



# Introduction to Computer Applications

## CHAPTER 2

# Computer System

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# Lecture overview

- ❖ Introduction
- ❖ Computer hardware
  - ❖ Input Devices
  - ❖ System Unit
  - ❖ Output Devices
  - ❖ Storage Devices
- ❖ Computer software
  - ❖ System Software
  - ❖ Application Software

# System and Computer system

- **System** is a group of **components** that work together in coordination to achieve a **common goal**.
- **Computer system** is a system that has **two fundamental** components:
  1. ***Hardware component and***
  2. ***Software component.***

# Hardware components

- **Hardware** represents the physical and **tangible** components of the computer, i.e., the components that can be seen and touched.
- Hardware Components Classified into four:
  1. Input Device
  2. Processing Device
  3. Output Device
  4. Storage Device

# Hardware component

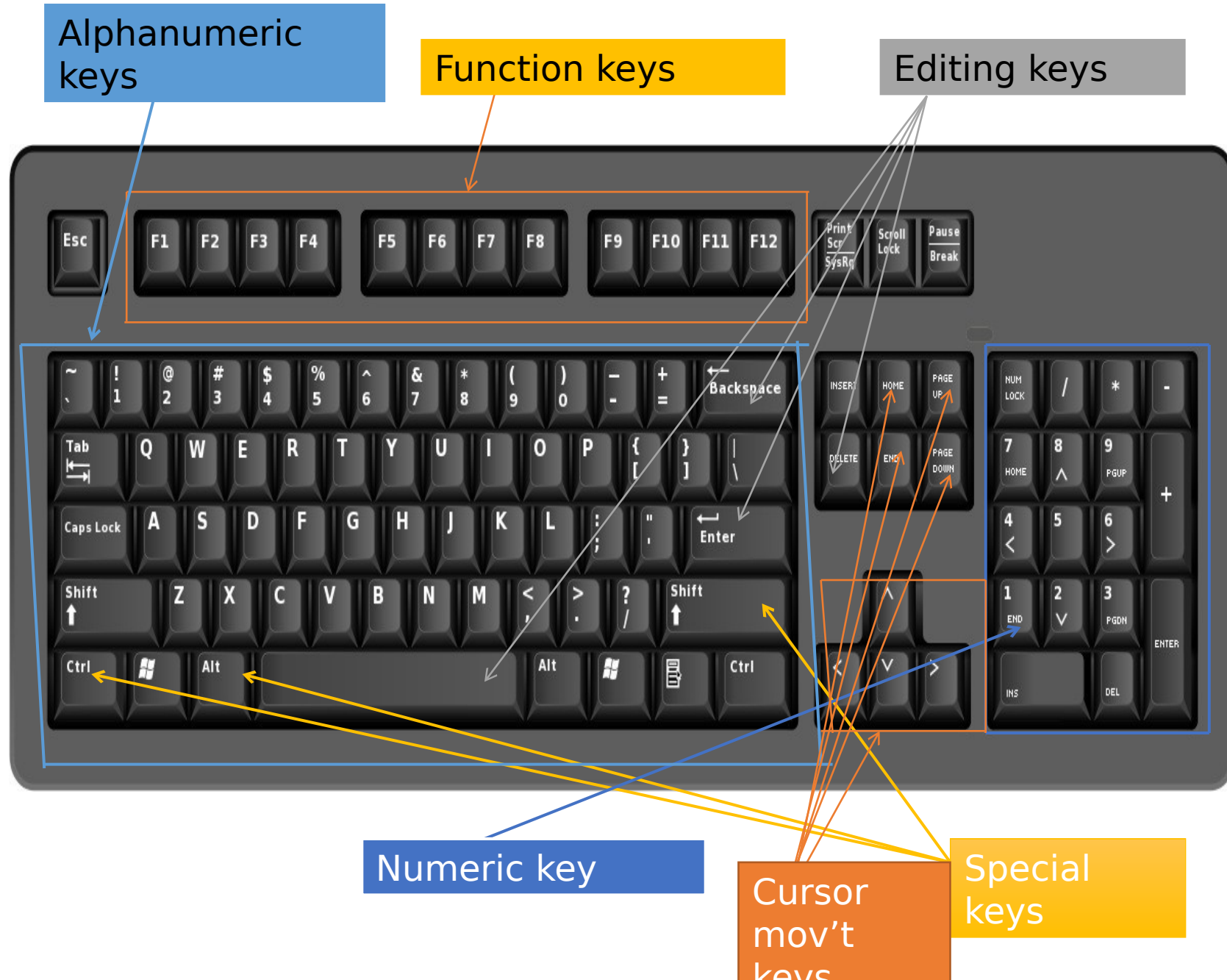


# 1. Input devices

- Input device:-accept data and convert it into a form suitable for computer processing.
- Input device:-allows people to put data into the computer in a form that the computer can use

# Keyboard

- Keyboard is for the input of text and characters and to control the operation of a computer.
- Keys on a keyboard based on their function classified as
  - Alphanumeric keys
  - Numeric keypad
  - Function keys
  - Cursor movement keys
  - Control key(Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).)
  - Special purpose key(Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.)



# Mouse

- Used to direct pointer to computer's display screen.
- Mouse consists of two button:
  - 1/Primary button.
  - 2/Secondary button.
