DIPLOMA IN COMPUTER APPLICATION

BLOCK-1

Computer Basics and Number System

Introduction

Ever since Human understood the concept of communication, numbers, and counting, their primary style to counting and data calculations with help of sticks or lines on walls of caves. Then they moved towards counting using ten fingers of their hands, which probably is the basis of present decimal system.

According to the history the first computing device, which was developed before 5000 years by China is ABACUS. By which we can calculate simple addition and subtraction. It is still in use in south East Asia, China and Japan.

The first mechanical calculating machine, which is capable to perform various arithmetic operations, was developed in early 1642, which was initiated by French scientist BLAISE PASCAL (1623-1662). This calculating machine mainly perform only two basic operations i.e. addition and subtraction. This was named as Pascaling.

In 1822, Charles Babbage designed the early computer called difference engine. Which could produce logarithm tables. He improved this machine and came out with a new idea of Analytical Engine in 1833, which could perform the basic arithmetic functions. This machine used punch as input output devices. He is called as "FATHER OF COMPUTERS".

Mark One was the first electric and mechanical computer discovered by Howard Aekain in 1939. Who work multiply is 6 sec and division in 12 sec.

The first electronic computer, ENIAC (Electronic Numerical Integrator and Computer) was designed in 1946. It has capability to perform about 5,000 calculations per second. This was a huge computer which occupied about 1,500 sq. ft and weighed about 50 tons. Which is also considered as the 1st generation of Computer.

The computer as we know it today had its beginning with a 19th century English mathematics professor name Charles Babbage. He designed the Analytical Engine and it was this design that the basic framework of the computers of today are based on. In the present 21st century we depend on computers to fulfill our requirements at a very short period of time.

Some of the many purposes where Computers are used are

1. Email service such as Yahoo, Gmail for quick delivery of messages.
2. In hospitals for the purpose of patient care and hospital billing.

3. Telecommunications in the form of mobile phones.
4. Defense in the form of missile guidance system and other defense activities.

(The Present Day computer)

Definition

The term Computer is derived from a Latin word 'Compute' which means to calculate or to manipulate

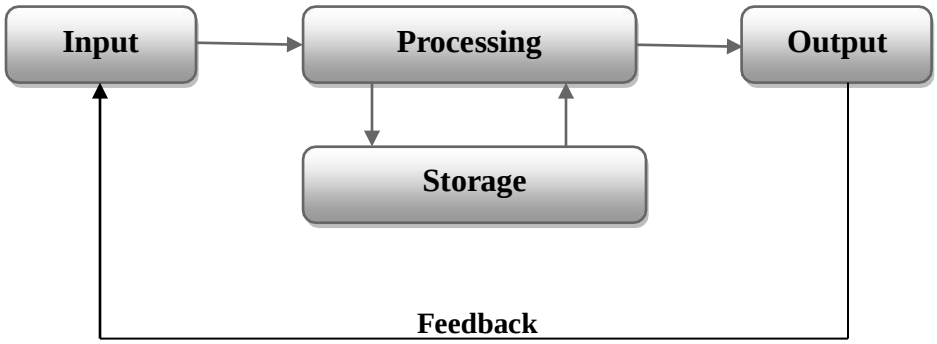
A Computer is anything that transforms process information in a purposeful way.

In Simple terms

A computer is a device that accepts data and instruction (in the form of digitalized data) and process it according to the given instruction and give the output.

OR

A computer can be described as an electronic calculating device that accepts raw data as input, processes it and produces meaningful information i.e. output as result.



Characteristics of Computer

Computer is the most powerful machine in today's world. It has become the need in everyone's life. A computer can perform task very quickly and accurately. Computer has its own features and characteristics. The characteristics of computers that have made them so universally useful are speed, accuracy, diligence, versatility, storage capacity, power of remembering, no IQ, no feeling

