COMPUTER APPLICATION

Unit - 1

Computers are a necessary component of our daily lives in the current day. This indicates that practically every industry uses computers, which facilitate and expedite our daily duties. Computers are now found in banks, stores, hospitals, schools, railroads, and many other locations, including our homes. We must be familiar with the fundamentals of computers because they are such an integral part of our life. A computer is simply a mechanism that is capable of calculation. But these days, computers are more than simply calculators. They are capable of many different tasks. To put it simply, a computer is an electronic device that can be programmed to store, retrieve, and process data.

A computer is an electronic device that generates information after processing raw input. In order to generate the intended output, an electronic device uses a set of unique instructions called programs to convert data. Before being sent to the recipients via the output devices, a computer's internal memory holds intermediate results (information) as well as data and instructions that are momentarily awaiting processing.

According to the definition, "**A computer is a programmable electronic device that takes data, perform instructed arithmetic and logical operations, and gives the output.**"

Whatever is given to the computer as input is called 'data', while the output received after processing is called 'information'.

Evolution of computer:

a. ABACUS: The first mathematical device developed for arithmetic calculation and it was invented by Chinese in BC

b. Pascal Machine (Pascaline): It was invented By Blaise Pascal. It was used as a mathematical calculator for Addition and Subtraction purpose.

c. Leibnitz Machine: It was developed by German mathematician in 1964 which can perform multiplication and division operation.

d. Babbage's Machine (Difference Engine): In 1863 UK's Charles Babbage developed this Machine which can perform arithmetic operations and store data.

e. Hollerith Punched Card: The USA scientist Herman Hollerith developed punched card machine in 1980. It was the first electromechanical punched card data processing machine which is used to compile information. This was very much popular for data processing work.

f. ENIAC (Electronic Numerical Integrator& Computer): It was developed in 1946 in USA by John Presper Eckert & John W. Mauchly. It uses 18000 vacuum tubes, several registers & capacitors. It was the first electronic general-purpose computer.

g. EDSAC (Electronic Delay Storage Automatic Calculator): Von Numeric first time introduces the concept of stored program in memory. It was developed in 1949 and the first digital computer to store instructions in memory.

h. EDVAC (Electronic Discrete Variable Automatic Calculator): It was developed in 1949 by John Presper Eckert & John W. Mauchly. It was a binary serial computer with automatic addition, subtraction, multiplication, programmed division etc.

i. UNIVAC (Universal Automatic Computer): It was developed in 1951 in USA. It had both numeric and alphabetic data processing. It is first general-purpose computer for commercial use.

Generation of Computer:

The development of computers is classified into different generations depending upon the device technology, architecture and mode of operations.

a). First Generation (1940-55): ¬ The main component used is vacuum tubes. The Operating System is very slow. ¬ It's size is very large and more heat generated from it. Ex. UNIVAC, EDSAC etc.

b). Second Generation (1956-63): ¬ The main component used is Transistors in place of vacuum tubes. ¬ Transistors are smaller, faster and cheaper than vacuum tubes. The Operating System is faster than first generation computers. ¬ It's size is smaller and less heat generated from it than first generation computers. ¬ Ex. IBM 1620, UNIVAC-III etc.

c). Third Generation (1964-71): ¬ The main component used is Integrated Circuits (IC) in place of Transistors. ¬ User interacts with computer through Key board. ¬ Computers are smaller and cheaper than second generation computers. ¬ Semi-conductors are used for storage. ¬ BASIC, PASCAL Languages are used. ¬ Ex. IBM 360, Honeywell-6000I etc.

d). Fourth Generation (1971-89): ¬ The main component used are LSI, VLSI etc. ¬ Computers are smaller and powerful. ¬ Microprocessors are used. ¬ Magnetic disk, Optical disk Floppy

disks are used for storage. ¬ High level languages like C, C++ etc are used. ¬ Mouse and other devices used.

e). Fifth Generation (1989-Onwords): ¬ These are based on Artificial Intelligence and still in development. ¬ Uses parallel processing and super conductors are used. ¬ Voice recognitions are used today. ¬ All modern computers are goes under this category.