- Operation performed using a mouse:
  - Selection = single click.
  - Give command = double click.
  - Dragging object = press mouse button and moving mouse.
  - Dropping Object = Releasing a mouse button.



# Scanner

- Scanner translate **images of text**, drawings and photos into digital form.

*Based on the technology they use to scan, scanners are the following type*

- ❖ BCR – Bar Code Reader : for reading barcode print consists of Light source lens and photoconductor.
- ❖ OCR – Optical Character Reader : to recognize type written and hand written characters.
- ❖ OMR – Optical Mark Recognition : detect absence and presence of mark.
- ❖ MICR – Magnetic Ink Character Recognition:  
recognize character printed Using magnetic ink tone



# Microphone



- The word "microphone" (Greek *mikros* "small" and *phone* "voice" or "sound") originally referred to a mechanical hearing aid for small sounds.
- Therefore, microphones have a great role in inputting sound or voice data into the computer ***ing.***



# Touch screen

- ***Touch screens*** or ***touch panels*** or ***touch screen panels*** have the ability to display and receive information on the same screen.
- It allows a display to be used as an input device, removing the keyboard and mouse.
- It can also be considered as output device as it displays selectable commands.



# Touch pad



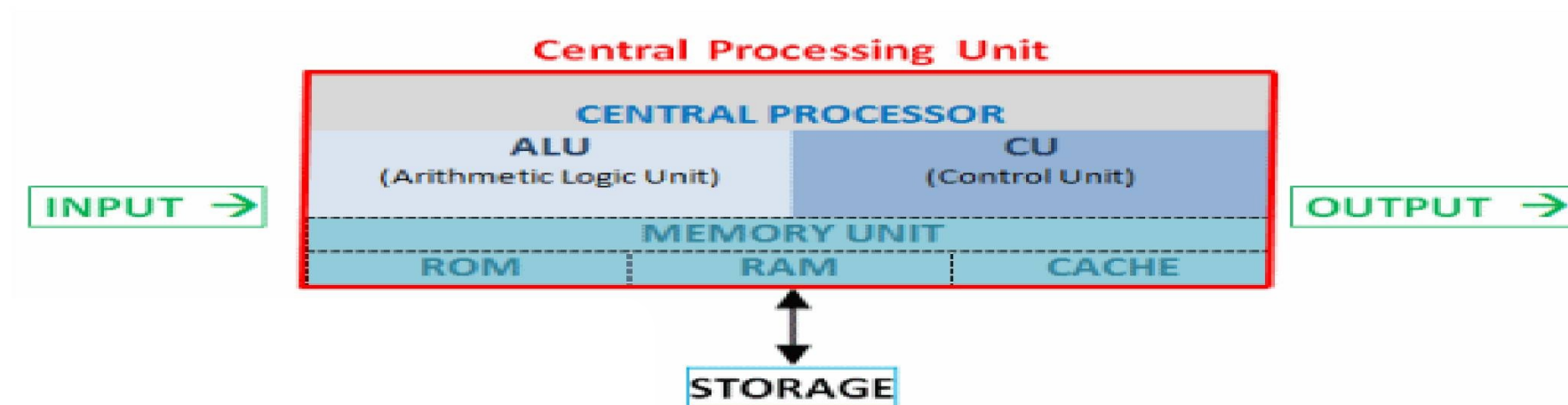
- In Touchpad the cursor is controlled with the **fingers**.
- About the same size as a mouse, touchpad is a *flat, rectangular* device.
- As fingers are moved over the surface of the touchpad the cursor moves on the screen.
- The click operation is performed by tapping the fingers on the surface of the pad.