- **Efficiency:** The time take to process data by computer is called speed of computer. It takes only few seconds for calculations that we take hours to complete which is beyond of human Capacity. The speed of computer is measured in MIPS (Millions Inch per Seconds).
- **Speed: -** In terms of speed computers can work incredibly fast to achieve the needs of a human within a short span of time.
- **Accuracy: -** In terms of accuracy the computer is 100 % accurate and so computerized calculation is given importance in the field of science and other subjects.
- **Diligence: -** Computer can work for hours without any break and creating error.
- **Versatility: -** We can use computer to perform completely different type of work at the same time.
- **Storage Capacity**: - Computer can store mass storage of data with appropriate format.
- **Reliability**: The computer is a reliable electronic multipurpose and multiprocessing machine. It processes data with high accuracy without any mistakes.
- **Power of Remembering: -** It can remember data for us. One of the examples includes mobile phones which retrieve phone numbers when the name is selected or the name of the person when the mobile number is dialed.
- **No IQ: -** Computer does not work without instructions.
- **No feeling: -** Computer does not have emotions, knowledge, experience, and feeling.
- **Artificial intelligence:** The fifth generation computer which recognizes voice is based on artificial intelligence. The AI is applied in gaming software, and robotics from many years, but operating system based on AI is also in process which can recognize not only voice, but read mood of users also. It gives suggestion and decision on complex problems.

Functions of the Computer

The four basic functions of a computer system are as follows:

1. Data input
2. Data Processing
3. Information output
4. Data and information Storage

1. **Data input:-**Receiving of accepting information from outside sources. Some of the input devices are as shown below.

2. **Data Processing**: - The processing is done by the computer processor. A processor is the logic circuitry that responds to and processes the basic instructions that drive a computer. The term processor has generally replaced the term central processing unit (CPU). The processor in a personal computer or embedded in small devices is often called a microprocessor.

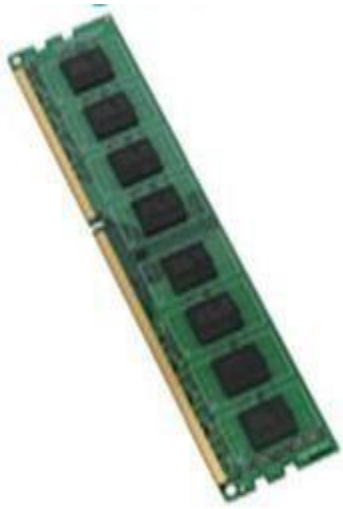
(Microprocessor)

3. Information output: - The Output of a computer is done by Output device.

An output device is any device used to send data from a computer to another device or user.

(Output Device)

4. Data and information Storage: - The storage is done by a storage devise. A storage device is any computing hardware that is used for storing, Porting and extracting data files and objects. It can hold and store information both temporarily in Primary Storage Devices and permanently in secondary storage devices which can be internal or external to a computer.



(**Primary Storage)** **(Secondary Storage)**

Application of Computer

Computer are used in areas which require huge amount of data to be processed at a short period of time to give desired required output.

Where computer is used

Computer is used in many fields and they are

1. **Research:** Scientific Calculations where a human is prone to error.
2. Large scale data processing which human being cannot do
3. Getting data from dangerous locations where a human being cannot reach or may lose life.
4. **Telecommunication** and many more
5. **Education:** The computer provides various tool in the education system like Computer Based Education that involves control, delivery, and evaluation of learning
6. **Health care:** It used in hospitals to keep the record of patients and medicines. It is also used in scanning and diagnosing different diseases. ECG, EEG, ultrasounds and CT scans, etc. are also done by computerized machines.
7. **Entertainment:** Audio video editing and pre and post production activity is being done using computer system.
8. **Banking:** banking system is completely dependent on Computer system. Online accounting facility, which includes checking current balance, making deposits and overdrafts, checking interest charges, shares, and trustee records.
9. **Engineering Design:** One of the major areas is Computer Aided Design that provides creation and modification of images.
10. **Defense:** Computers are largely used in defense. Modern tanks, missiles, weapons, etc. Military also employs computerized control systems.
11. **Weather forecasting:** Huge capacity computer system are used in weather forecasting.

Classification of Computer

Computers differ based on their data processing abilities. They are classified according to purpose, technology, size and capacity.

On the basis of purpose: Types of Computer

According to utilization of computer for different uses, computers are of the following two types:

1. General Purpose
2. Special Purpose

1. ***General Purpose Computers***: These are general purpose computers that are used to perform a variety of tasks ranging from scientific as well as business purpose applications. They are multi-purpose computers that cater the needs of different people. They are generally found in homes and offices. Their uses include preparation of documents, letters, reports, gaming, financial analysis, data recording and analysis etc.

