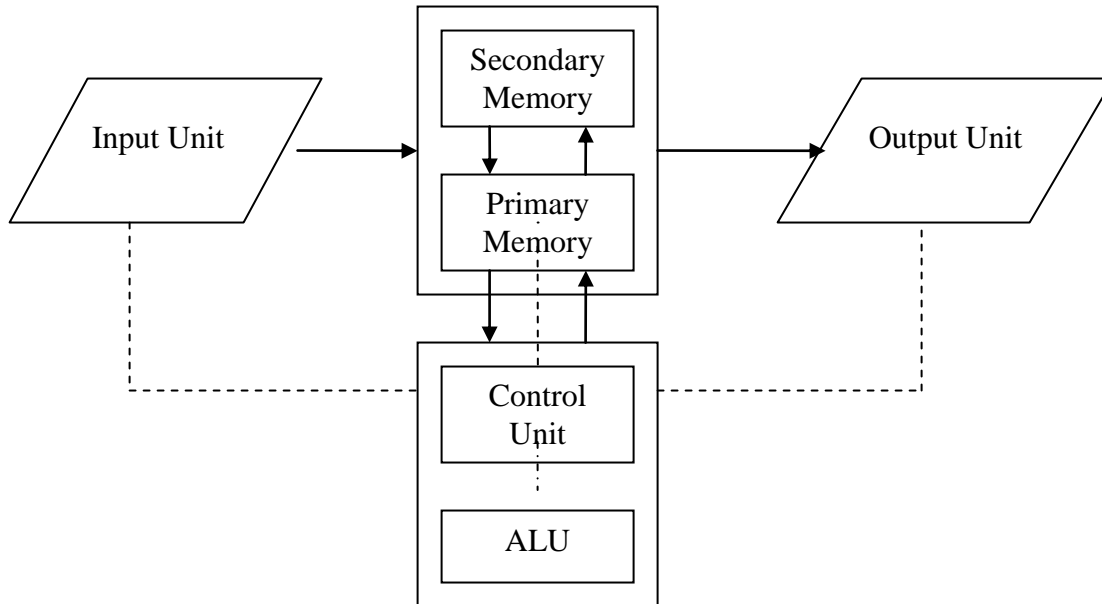# 1. Explain the block diagram of a computer

The components of a digital computer are shown in the following block diagram. They are Input devices, CPU, Memory and Output devices. The input and output devices are also called as peripherals.

1. **Input devices** – Data and Commands are entered into the computer through the keyboard. So, it is called the standard input device. Other input devices are mouse, joystick, light pen, touch screen, Micro phones etc.

2. **CPU** - CPU stands for Central Processing Unit. It controls the operation of input output devices and memory unit. The CPU contains the following parts : They are ALU, CU and Accumulator, general and special purpose registers.

   a) ALU stands for Arithmetic and Logic Unit. It performs all the Arithmetic calculations such as Addition, subtraction, multiplication and division.

   b) Registers are used to store the temporary results and data.

3. Memory – The purpose of memory is to store information. Memories are two types. They are Primary memory and Secondary memory.

Primary memory is again classified into two types. They are RAM and ROM.

RAM stands for Random Access Memory. It is a volatile memory. It's contents would get erased when the electricity is off.

ROM stands for Read Only Memory. It is a permanent memory. It is a non-volatile memory. It is supplied by the manufacturer of the computer.

The information stored in Hard Disk is permanent. To improve the performance of the computer several other memories are used such as Cache memory and Virtual memory. This is of two types. They are Semiconductor memory and Magnetic memory.

Semiconductor memory is static, faster, lighter, smaller and size and consumes less power. Generally this type of memory is used as main memory. Magnetic memory is slower but cheaper. It is used as secondary memory and backup for mass storage of information.

RAM, ROM, EPROM, EEPROM are the examples for semi conductor memories.
Hard disk, Floppy disk, Magnetic tape, CD, DVD, Pen drive are the examples of Secondary memory.