## 2. Processing device (Central Processing Unit)

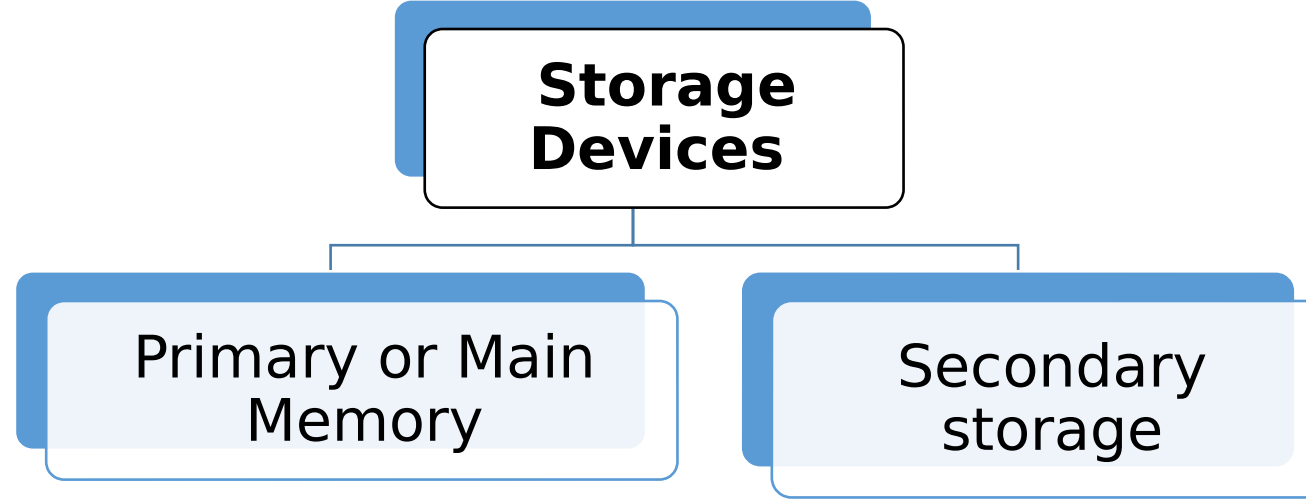
- It is the brains of the computer.
- Sometimes referred as the processor or central processor
- CPU is where most calculations take place.
- It is the most important element of a computer system
- Many people wrongly call the system case (chassis) as CPU.
- But the chassis is a **housing** for devices like CPU, RAM, disks, motherboard and expansion cards.



- ▶ CPU – Central Processing Unit
- ▶ The two typical components of a CPU include the following:
- ▶ The arithmetic logic unit (ALU), which performs arithmetic and logical operations.
- ▶ The control unit (CU), which extracts instructions from memory and decodes and executes them, calling on the ALU when necessary.