Generation	Key Component	Storage Device	Example
First	Vacuum Tubes	Magnetic Drum Second	UNIVAN, ENIAC
Second	Transistors	Magnetic Core	IBM 700, IBM 650, ATLAS
Third	Integrated Circuit (IC)	Main Storage	IBM/360/370, NCR 395
Fourth	LSI, VLSI,	Semiconductor	Apple, IBM PC, Microsoft PC
Fifth	ULSI, AI	Semiconductor	Artificial Intelligence, Robotics

Classification of Computers: Modern computers are broadly classified into following 4 types-

(a) Analog Computers

(b) Digital Computers

(c) Hybrid Computers

(d) Super Computers

(a) Analog Computers: - These computers work on analog data like variation of temperature, pressure, speed, voltage etc. ¬ These are not general-purpose computers; these are made for special purpose activities. ¬ These are mainly used for process control activities in industries. ¬ Cost of these computers varies depending upon the type of application.

(b) Digital Computers: ¬ These are general purpose computers and most widely used. ¬ These are works on digital data or binary data. ¬ Factors on which it depends are speed, accuracy etc. ¬ These computers are used for evaluation of arithmetic expressions and manipulation of data etc.

Digital Computers are again classified in to following 3 types-

(i) Mainframe Computers

(ii) Mini Computers

(iii) Micro Computers

(i) Mainframe Computers: These computers are capable of processing millions of instructions per sec(MIPS) and billions of data. So these are used for processing of high volume of data.

Features: ♣ Large primary memory. ♣ High processing speed (30-100 MIPS) ♣ Capable of connecting thousands of terminals. ♣ Wide verity of memory size. ♣ Large computer application. ♣ Word length 64 bits. ♣ Ex: IBM-360/370, IBM Z-series, Unisys Libra etc.

(ii) Mini Computers: These computers are also capable of processing millions of instructions per sec(MIPS) and billions of data but performance level is less than main frame computers. So these are mostly used for middle level organizations like university, business organizations, colleges etc.

Features: ♣ Fairly large primary memory. ♣ processing speed (10-30 MIPS) ♣ Capable of connecting up to 500 terminals. ♣ Word length 32 bits. ♣ Ex: HP 3000 series, HP 2100 Series, etc.

(iii) Micro Computers (personal Computers): These are the smallest and least expensive computers. These are also called as personal computers. These are most widely used in different areas.

Features: ♣ Portable. ♣ Required minimum power. ♣ Wide verity of memory size. ♣ Appropriate processing speed which can handle most of the tasks. ♣ Affordable price. ♣ Ex: Desktop, Laptop, Notebook, Tablet, Smart phone etc.

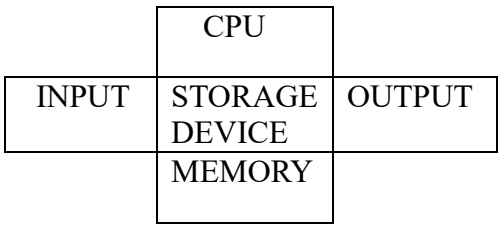
(c) Hybrid Computers: ¬ These computers have both the features of analog and digital computers. ¬ These computers are used to control the entire process of an operation. ¬ The analog features of these computers enable it to measure the physical quantities such as temperature, pressure etc and convert them to digital data and these data are then processed by the computers.

(d) Super Computers: ¬ These computers are most powerful computers in the world. ¬ These are specially designed to maximize the processing of floating-point instructions. ¬ These computers are working in parallel processing technique by implementing multiple processors to work in parallel manner. ¬ These computers are used for special operations like weather forecasting, scientific research, satellite operations etc. ¬ Ex. Param, Cray, Anupam, PARAM Yuva, EKA, etc.

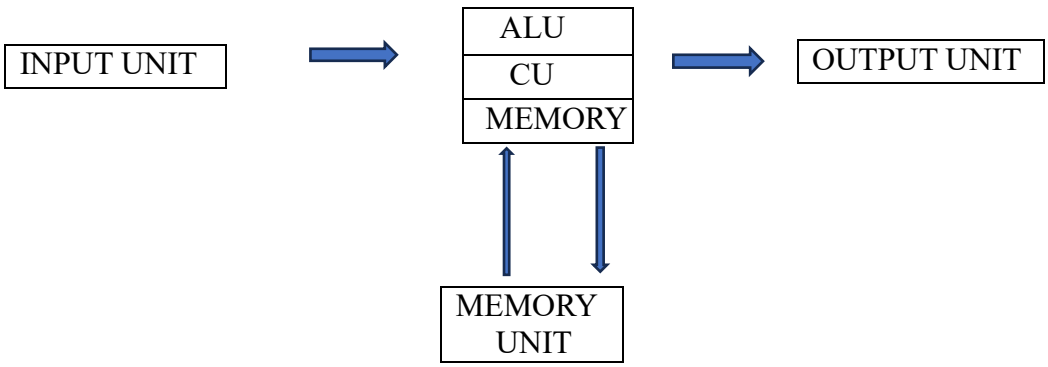
Components of Computer System:

A computer device is made up of various elements which help in its effective functioning and processing. Components of a computer system are the primary elements which make the functioning of an electronic device smooth and faster. There are five basic components which include:

a) Central Processing Unit (CPU)
b) Memory Unit
c) Storage Device
d) Input Device
e) Output Device



Components of computer system



Functional Design of Computer

CPU Unit (Central Processing Unit): ¬ It is the main part of the computer and also called as the brain of the computer. ¬ It controls the overall activities of the computer and performs different types of operations. ¬

It mainly consists of 3 units

(i) ALU

(ii) CU

(iii) Memory

(i) ALU (Arithmetic Logic Unit): This unit performs all the arithmetic and logical operations/ calculations inside the computer like Addition, Subtraction, Multiplication, Division, Logical AND, OR etc.

(ii) CU (Control Unit): It is used for controlling the overall operations of a computer. It generates different signals for different activities like Read, Write operations.

(iii) Memory: These are set of registers which are used to store data and intermediate results during an arithmetic and logical operation.

Memory Unit: It is used to store data, instructions and results. The memory of computer is divided into 5 types.

(i) Primary Memory: This is the memory where program is stored for its execution by CPU. o Execution of program is not possible until the program and data are loaded in this memory. o During the execution the result is also stored in main memory and after that it goes to the secondary memory for permanent storage. o Main memory is volatile in nature i.e the contents of this memory are goes out when power goes off.

(ii) Secondary Memory: As main memory is volatile in nature and limited capacity so in order to store large amount data permanently secondary/ auxiliary memory is used. o It consists of magnetic or optical materials and used to store data permanently even power is off. o Both read and write operation is possible here and data & programs need to load in main memory for their execution.

(iii) Register Memory: ¬ This memory is present inside the processor. ¬ It consists of a set of general & special purpose registers ¬ These are used to store the intermediate results during an arithmetic & logical operation. ¬ Register memory is smaller but faster in nature.

(iv) Cache Memory: ¬ Since the size of register memory is very small, then most of cases CPU access the data stored in main memory. ¬ But since the memory access time for accessing main memory is relatively more, so CPU execution time is more. ¬ In order to avoid the delay, a small faster memory known as cache memory is used and it is present in between CPU and main memory. ¬ Cache is used to store frequently used programs and data.

(v) Backup Memory: ¬ It is an additional memory, which is used to store data in parallel with storage of data in secondary memory. The main purpose of this memory is to recover data after it lost. ¬ It is normally used in large organizations & business fields to provide additional level of security. ¬ Magnetic tape and CD are normally used as back-up memory.

Storage Device: The storage unit is a part of the computer system which is employed to store the information and instructions to be processed. A storage device is an integral part of the computer

hardware which stores information/data to process the result of any computational work. Without a storage device, a computer would not be able to run or even boot up. Or in other words, we can say that a storage device is hardware that is used for storing, porting, or extracting data files. It can also store information/data both temporarily and permanently.

Primary Storage Devices: It stands for **Random Access Memory.** It is used to store information that is used immediately or we can say that it is a temporary memory

Secondary Storage Devices: A ***secondary storage device*** refers to any non-volatile storage device that is internal or external to the computer. It can be any storage device beyond the primary storage that enables permanent data storage.

- Hard Disk**:** Hard Disk is a storage device (HDD) that stores and retrieves data using magnetic storage. It is a non-volatile storage device that can be modified or deleted n number of times without any problem. Most computers and laptops have HDDs as their secondary storage device. It is actually a set of stacked disks, just like phonograph records.

- Floppy Disk**:** Floppy Disk is also known as a floppy diskette. It is generally used on a personal computer to store data externally. A Floppy disk is made up of a plastic cartridge and secured with a protective case. Nowadays floppy disk is replaced by new and effective storage devices like USB, etc.