4. **Output devices** – Output devices display the information outside. The other output devices are Monitor, Printer, Plotter, Speakers etc. Output devices produce Hard copy and Soft copy. Hard copy means printed copy. Soft copy produces the information on the VDU, Floppy disk, CD, DVD and Pen drive etc.

2. Explain Characteristics or Features of computers and limitations.

A computer is an electronic device. It can store, retrieve, manipulate and calculate the large amount of data at a high speed and with a great accuracy.

Characteristics of computers

Speed: Computer can work very fast. It takes only few seconds for calculations that we take hours to complete. The rate at which computers process the instructions per second is called speed of the computer. Modern computers execute instructions within Micro, Nano and Pico seconds.

Accuracy: Computers always process the data with high accuracy. The errors in computer are due to human and inaccurate data.

Storage: Computers have large storage capacity. Two types of storages are Primary memory and Secondary memory. The storage capacity is measured in terms of number of bytes. You can also store data in secondary storage devices such as floppies, Disks etc.

Diligence – Human need rest after certain point of time. But the computers being a machine does not require any such type of rest. They can process the same activity any number of times with same speed and accuracy.

Versatility – Computers are used in variety of applications. They are not limited to any particular job. Many soft wares are available to perform different jobs with the help of computers.

Reliable - The output generated by the computer is reliable only when the data is passing as input to the computer.

Automation - Once the instructions fed into computer it works automatically without any human intervention until the completion of execution of program until meets logical instructions to terminate the job.

Limitations of Computer:

1) Computer does not work on itself, it requires set of instructions to be provided, and else computer (Hardware) is waste.

2) Computer is not intelligent, they have to be instructed about each and every step which they have to perform

3) Computers cannot take decisions on its own, one has to program the computer to take an action if some conditional   prevail.

4) Computers, unlike humans cannot learn by experience.

3. Explain the various types of computers

Computers can be divided into different categories depending upon the size, efficiency, memory, and number of users. They are:

1. Analog computer
2. Digital computer
3. Hybrid computer

On the basis of purpose of usage, they can be classified into two types:

1. Special purpose computers
2. General purpose computers

On the basis of size, they can be classified into 5 types:

1. Portable computers
2. Desktop computers
3. Mini computers
4. Mainframe computers
5. Super computers

Analog computers: It operates on inputs of continuously varying electrical voltage. It measures the input rather than counting. These are mainly used in Scientific design and production environments.

Digital computers: In these computers, computations are done with numerical digits 0 and 1.It is much faster than Analog computers.

Hybrid computers: It combines both the features of Analog and Digital computers. In these computers some calculations are done in the Analog portion and some are done in Digital portion of the computers.

Special purpose computers: These are used for weather forecasting.

General purpose computers: The general purpose computer is designed to meet the needs of many different applications. Ex. Pay-bills, reports etc.

Portable computers: Portable computers are very small and easy to carry anywhere. Business executives, Traveling sales man etc use these computers.

Desktop computers: These are larger than portable computers. It is normally installed on a desktop, so it is called desktop computer. These are also called Personal computers.

2) Mini Computers: These computers have a large storage capacity and can operate a high speed. These can be connected to a number of I/O devices. These are used to support multiple users.   Ex: PDP-1 AND IBM AS/400

3) Mainframe Computers: These computers also have large storage devices as compared to Mini Computers. They operate at a very high speed. They can also handle the workload of many users. Ex. IBM 3000 Series, DEC and ICL.

4) Super Computers: Super Computers are built by interconnecting hundreds of microprocessors. They also have a multi processing techniques. They are mainly used for weather forecasting, biomedical research, remote sensing, aircraft design and other areas of science and technology. Ex.   CRAY 2,CRAY 3, CRAY XMP, PARAM 10000, PARAMPADMA

4. Classify the computers according to the size and functionality.

Computers are classified into six varieties. They are:
   a) Desktop computers
   b) Workstations
   c) Notebook computers
   d) Tablet computers
   e) Handheld computers
   f) Smart Phones

Desktop computers: A desktop computer is a Personal Computer or PC that is designed to sit on a desk or table. These are commonly used in Schools, Homes and Offices. These computers can be used to communicate, produce music, edit photographs and videos, and play games.