# 3. Storage devices



1. *Cache memory*
2. *RAM (Random Access Memory)*
3. *ROM (Read-only Memory)*

- Magnetic tape
- Magnetic disk
  1. Floppy Disk
  2. Hard disk
- Optical disk (CD-R, CD-RW, DVD)
- Flash Memory

# Storage Capacity Measurement

- **Bit (Binary Digit)**: A ***bit*** of storage is like a light switch; it can be either on (1) or off (0).
- A single bit is a one or a zero, a true or a false, a "flag" which is "on" or "off".
- The **bit** is the smallest unit of storage used in computing.

# Primary storage

## ❖ *Cache memory*

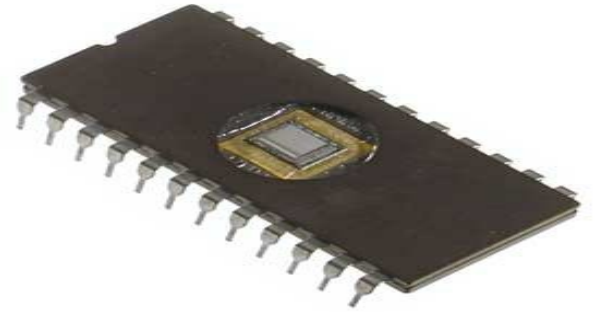
- ✓ Is an extremely fast **memory** type that acts as a buffer between **RAM** and the CPU.
- ✓ It holds frequently requested data and instructions so that they are immediately available to the CPU when needed.
- ✓ **Cache memory** is used to reduce the average time to access data from the Main **memory**.
- ✓ **Small** memories on or close to the CPU chip
- ✓ Can work faster than the much larger RAM (main memory).
- ✓ Most CPUs since the 1980s have used one or more caches.

# RAM (Random Access Memory)



- RAM in a computer is considered **main** memory or **primary** storage:
- It is usually in the form of **integrated circuits** (ICs)
- These are commonly called memory sticks or RAM sticks.
- RAM is **volatile** and quite expensive.
- RAM is the working area used for loading, displaying and manipulating applications and data
- Used for **temporary** storage of data and program instruction

# ***ROM (Read-only Memory)***



- Storage media used in computers and other electronic devices.
- Modern ROMs typically take the shape of IC packages
- Is used to store the routines that enables the computer to boot up
- Is known as Firmware (software permanently stored on a chip).
- All ROMs allow data to be written into them at least once,

# Types of ROM

1. **PROM** (Programmable Read-Only Memory)
2. **EPROM** (Erasable Programmable Read-Only Memory)
3. **EEPROM** (Electrically Erasable Programmable Read-Only Memory)

## **PROM** (Programmable Read-Only Memory)

- can be written to (*programmed*) via a special device, a PROM programmer.
- It can only be programmed once.

## ***E*EPROM** (Erasable Programmable Read-Only Memory)

- It can be erased by exposure to ultraviolet light then rewritten via an EPROM programmer.
- Repeated exposure to ultraviolet light will destroy the EPROM but it takes greater than **1000** exposures *before* the EPROM becomes *unusable*.
- It have circular window to allow UV light to enter

# **EEPROM** (Electrically Erasable Programmable Read-Only Memory)

- It allow the entire ROM (or selected *banks* of the ROM) to be electrically erased (*flashed back to zero*) then written to without taking them out of the computer (camera, MP3 player, etc.).
- This is called Flashing.