- Magnetic tape**:** is a medium for magnetic storage made of a thin, magnetizable coating on a long, narrow strip of plastic film. It was based on the earlier magnetic wire recording from Denmark. Devices that use magnetic tape can with relative ease record and play back audio, visual, and binary computer data.

- Optical disc: is a flat, usually disc-shaped object that stores information in the form of physical variations on its surface that can be read with the aid of a beam of light. Optical discs can be reflective, where the light source and detector are on the same side of the disc, or transmissive, where light shines through the disc to be detected on the other side.

- CD**:** It is known as Compact Disc. It contains tracks and sectors on its surface to store data. It is made up of polycarbonate plastic and is circular in shape. CD can store data up to 700MB. It is of two types: CD-R**:** It stands for Compact Disc read-only. In this type of CD, once the data is written cannot be erased. It is read-only. CD-RW**:** It stands for Compact Disc Read Write. In this type of CD, you can easily write or erase data multiple times.

- Pen Drive**:** It is also known as a USB flash drive that includes flash memory with an integrated USB interface. We can directly connect these devices to our computers and laptops and read/write data into them in a much faster and more efficient way. These devices are very portable. It ranges from 1GB to 64 GB generally.

- Flash Memory: Flash memory is a type of computer memory that can be reprogrammed and erased electronically, and it can store data even when there's no power. Flash memory is used in many devices, including smartphones, digital cameras, USB flash drives, and video games.

Input Device: An input device is a computer device or hardware that allows the user to provide data, input, and instructions to the computer system. Data is provided to the computer system in a raw format which is then converted into a computer-understandable language by the input devices. The central processing unit then processes the data to produce output. In other words, an input device is a kind of peripheral device that helps the users communicate with the computer system.

In order to get output from a computer we have to enter data to the computer through different input devices. An input device is any hardware components through which user can insert data, instructions, and programs into the computer.

Some of the most commonly used input devices are mentioned below.

(i) Keyboard: The most commonly used input device is a keyboard. By the help of keyboard user can input letters, numbers and special characters in to different applications or programs. A keyboard also has a special character that helps to operate the computer.

(ii) Mouse: The ssmouse is the most widely used pointing device. By the help of mouse user can work in graphical user interface. A mouse is an input device that is used to control the movement of the pointer on the computer screen and helps to make selection from the screen.

(iii) Optical Mark Reader (OMR): The Optical Mark Reader is a special type of input device which is used to read carefully pencil/ pen marks on a specially designed OMR sheet. This device mostly used now days for conducting objective type examinations, questionnaires and in forms

(iv) Scanner: Image Scanner is an input device that optically scans images, printed text or any object into digital image. By placing the picture on the flat transparent surface of the scanner, any hardcopy can be converted into digital form. Now a day’s scanners are also providing an Optical Character Recognition (OCR) technique which scans a text and gives us a text file.

(v) Magnetic Ink Character Recognition (MICR): The Magnetic Ink Character Recognition is a special type of input device that recognizes special characters printed in magnetic ink and input rapidly to a computer. This technique is mainly used by banking system (in ATM) and other business organizations for identification purpose.

(vi) Other Input Devices: The input devices are Camera, Microphone, Digital pen, joystick, touch screen etc.

Output Devices: An output device is a computer hardware device that retrieves and presents the result of the inserted input data from the computer system and further translates that data into human-understandable language. The output or result is then presented to us in the form of text, visuals, audio or a hard copy (printed on paper). The output devices can be mainly classified into four categories such as visual, data, print and sound. Based on the type of output and requirements, different output devices can be attached to the computer systems to retrieve the output.

(i) Printer: Printers are used to produce the output in hardcopy format. The resolution of Printer is measured in the form of DPI (Dots Per Inch) or PPI (Pixel Per Inch). Printers are off 2 types (a) Impact Printer (b) Non-impact Printer

(a) Impact Printer: Here physical contact occurs between print head and paper while printing. Ex. Dot-matrix printer, Daisy-wheel printer, Chain Printer etc.

(b) Non- Impact Printer: Here no physical contact occurs between print head and paper while printing. Ex. Ink-jet printer, Laser printer etc.