2. ***Special Purpose Computers***: Special purpose computers are designed to perform only specialized task for which they are meant. For example weather forecasting, space research, air traffic control, medical diagnostic etc. They may not have additional unnecessary options. They are designed with specific instructions to perform a particular type of work only.

On the basis of Technology: Types of Computer

According to the technology used, computers can be classified into three types:

1. Analog Computer
2. Digital Computer
3. Hybrid Computer (Analog + Digital)

1. **Analog Computer: -** An analog computer is a form of computer that uses the continuously changeable aspects of physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved.

(Analog Computer)

2. **Digital: -** The device capable of solving problems by processing information in discrete form. It operates on data, including magnitudes, letters, and symbols, that are expressed in binary form—i.e., using only the two digits 0 and 1.

There are three major elements in a digital computer which help in solving the problems they are: hardware, software and data. The data is processed by digital computers using arithmetic and logical operations and therefore, they are more reliable and fast. They work on GIGO (Garbage In and Garbage Out) principle and require significant programming efforts. The desktop PC used at home is an example of digital computer, other examples include note books, work stations, smart phones etc.

(Digital Computer)

3. **Hybrid (Analog + Digital):-** Hybrid computers are computers that exhibit features of analog computers and digital computers. The digital component normally serves as the controller and provides logical and numerical operations, while the analog component often serves as a solver of differential equations and other mathematically complex equations.

(Hybrid Computer)

On the basis of Size and Capacity: Types of Computer

Computers can be as big in size as a room and as small as a hand palm. Computers can be classified into four categories on the basis of their size and capacity. These are:

1. Micro Computer (personal Computer)
2. Mini Computer
3. Mainframe Computer
4. Super Computer
5. Work Station

1. **Micro Computers:** These are small, low cost and single-user digital computers. IBM PC (Personal Computer) and Apple Macintosh are some examples of microcomputers. Microcomputers include desktop computers, notebooks, laptops, tablets, smart phones etc.

2. **Mini Computer:** Mini computers are much smaller in size than mainframe computers but are larger than microcomputers. They are also known as mid-range servers. In size and power, mini computers lie between workstations and mainframes. Examples of mini-computers are PDP 11, IBM 8000 series and VAX 7500.

3. **Mainframe Computer:** A very large and expensive computer capable of supporting hundreds, or even thousands, of users simultaneously. In the hierarchy that starts with a simple microprocessor (in watches, for example) at the bottom and moves to supercomputers at the top, mainframes are just below supercomputers. In some ways, mainframes are more powerful than supercomputers because they support more simultaneous programs. But supercomputers can execute a single program faster than a mainframe.

4. **Super Computer:** They are the most powerful and expensive computers among digital computers category and are huge in size. Because of their size and expense they are very rare and used only by large business houses, government and universities. They are the fastest calculating device ever invented and are not used for commercial data processing. They have huge primary memory and the most advanced capabilities. Examples of super computers are: CRAY-1, IBM's Sequoia in United States, Fujitsu's computer in Japan, PRAM & ANURAG in India etc.

5. **Work Station:** A terminal or desktop computer in a network. In this context, workstation is just a generic term for a user's machine (client machine) in contrast to a "server" or "mainframe."

		
Super Computer	**Mini Computer**	**Mainframe Computer**

Generation of Computer

The evolution of computers can be divided into five generations. Each generation represents technological evolutions over the period of time. Each generation of computers resulted in better, cheaper and smaller computers that are more powerful, faster and efficient than the previous generation. The five generation of computers with their technological advancements are discussed below.

1st Generation: - PERIOD :-(1946-1959).

1. Used Vacuum tubes which radiated a lot of heat.
2. Worked on batch processing operating systems
3. Input devices used: - Punched Cards, paper tape, magnetic tape.
4. Output devices used: - Punched Cards, paper tape, and magnetic tape.
5. Used machine code as programming language.
6. Consumed a lot of electricity
7. Slow input and slow output
8. Very huge in size and not portable.