# Secondary storage

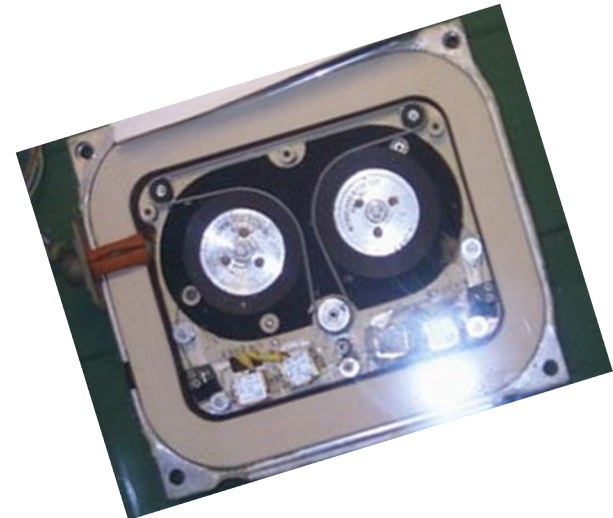
- Secondary storage, or external memory, is computer memory that is **not directly accessible** to the central processing unit of a computer, requiring the use of computer's input/output channels.
- It is used to store data that is not in **active use**.
- is **slower than** primary storage(internal memory), but has higher storage capacity and is non-volatile, which is **perfect** for the preservation of stored information in an event of power loss.

## ...Secondary storage

### ➤ Magnetic tape

Magnetic tape is a non-volatile storage medium consisting of a magnetic coating on a thin plastic strip.

- large storage capacity
- Slow to access
- Because of its sequential accesses



## ...Secondary storage

### ➤ Magnetic Disk

#### 1. Floppy Disk

- ✓ They are read and written by a floppy disk drive.
- ✓ It is cheap, portable, but has small storage capacity (1.44 MB) and is unreliable.



# ...Secondary storage

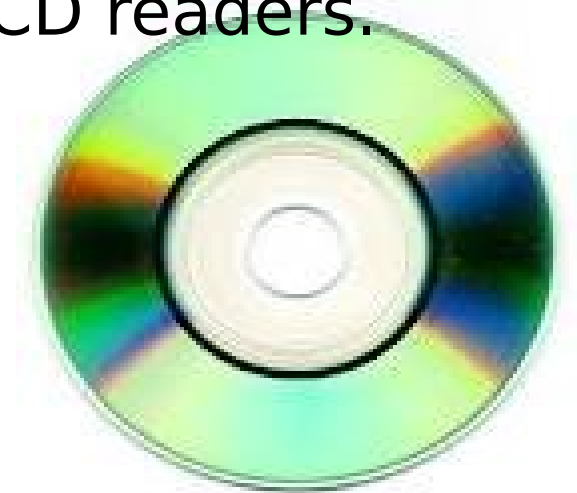
## 2. Hard disk



- Hard disks were originally developed for use with computers.
- It is digitally encoded non- volatile storage device.
- Hard disk drive includes platter and read/write head

# Optical disk

- A CD-R (Compact Disc-Recordable)
- Write once, read only, have high compatibility with CD readers.
- CD-RW (Compact Disc Rewritable)
- Rewritable
- first called CD-E
- up to 700MB
- DVD(Digital Versatile Disc)
- Resemble CD but differ in format and density or storage capacity
- Storage capacity Up to 4.7 GB



# Flash Memory

- ✓ USB flash
- ✓ Used for general storage and transfer of data between computers.
- ✓ It is highly portable and it can store much data but it is expensive.



# 4. Output devices

- **Display devices** - *softcopy output*
- **Printer** - *hardcopy output*
- **Plotter** - *hardcopy output*
- **Speaker** - *voice output*
- **Robot** - *physical output*

# Display devices - softcopy output

## CRT(*Cathode-ray Tube*)

- ▶ used in most televisions and computer display screens.
- ▶ It works by moving an electron beam back and forth across the back of the screen.
- ▶ It lights up phosphor dots on the inside of the glass tube
- ▶ Large in size requires a lot of spaces and power



# LCD(*Liquid Crystal Display*)

- Used in digital watches and portable computers.
- Monochrome LCD:- images appear as blue or dark gray
- Color LCD:-use two techniques for producing colors
  - **Passive matrix**:- less expensive
  - **Active matrix(Thin Film Transistor TFT)**:- produce sharp image ,expensive, con



## Flat-Panel Display Monitor(LED)

- The flat-panel display have reduced volume, weight and power.
- Works by sandwiching a thin film of phosphorescent substance between two plates.
- One plate is coated with vertical wires the other with horizontal wires and form a **Grid**.
- When electric current passes through the grid the phosphorescent film at the intersection glows and create point of light called **Pixel**.
- Convert electrical energy into light. Example are **plasma panel**.

