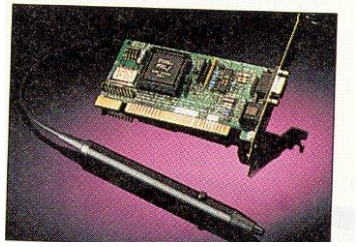
Voice Recognition Devices

- Voice recognition devices are input devices, which allow a person to input data to a computer system by speaking to it. Hence,' they make computers much easier to use.
- Some of its typical applications are as follows:
  - For inputting data to a computer system by person in situations where his/her hands are busy, or his/her eyes must be fixed on a measuring instrument or some other object. For example, doctors in an operation room can request certain information about a patient while operating.
  - For authentication of a user by a computer system based on voice input.
  - For limited use of computers by individuals with physical disabilities.

Light pen

- Top -The person is using a light pen to create a cartoon.
- Bottom- Light pen and its adapter care, which goes in an expansion slot inside the system unit





Digital Camera

- Light received through the lens is converted to digital signals by sensors, rather than stored by chemical change on a film as in a normal camera. The resulting "photograph" can then be stored on a computer and used just like any clipart files.

Keyboard

- A keyboard resembles the type writer and it allows data entry into a computer system by pressing a set of keys which are neatly mounted on a keyboard, which is connected to the computer system.
- Keys on the keyboard include:
  - Type writer keys – These are keys namely A to Z
  - Editing Keys – Keys with the arrows
  - Functional Keys – F1 to F12
  - Numeric key pad keys – 0 to 9
  - Back space key-deletes characters to the left of the cursor
  - Delete Key – deletes characters to the right of the cursor
  - Space bar – Adds a space between words
  - Caps lock – Adds Capital letters to the document
  - CTRL + ALT + DEL – restarts the computer
  - etc

DIGITIZERS

- Its an input device used for converting pictures, maps and drawings into digital form for storage in computers. This enables recreation of the drawing from the stored information whenever required, as well as easy incorporation of changes in the drawing as and when required.

Sensor

- Chemical responses to the physical environment or movement can be converted to electrical signals in the sensor that can be translated and used by the computer. Various sensors can be used to measure heat, light, sound, pressure, strain, acidity (pH), oxygen concentration, humidity, pulse, water level, water flow, speed, tilt or simply whether something like a door or a valve is open or shut.

Data Scanning Devices

- These are input devices, which are used for direct entry into the computer system from the source documents.
- Examples of direct entry input devices
- Image Scanners and all document readers
- Advantages
    - They eliminate some of the duplication of human effort required to get data into the computer.
    - The reduction in human intervention improves data accuracy.
- Disadvantage
    - Since scanners are direct data entry devices, they demand high quality of input documents.

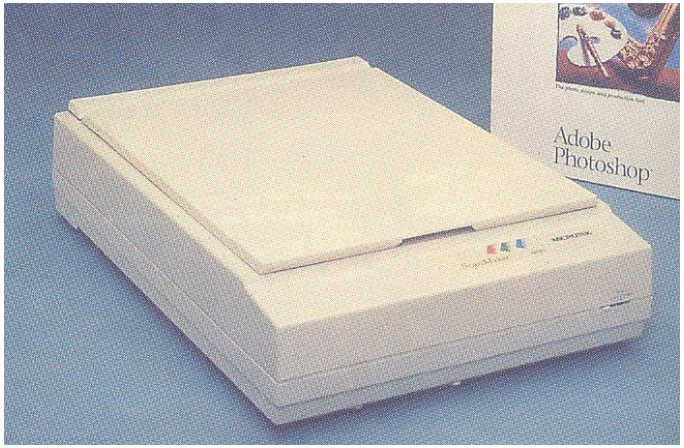
Types of data scanning devices

»Image scanners

»Document readers.

- **Image Scanners-** It translates paper documents into and electronic format, which can be stored in a computer.
- The input documents may be typed text, pictures, graphics or even hand written material.
- The commonly used image scanners are:
  - Flat bed scanners
  - Hand held scanners

scanner



Flat bed verses Hand held scanners

Flat Bed Scanners	Hand Held Scanners
Looks like a photocopier machine, which consists of a box having a glass plate. The document to be scanned is placed upside down on the glass plate. The light source is situated below the glass plate, and moves horizontally from left to right when activated.	It has a set of light emitting diodes encased in a small case which can be conveniently held in hand during operation. To scan a document, the scanner is slowly dragged very steadily and carefully over the document.

Document readers

- Image scanners had the following limitations that led to the development of document readers or optical scanners:
  - In image scanning, the input document is stored as an image instead of text and so it's not possible to do any word processing of the document.
  - The storage required for storing the document as an image is much more than that required for storing the same document as text.
- The document readers have over come these limitations.