Workstations: A workstation is a specialized, single user computer that has more powerful features than a desktop. These are used by Scientists, engineers and animators. These workstations have large, high-resolution monitors.

Notebook computers: The approximate size of these computers are 8.5 by 11 inch. People frequently set these devices on their lap, so they are called Laptop computers. These computers generally less than 8 pounds in weight. Some notebook systems are designed to be plugged into a docking station which may include large monitor.

Tablet PCs : Tablet PCs offer all the functionality of notebook PC. Many Tablet PCs also have a built-in microphone and special software that accepts input from the user voice.

Handheld PCs: A popular type of handheld computer is the Personal Digital Assistants (PDA).It is normally used for special applications such as taking notes, displaying telephone numbers and addresses and keeping track of data and agenda.

Smart Phones : These are large size of cellular phones These are called smart phones. These can include Web and e-mail access.

5) Explain the Generations of computers

First Generation compters (1946-55) : The First Generation was started with the development of ENIAC in 1946. They used Vacuum Tubes. They produce lots of heat. The Vacuum tubes failed frequently. These computers had slow Input/Output operations, limited storage capacity, high power consumption, large space requirement and poor reliability, Machine language was used. In these computers, data and instructions were input from the punched cards. Secondary storage was Magnetic drums, later these were replaced by Magnetic tapes.

Second Generation computers (1956-64) : Vacuum Tubes were replaced by Transistors. Transistors are small, require very little power and run effectively. They are much more reliable. Magnetic disks were developed for secondary storage. Use of the Transistors made the computers much faster. Size of these computers was also reduced. Assembly language was used in these computers. Assembly language is the combination of Binary codes and Mnemonics.
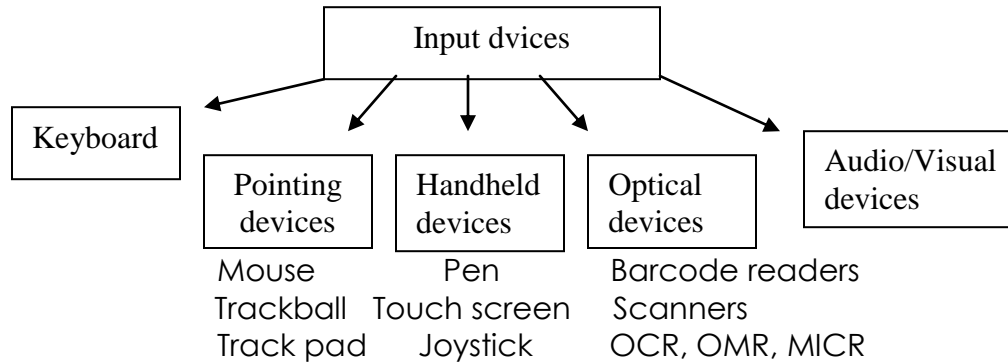
Third Generation (1965-75): Third Generation computers used Integrated circuit chips (ICC) in place of Transistors and Magnetic disks in place of Magnetic tapes for external storage. The speed and reliability of these computers were much higher than those of Second Generation computers. High level languages were introduced in this period.

Fourth Generation (1975 – Present): These computers were entirely based on microprocessor chips that contain VLSI circuits to perform Arithmetic, Logical and Control functions. It was the beginning of the personal computer having the microprocessor. It introduced Office automation, Query languages, Report writers and Spread Sheets.

Fifth Generation (Present and Beyond): Artificial Intelligence Technology is being incorporated in these computers. It can make the computer think and reason like a human being and make appropriate decisions.