Some of the examples of 1ST Generation computers are ENIAC, EDVAC, UNIVAC, IBM-701 and IBM-650

2nd Generation: - (1959-1965)

1. Used transistors which consumed less power.
2. More compact in size
3. More reliable and faster than the first generation computers
4. Used magnetic core as the primary memory and magnetic tape and magnetic disk as secondary memory.
5. Used machine, assembly language and high level programing languages such as FORTRAN, COBOL.
6. Used batch processing and multiprogramming operating systems.
7. Needed A/C

Some of the examples of 2nd Generation computers are IBM 1620, IBM 7094, CDC 1604, CDC 3600 and UNIVAC 1108

3rd Generation (1965-1971)

1. Used Integrated Circuits.
2. More reliable and faster in comparison to the previous 2 generation computers.
3. Less heat and less maintenance.
4. Consumed less electricity

5. Costly and supported high level languages.

Some of the examples of 3rd Generation computers are: IBM-360 series, PDP (Personal Data Processor), IBM-370/168, TDC-316, Honeywell-6000 series

4th Generation ((1971-1980)

1. Microprocessor Based
2. Uses VLSI(Very large scale Integration Circuit) Technology
3. Very cheap
4. Portable and reliable
5. Use the concept of pipeline processing
6. No A/C required
7. Internet was introduced in these systems

Some computers of this generation were: PDP 11, DEC 10, STAR 1000, CRAY-X-MP (Super Computer), CRAY-1(Super Computer)

5th Generation (1980- till date)

1) Used Ultra Large Scale Integration circuits
2) Use of high level languages such as C,C++,Java, vb.net.c#.net
3) Use of web development and web technologies
4) High speed portable and reliable
5) Used natural language processing
6) Used parallel processing
7) More friendly user interfaces with multimedia features
8) Use of web technologies such as php,JSP,J2EE,SAP
9) Used super conductor technology
10) Very powerful compact computers at cheaper rates

Some of the computers of this generation are

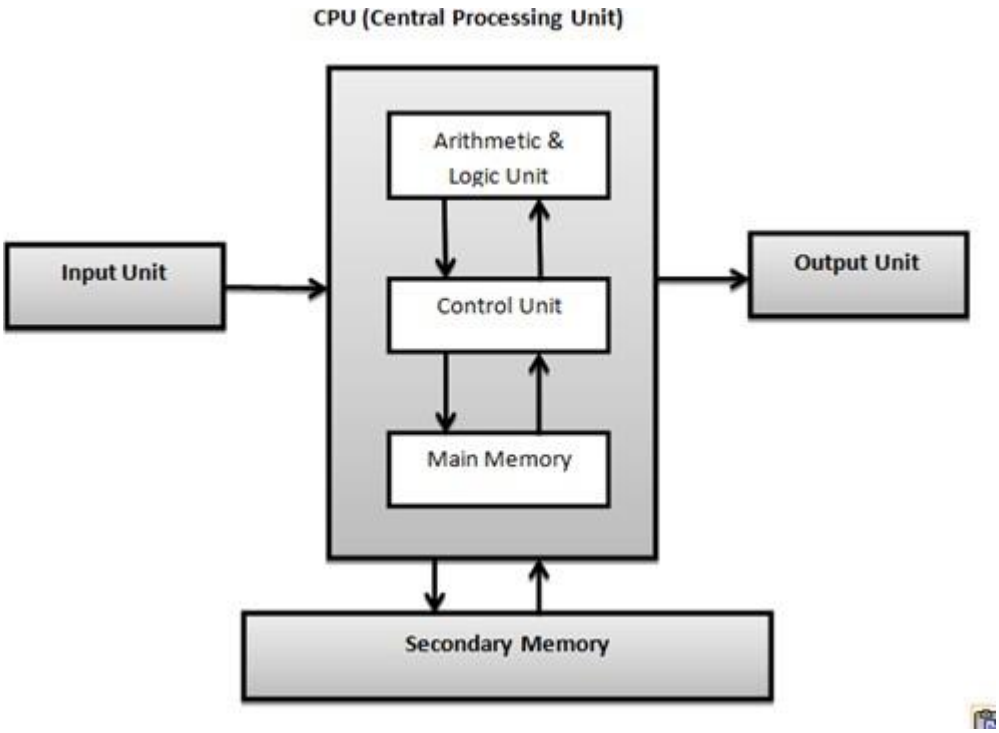
- Desktop
- Laptop
- Notebook

Computer Memory Units

Computer memory Units. Memory unit is: the amount of data that can be stored in the storage unit. That in which storage capacity is expressed in terms of Bytes.