# Printer – Hardcopy output

- Printer is a device that prints text or illustrations on paper.
- Based on the technology they utilize, divided into:
  - 1. Daisy-wheel:**
  - 2. Dot-matrix**
  - 3. Ink-jet**
  - 4. Laser**
  - 5. LCD & LED**
  - 6. Line printer:**
  - 7. Thermal printer**

**Daisy-wheel:-** cannot print graphics

- Has plastic or metal wheel having the shape of each character.
- A hammer press the wheel against a ribbon then the shape of the character will appear on the paper.

**Dot-matrix:-** strike pin against an ink ribbon

- Each pin makes a dot which in combination form a character

**Ink-Jet:-** sprays ink at a sheet of paper in desired shape of characters.

**Laser:-** uses laser beam same as copy machines produces an image on a drum

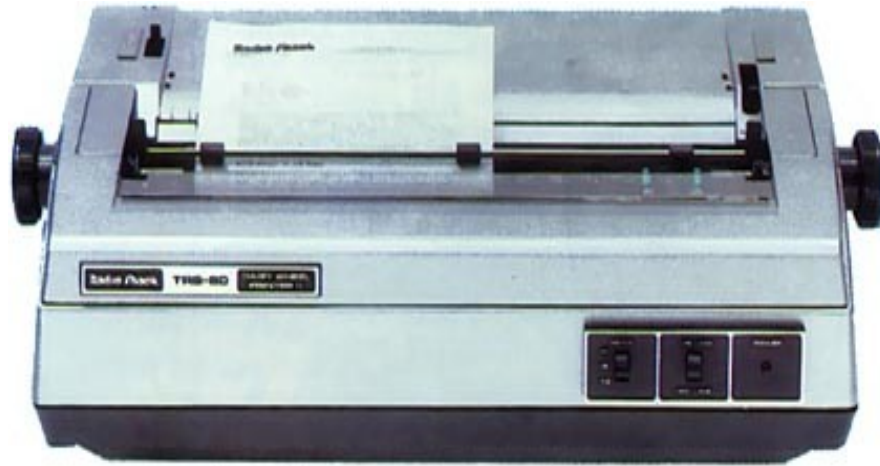
**LCD & LED printers** :- similar to laser but uses crystals or light emitting diodes than laser to produce an image on a drum.

**Line printer**:- print an entire line at one time very fast but low quality print.

**Thermal printer**:- pushing heated pins against heat sensitive paper.

- Mostly used in calculators and fax machines.

# ...Printer



[www.old-computers.com](http://www.old-computers.com)

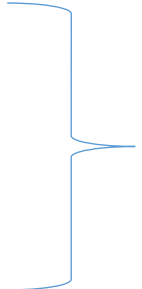
**Daisy-wheel**



**Dot-matrix**

## Printers are also classified by the following characteristics:

### ❖Quality of type:

- ❖ daisy wheel
  - ❖ Inkjet
  - ❖ laser
- letter quality type
- 

### ❖Speed : characters per second (cps) or pages per minute (ppm), line per minute(lpm).

- ❖ Daisy wheel is slowest 30 cps
- ❖ Line is fastest 3,000 lpm

### ❖Graphics: daisy-wheel and line printers can print only text. Other printers can print both text and graphics.

## • Impact and non impact:-

- Daisy-wheel
  - Dot-matrix
  - Line
  - Thermal
- 

impact

Laser

Ink-jet

LCD & LED



non impact

# Plotter - hardcopy output

- A **Plotter** is also a printer that produces hard copy
- It produce high quality color graphics output.
- They help **to draw maps** from stored data.
- Draw continuous point to point lines directly
- For Engineering, Drafting. e.g. CAE, CAD