Examples of doc readers.
1.Bar Code Reader

- Almost everything you buy has a bar code either on it or on its packaging. The bar coded item is wiped over a laser scanner or a wand is wiped over the bar code to read in the data. It is the same as a scanner but due to the simple nature of the bar code the scanning is very rapid. Used at supermarket checkouts and some libraries.

2.Optical Character Recognition (OCR)

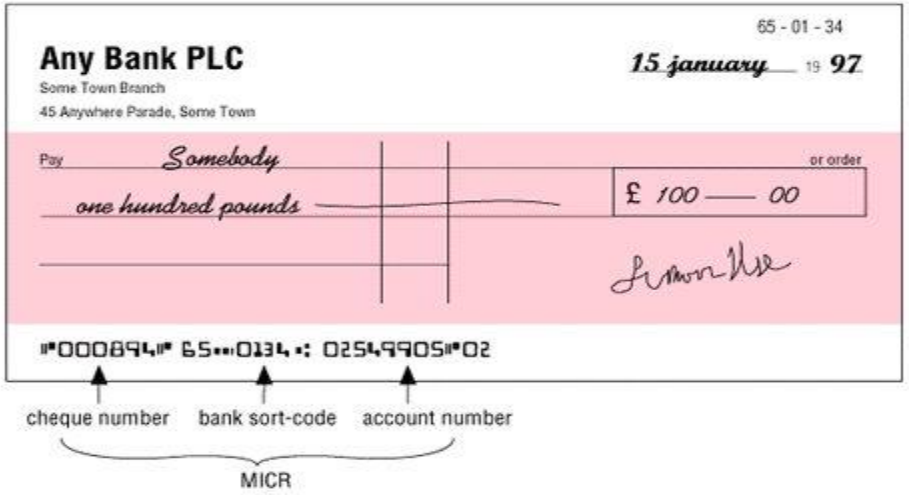
- Uses an ordinary scanner to take a photographic image of printed or even hand-written text. Special software then looks at the image, recognises each character and converts it into a text file. This can then be edited using a word processor. It is also used to automatically recognise post codes on letters at sorting offices.

3.Optical Mark Recognition (OMR)

- Similar to a bar code reader but uses infra-red light to scan pencil marks on prepared forms such as multiple-choice examination answer sheets or lottery tickets.

4.Magnetic Ink Character Recognition (MICR)

- Uses ink containing magnetic particles. This method is used by banks to print on a cheque the amount that it is made out for, then it is scanned into a computer.



Review Question

- Discuss the different types of optical scanners that are used to input data in the computer.

Questions

- What are data scanning devices? How do they help in improving input data accuracy as compared to keyboard devices?
- What is an electronic card? Give two applications where electronic cards can be effectively used. Is there a difference between a smart card, a debit card and a credit card? If yes, state the difference.

OUT PUT DEVICES

Output devices

- Allows people to receive information from computers
- Return the results of processing
- Examples are:
  - Printers
  - Plotters
  - Monitors

Output devices

- Output devices generate computer output, which can be broadly classified into the following two types:

  1. Soft-copy output. A soft-copy output is an output, which is not produced on a paper or some material, which can be touched and carried for being shown to others. They are temporary in nature, and vanish after use. For example, output displayed on a terminal screen, or spoken out by a voice response system are soft-copy output.

  2. Hard-copy output. A hard-copy output is an output, which is produced on a paper or some material, which can be touched and carried for being shown to others. They are permanent in nature, and can be kept in paper files, or can be looked later, when the person is not using the computer. For example, output produced by printers or plotters on paper are hard-copy output.

Monitor

- Display device that operates like a television
  - Monitors are by far the most popular output devices used today for producing soft-copy output.
  - The two basic types of monitors used today are *cathode-ray-tube (CRT)* and *flat-panel.*
  - The CRT monitors look much like a television, and are used with non-portable computer systems.
  - On the other hand, the flat-panel monitors are thinner and lighter, and are commonly used with portable computer systems, like notebook computers.

Printers

- Printers are the most commonly used output devices today for producing hard-copy output. Eg dot matrix, laser printers etc.
- They are electro-mechanical output devices used to output information from the computer onto the paper.