6. Explain the various Input Devices of a computer

The input devices in the computer system are Keyboard, mouse, joystick, scanner, digital camera, barcode reader and Touch Screen. These are used to communicate with the outside world. Some commonly Input/Output devices are as follows:

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                        ┌──────────────────┐
                        │   Input dvices   │
                        └──────────────────┘
        ┌──────┬──────────┬──────────┬──────────┬──────────┐
┌─────────┐  ┌──────────┐ ┌──────────┐ ┌──────────┐  ┌──────────────┐
│Keyboard │  │ Pointing │ │ Handheld │ │ Optical  │  │ Audio/Visual │
└─────────┘  │ devices  │ │ devices  │ │ devices  │  │   devices    │
             └──────────┘ └──────────┘ └──────────┘  └──────────────┘
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Mouse	Pen	Barcode readers
Trackball	Touch screen	Scanners
Track pad	Joystick	OCR, OMR, MICR

Keyboard
It is a standard input device that allows the user to input alphabets, numbers and other characters. It consists of a set of keys mounted on a board. They are   Numeric Keypad, Navigation Keys and Function Keys

Mouse
It is a pointing device. It is used to perform the tasks in a short way. It can be used to select menu commands, size windows, start programs etc.

Joystick
The joystick is a vertical stick which moves the graphic cursor in a direction the stick is moved. Joystick is used as an input device primarily used with video games, training simulators and controlling robots

Scanner
Scanner is an input device used for direct data entry from the source document into the computer system. It converts the document image into digital form so that it can be fed into the computer. Capturing information like this reduces the possibility of errors typically experienced during large data entry.

Bar code reader
A bar code is a set of lines of different thicknesses that represent a number. Bar Code Readers are used to input data from bar codes. Most products in shops have bar codes on them. Bar code readers work by shining a beam of light on the lines that make up the bar code and detecting the amount of light that is reflected back

Light Pen
It is a pen shaped device used to select objects on a display screen. It is just like the mouse (in its functionality) but uses a light pen to move the pointer and select any object on the screen by pointing to the object. Users of Computer Aided Design (CAD) applications commonly use the light pens to directly draw on screen.

<u>**Touch Screen**</u>
It allows the user to operate selections by simply touching the display screen. Common examples of touch screen include information kiosks, and bank ATMs.

<u>**Digital camera**</u>
A digital camera can store many more pictures than an ordinary camera. Pictures taken using a digital camera can be transferred to a computer. A digital camera takes pictures by converting the light passing through the lens at the front into a digital image.

7. Explain the various Output Devices of a computer

The output devices in the Computer system are Monitor, Speaker, Printer.

Monitors : Monitor commonly called as Visual Display Unit (VDU) is the main output device of a computer. It forms images from tiny dots, called pixels, that are arranged in a rectangular form. T he sharpness of the image depends upon the no. of the pixels. T here are two kinds of monitors.

Cathode-Ray Tube (CRT)
Flat- Panel Display

Cathode-Ray Tube (CRT) Monitor - In the CRT, display is made up of small picture elements called pixels for short. T he smaller the pixels, the better the image clarity, or resolution. The most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically.

Flat-Panel Display Monitor : T he flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement compare to the CRT. You can hang them on walls. Current uses for flat panel displays include calculators, video games, monitors, laptop computer, graphics display.

Speakers : The more complicated part of the sound output system is in the sound card. The sound card translates digital sound into the electronic current that is sent to the speakers.

Printer : Other important output device is the printer. Generally printers fall into two categories. They are Impact and Non-impact. An impact printer creates an image by pressing an inked ribbon against the paper, using pins and or hammers to shape the image. An example of an impact printer is a typewriter. Non-impact printers are used to print images. Laser printers work like photocopies.

Plotters : A plotter is a special kind of output device. It is like a printer. Because it produces images on paper, but the plotter is used to print large format images, such as construction or engineering drawings created in CAD (Computer Aided Design).

Snapshot printers : These are specialized. Small format printers used to print small color photographs. Snapshot printers popular among users who own digital cameras. These printers are slow and they can be more expensive than inkjet or laserprinters.

8. Explain the various applications of computers ?

Computers are widely used in fields such as engineering, health care, banking, education and so on.

Word processing : Word processing software enables users to read and write documents. Users can also add images, tables, and graphics. This software automatically correct spelling mistakes and includes copy-paste features.

Internet : The Internet is a network of networks that connects computers all over the world. It gives the users to access the Chat software, e-mail, Video-conferencing tools for conducting meetings etc.