# Speaker – voice output

- ***Speaker*** is an electronic device that converts electrical signals into sounds loud enough to be heard at
- Produce sound or voice output.
- The sound is input from external world into computer system via ***microphone*** and is output to external world via ***speaker***.



# Robot – physical output

- **Robot** is the most attractive output device.
- Robotic device consists of **arms** that can perform a preprogrammed task.
- Robots are mostly used in manufacturing tasks such as spray painting or assembling parts.
- Advanced robots are used in scientific research such as **space** and **undersea** exploration.

# Software Component

- **Computer software** is a set of step-by-step *instructions* given to the computer in the form of programs or procedures or routines to accomplish any specified task or to process the raw data and convert it into meaningful information.
- Software is the intelligence of the computer.

# Classification of the software

- **System software:-** essential part used to run computer hardware and software.

- **Operating system**

- **Device driver**

- **Language software**

- **Utility software**



- **Application software**

- **Productivity Software:**

- **Home / Personal software:**

- **Education / Reference software**

- **Entertainment software:**



# System software

## ➤ Operating system (OS)

- ✓ is a computer program that ***manages*** the hardware and software resources of a computer.
- ✓ It is considered as the ***manager*** of the whole system.
- ✓ Basic functions of operating system are:
  - input /output management
  - memory management
  - file management
  - job control (process scheduling)

## ➤ **Device driver**

- ✓ It is a type of system software that introduces a new device to the operating system and facilitates the communication between the operating system and the device.

## ➤ **Language software**

- ✓ Languages are used for writing instructions or software.
- ✓ **Machine language:-** the only language a computer directly understands.  
Strings of binary numbers. It has at least 2 parts
  - ✓ Opcode:- tells function performed
  - ✓ Operand address:- tells location of data

- ✓ **Assembly language:-** easier than machine language & machine dependent.
  - Represent most commonly used instructions with symbols and needs special translating program
- ✓ **High level language HLL:-** look like some human language & easier for human programmers. FORTRAN, BASIC, C++, Java
- ✓ **Language translators:-** for HLL either **compiler** or **interpreter** for assembly language **assembler**
- ✓ **Compiler:** execute later entire program into machine language(object code)  
e.g. c, c++, java
- ✓ **Interpreter:** execute immediately statement by statement & no object code is saved. e.g. Basic & VB

# ➤ Utility Software

- To support ,enhance expand existing programs. E.g.
  - Backup-duplicate data for safety
  - Data recovery- restore damaged data
  - Virus protection- Antivirus software protection
  - Data compression- compress huge files and save memory

# Application software

- ❑ Consists of programs that help the end-user to perform specific, productive tasks, such as word processing or image manipulation.
- ❑ There are **four** categories of application software.

## **Productivity Software**

- Make the users more productive at performing general tasks.
- E.g. word processing, spread sheets, presentation, database managers, accounting etc.

## **Home / Personal software:**

- For domestic and personal use.
- E.g. cook books, medical guide, gardening, etc.

## **Education / Reference software**

- ❖ To learn any subject or to refer for additional information.
- ❖ E.g. Encyclopedia, Dictionaries, Computer Based Tutorials (CBT)

## **Entertainment software**

- ❖ The purpose of this software is for entertainment and time passing.
- ❖ For example games.

# Questions



# Quiz 1

1. What is mean by a computer system?
2. What are two basic components of computer system?
3. List at list 3 input device and 3 output devices?
4. What is the use of catch memory for a computer?
5. What is the main memory of a computer?

Thank You