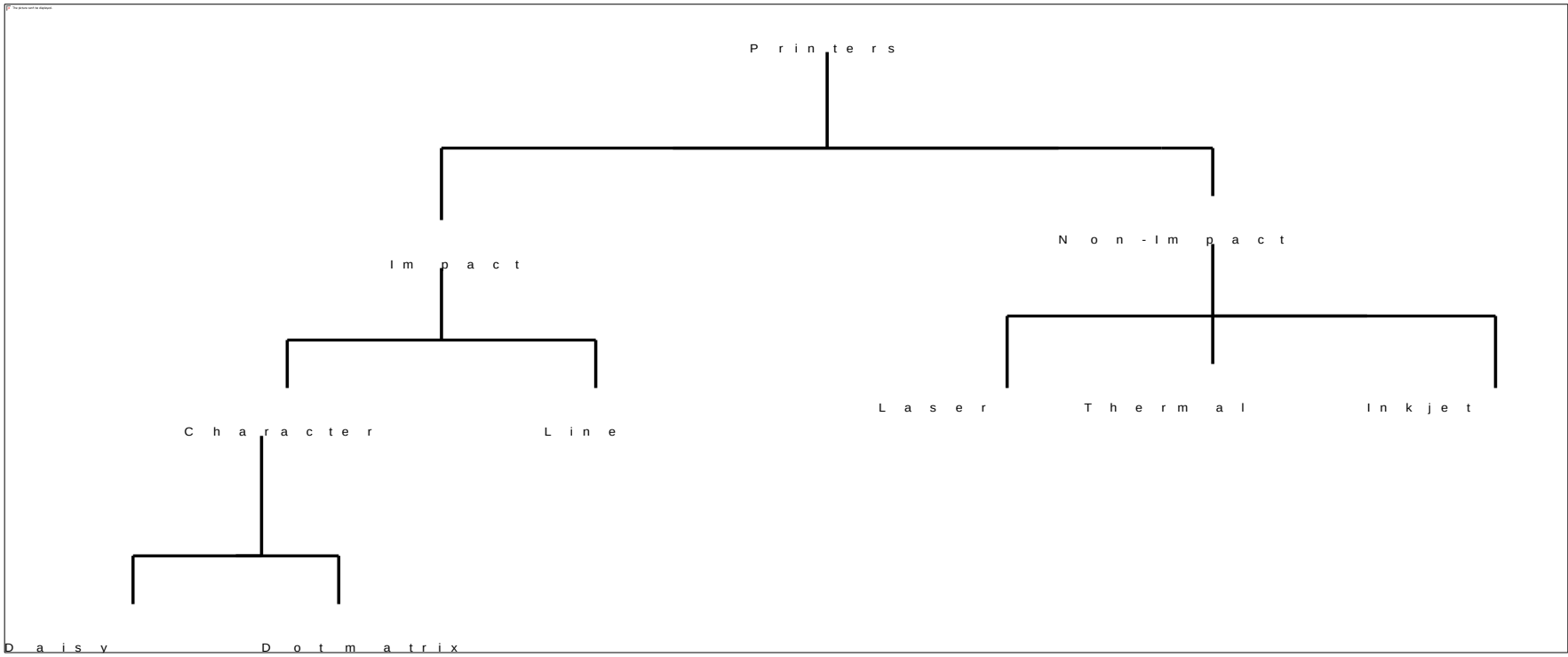
printers

- There are two main categories of printer:
  - Impact printers operate in the same way as typewriters. Characters are hammered onto the paper through a carbon ribbon. And the carbon ribbon leaves a printed impression of the character on the paper.
  - Impact printers use hammers or pins to strike an inked ribbon and print the character on paper.
  - **Nonimpact printer**: Any type of printer that leaves an imprint without physically touching the page.

printers

- Nonimpact printers print characters using electricity, a chemical process, or a combination of both.
- Impact and nonimpact printers can be sub-divided into three types:
  - Character printers
  - Line printers
  - Page printers
- Character printers output data to the printed form one character at a time, line printers print one line of information at a time, and page printers print one whole page of data at a time.

Classification of printers



Difference between impact and non impact printers

Impact printers	Non impact printers
These printers hit an inked ribbon pressing against the page and creating dots which form the characters on the page.	These use other methods of printing like thermal, electrostatic means and spraying ink on paper.
Most impact printers are noisy	They are quiet
They produce multiple pages in one print	They produce a single page at a time
They are cheaper in cost than non impact printers	They are expensive
They have poor quality output	Have a high quality output.

Factors to consider when buying a printer

Cost	The initial outlay, the cost of the cartridge, paper and other consumables that goes with the printer
Quality of output	This is measured in terms of characters per inc. The more the characters per inch, the better the quality.
Speed	It's measured in terms of characters/lines/pages per second
Volume of output	Total volume of output in a given time is limited by printer speed.
Appropriateness/ Type of work	Multiple copies would prompt the use of an impact printer, while a quiet environment would prompt the use of non impact printer
Compatibility	The printer should be compatible with the operating system you want to use.
Warranty	Chose a manufacture who will give warranty and after sale services to the buyer.