Desktop publishing : Desktop publishing software enables you to create page layouts for entire books.
Government : Computers are used in Government organizations to keep records on legislative actions, Internal Revenue Service records etc.

Traffic control : In the United States, Computers are used by the Government for city planning and Traffic control.

Legal system : Computers are used by lawyers to shorten the time required to conduct legal precedent and case research.

Retail business : Computers are used in retail shops to enter orders, calculate costs, and print receipts. They are also used to keep an inventory of the products available and their complete description.

Sports : computers are used to compile statics, identify weak players and strong players by analyzing statistics, sell tickets, create training programs.

Music : All computers today have musical instrument digital interface facility, which links musical instruments to a PC and generate a variety of sounds.

Movies : Computers are used to create sets, special effects, animations, cartoons, imaginary characters, videos, and commercials.

Travel and Tourism : Computers are used to prepare tickets, monitor the routes of trains and aero planes, and guide planes to a safe landing.

Business and Industry : In Business and Industry, Computers are used mainly for data processing, which includes tasks such as word processing, analyzing data, entering records, payroll processing, personnel record keeping and inventory management.

Hospitals : Hospitals use computers to record every information about patients, from the time to their admission till their exit.

Weather Forecasting : Computers are used to predict weather and climate changes in the entire world.

Education : A computer is a powerful teaching aid and acts as another teacher in the classroom. Teachers use computers to give power point presentation to the students.

Online Banking : The world today s moving towards a cashless society, where you need not have money in your pocket to purchase anything. You just can have your Credit card or Debit card with you. The ATMs provide a 24 x 7 service and allow you to draw cash, check the balance in your account and order a product.

9. Explain different types of Computer codes.

Computer codes are used for internal representation of data in computers.
Computer codes are binary coding system.
In binary coding, every symbol that appears in the data is represented by a group of bits.
The group of bits used to represent a symbol is called a byte.
Most of the modern coding scheme use 8 bits to represent a symbol, the term byte is often used to mean a group of 8 bits.

Commonly used computer codes are BCD, EBCDIC and ASCII.

BCD – It stands for Binary Coded Decimal. It is one of the early computer codes. It uses 6 bits to represent a symbol. It can represent 64 (2^6) different characters.

EBCDIC – It stands for Extended Binary Coded Decimal Interchange Code. It uses 8 bits to represent a symbol. It can represent 256 (2^8) different characters.

ASCII – ASCII stands for American Standard Code for Information Interchange. ASCII is of two types. They are ASCII - 7 and ASCII – 8.
ASCII – 7 uses 7 bits to represent a symbol and can represent 128 (2^7) different characters.
First 128 characters in ASCII – 7 and ASCII – 8 are same.

10. What is an Algorithm ? Explain the characteristics of an Algorithm.

Ans) In Mathematics and Computer Science, an algorithm is a step-by-step procedure for calculations. Algorithms are used for calculation, data processing, and automated reasoning.

An algorithm is an effective method expressed as a finite list of well-defined instructions for calculating a function.

While designing an algorithm as a solution to a given problem, we must take case of the following five important characteristics of an algorithm.

1. **Finiteness** – An algorithm must terminate after a finite number of steps and further each step must be executable in finite amount of time. In order to establish a sequence of steps as an algorithm, it should be established that it terminates on all allowed inputs.

2. **Definiteness** – Each step of an algorithm must be precisely defined; the action to be carried out must be rigorously and unambiguously specified for each case.

3. **Inputs** – An algorithm has zero or more but only finite, number of inputs.

4. **Output** – An algorithm has one or more outputs. The requirement of at least one output is obviously essential, because, otherwise we cannot know the answer/solution provided by the algorithm The outputs have specific relation to the inputs, where the relation is defined by the algorithm.

5. **Effectiveness** – An algorithm should be effective. It means that each of the operation to be performed in an algorithm must be sufficiently basic that it can, in principle, be done exactly and in a finite length of time, by person using pencil and paper. It may be noted that the 'FINITENESS' condition is a special case of 'EFFECTIVENESS'. If a sequence of steps is not finite, then it cannot be effective also.