(ii) Plotter: A Plotter is a special output device that draws image with ink pens and also produce the output in hardcopy format. So, a Plotter is a graphical printer used for making graphs, charts, maps & 3D graphics etc. Plotters are off 2 types (a) Drum Plotter (b) Flat-bed Plotter.

(a) Drum Plotter: This plotter has a drum. A paper wraps around the drum that rotates to produce plots. Pens are moving across the paper while the drum is turning.

(b) Flat-bed Plotter: This plotter has a bed. This is also called table plotter. Here paper is placed on the bed which is fixed. This is generally used for large drawing.

iii) Monitor: The most general example of an output device is a monitor. It is also known as a Visual Display Unit (VDU) and the major function of a monitor is to display the processed data like images, videos, text, audio, etc. A monitor arranges the microscopic dots known as pixels in a

rectangular pattern to make images. The number of pixels present determines the sharpness of an image.

iv) Projector: The projector is an output device that receives images from a computer and allows users to project their output onto a large area, such as a screen or a wall. The computer first sends the signal to a video card which then transmits the signal to the projector to project the images on the surface. Projectors magnify texts, photos, and movies using light and lenses. As a result, it's an excellent output device for giving presentations or teaching big groups of people.

v) Speaker: Speakers are the output devices that are connected to computers to allow sound to be output. For the working of speakers, sound cards send signals to the speakers which are converted into audio. Speakers are available in a variety of shapes and sizes ranging from simple two-speaker output devices to surround-sound multi-channel sets. These speakers use internal amplifiers which vibrate at different frequencies to increase/decrease the volume or amplitude of sound.

vi) Headphones: Headphones are the output devices that help us listen to the audio coming out of a computer. With the help of headphones, we can listen to the audio privately and without disturbing anyone around. These come in various sizes and brands and can be connected with computer systems both wired or wirelessly. Computers generate sound or audio as electric signals, which we perceive through headphones. The headphones can convert electrical energy into mechanical energy and we can then listen to songs or audio on computer systems. Headphones are light and portable, unlike heavy computer speakers.

vii) GPS: GPS or Global Positioning System (GPS) is a radio-based satellite navigation system that consists of a network of multiple satellites. GPS uses radio signals to pinpoint a specific location. The user sends a radio signal to the satellites, which collect data such as time, location, speed, and other variables and deliver it to the reception computer for analysis. GPS is considered an Output Device because this processed data can be evaluated to obtain information.

viii) Braille Embosser: Braille Embosser is an output device that converts digital text into Braille characters for visually impaired users. It is a specialized type of printer designed to produce tactile output in the form of Braille characters on paper or other materials. Braille is a system of raised dots that are used by individuals with visual impairments to read and write. It operates by transforming digital text or content into Braille characters and then employing a set of mechanical pins or embossing heads to produce raised dots on paper. These embossed dots can be read by touch, allowing blind individuals to access written information.

ix) Haptic Devices: Haptic Devices is an output device that provides tactile feedback, such as force feedback joysticks or vibration motors in gaming controllers. There are different forms of Haptic devices- Joysticks, steering wheels, game controllers, & more.

x) 3D Printer: A 3D Printer is an output device capable of creating three-dimensional objects by printing layer upon layer of material based on digital models. 3D printers are nowadays used as a medium to convert an idea into a prototype in a very quick time. This reduces the overall product cost and helps revolutionize the industry; therefore, it is a very high-demand product in the automobile, printing, and other industries.

Devices That Function as Both Input and Output: Some devices serve dual purposes, acting as both input and output devices:

1. **Headsets**: Combine speakers (output) and microphones (input) for communication and audio experiences.
2. **Touchscreens**: Allow for both input through touch and output through display.
3. **USB Drives**: Enable both reading (input) and writing (output) of data.
4. **Network Cards**: Facilitate sending (output) and receiving (input) data over networks.
5. **Webcams**: Provide visual input while often including microphones for audio input as well.

Conclusion

Understanding the various input and output devices available can help you create a more efficient and enjoyable computing experience. Whether you're setting up a home office, gaming station, or multimedia centre, choosing the right combination of these devices can significantly enhance your interaction with your computer.

Remember, the best setup is one that meets your specific needs. Consider your primary uses, ergonomic requirements, and personal preferences when selecting input and output devices. With the right tools at your fingertips (and on your desk), you'll be well-equipped to tackle any digital task that comes your way.