Plotters

- Many engineering design applications, like architectural plan of a building, design of mechanical components of an aircraft or a car, etc., often require high-quality, perfectly-proportioned graphic output on large sheets.
- A special type of output device, called *plotters,* is used for this purpose. Plotters are ideal output device *for* architects, engineers, city planners, and others who need routinely generate high-precision, hard-copy, graphic output of widely varying sizes. The two commonly used types of plotters are drum plotter and flatbed plotter.

Drum Plotters

- In a drum plotter the paper, on which the design has to be made is placed over a drum, which can rotate in both clockwise and anti-clockwise directions to produce vertical motion. The mechanism also consists of one or more penholders mounted perpendicular to the drum's surface. The pen(s) clamped in the holder(s) can move left to right or right to left to produce horizontal motion. The movements of the drum and the pen(s) are controlled by the graph-plotting program. That is, under computer control, the drum and the pen(s) move simultaneously to draw the designs and graphs on the sheet placed on the drum.

Flatbed plotters

- A flatbed plotter plots a design or graph on a sheet of paper, which that is spread and fixed over a rectangular flatbed table. In this type of plotter, normally the paper does not move, and the pen holding mechanism is designed to provide all types of motions necessary to draw complex designs and graphs. That is, under computer control, the pen(s) move in the required manner to draw the designs and graphs on the sheet placed on the flatbed table. The plotter can also annotate the designs and graphs so drawn by using the pen to draw characters of various sizes. Here also, provision is there to mount more than one pen in the pen(s) holding mechanism. Since each pen is program selectable, pens having ink of different colors can be mounted in different holders to produce multi-colored designs. The plot size is restricted by the area of the bed.

Screen Image Projector

- Screen image projector is an output device, which is used to project information from a computer on to a large screen (such as a cloth screen or a wall), so that it can be simultaneously viewed by a large group of people. This output device is very useful for making presentations to a group of people with the direct use of a computer.

Voice Response Systems

- Just as a voice recognition system allows a user to talk to a computer, similarly, a voice response system enables a computer to talk to a user. A voice response system has an audio-response device, which produces audio output. Obviously, the output is temporary, soft-copy output. Voice response systems are of two types - voice reproduction system and speech synthesizer.

Voice Reproduction System

- A voice reproduction system produces audio output by selecting an appropriate audio output from a set of prerecorded audio responses, The set of pre-recorded audio responses may include words, phrases or sentences spoken by human beings; music or alarms generated by musical instruments; or any other type of sound,
- Voice reproduction systems are very useful in a wide range of applications. Their typical uses include:

  1. Audio help for guiding how to operate a system. For example, banking industry uses voice reproduction systems in automatic teller machines to provide systematic guidance to customers on how to transact with the bank by using an ATM.

  2. Automatic answering machines. For example, telephone enquiries for new telephone numbers in place of an old number or vacancy status of a particular flight or train is often taken care of by an automatic answering machine.

  3. Video games are made exciting and interesting by playing an event-based sound from a set of pre recorded sounds.

  4. Talking alarm clocks. For example, every hour the clock speaks out what is the time by selecting the appropriate voice message corresponding to that hour from the set of pre-recorded voice messages. Else the clock may speak "its time to wake up" at the time set for alarm.

  Talking toys and home appliances also employ a voice reproduction system.

  5. Often, personal computers with audio facility are used for automated multimedia presentations during exhibitions.

Speech Synthesizer

- A speech synthesizer converts text information into spoken sentences. To produce speech, these devices combine basic sound units, called *phonemes.* From a given text information, sequence of words are combined into phonemes, amplified, and output through the speaker attached to the system.

Uses of speech synthesizers

1. For reading out text information to blind persons. For example, a recently published book may be scanned using a scanner, converted into text using OCR software, and read out to blind persons using a speech synthesizer. This will allow blind persons to know the latest information published in a book, as soon as it is printed, rather than wait for the book to appear in Braille.
2. For allowing those persons, who cannot speak, to communicate effectively. For example, the person simply types the information, and the speech synthesizer converts it into spoken words.
3. For translation systems, which convert an entered text into spoken words in a selected language.- For example, a foreigner coming to India may enter a text, which he/she wants to communicate to an Indian, and the speech synthesizer converts it into spoken words of the selected Indian language.

Questions

- A Student has bought a computer for use at home. The computer had the following peripherals: Monitor, Printer, Keyboard and mouse. It also had the following specifications:
    - 1.8 GHZ, 256MB RAM and 20GB hard disk.
- State the purpose of each Peripheral device named above.
- Give an example of a hard copy and a soft copy Out put device.
- The student also wanted to play games using the computer. State the input device the student can use to play games
- What do the following specifications mean?
    - 1.8 GHZ
    - 256MB RAM
    - 20GB hard disk