Sl. No.	Unit	Description
1	Bit (Binary Digit)	A binary digit is logical 0 and 1 representing a passive or an active state of a component in an electric circuit.
2	Nibble	A group of 4 bits is called nibble.
3	Byte	A group of 8 bits is called byte. A byte is the smallest unit which can represent a data item or a character.
5	Kilobyte (KB)	1 KB = 1024 Bytes
6	Megabyte (MB)	1 MB = 1024 KB
7	Giga Byte (GB)	1 GB = 1024 MB
8	Tera Byte (TB	1 TB = 1024 GB
9	Peta Byte (PB)	1 PB = 1024 TB

Components of computer {Broad Overview}



The components of a computer include the following

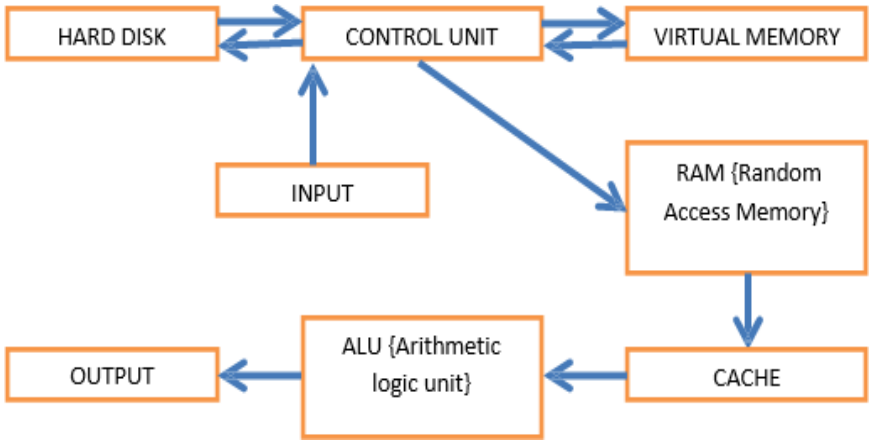
Input unit: - The input unit is used to input data into the computer. Keyboard is an input devise.

Processing unit: - The processing unit is used to process the data. CPU is a processing unit.

The CPU is comprised of 3 units

a) **Memory unit /cache**: - During the time of processing raw data from the RAM some data from RAM is brought from the RAM to cache memory prior to processing to increase processing speed. This memory keeps on filling up and gets emptied by the control unit till all the instructions and raw data from the RAM get emptied. RAM on the other hand gets filled up with instructions and raw data from the virtual memory (A Portion occupied in the hard disk) by the control unit till the program is completely executed.

A BRIEF OVER VIEW HOW THE PROCESSING TAKES PLACE IN COMPUTER TO GIVE OUTPUT



Hard disk: - A device to store huge amount of data and instructions. Data from the input unit is taken by the control unit and stored in hard disk or sent to RAM for processing .When working with heavy data and instruction from hard disk RAM is a small place and so when data and instructions are too heavy to be stored in RAM and so they are stored in the virtual memory a Portion of hard disk for faster execution. Instructions and data in RAM (Random Access Memory) go to the cache memory for processing. Instructions and data from cache memory go to the ALU for processing. After processing from ALU the output is generated on printer/ monitor or stored to a hard drive. Once instruction in RAM are over they are filled from virtual memory. The cycle continues till all instructions are executed.

b) Control Unit:-It is responsible for controlling all parts of the computer.

- Responsible in controlling the transfer of data and instructions among other units of a computer.
- Responsible in managing and coordinating with all the units of the computer.
- Gets instructions from the memory, interprets them, and accordingly directs the operation of the computer.
- Responsible in communication with input/output devices for transfer of data or results from storage.

- Does not process or store data.

c) **Arithmetic and Logic Unit**:-Arithmetic and logic section is comprised of 2 units. They are arithmetic section and logic section.
   - Arithmetic unit: - Arithmetic section is used to perform all arithmetic operation namely addition, subtraction, multiplication, division.
   - Logic Unit: - Logic unit is used to perform all logic operations such as comparison, selection, matching and merging of data.

Output unit: - Output unit is a devise which generates the output.

Example: **- Printer**

(Printer)

<u>Other units to discuss</u>

a) **Secondary storage**: - The secondary storage comprises of data that is very large in nature. Hard Disk is an example secondary storage device
b) **Virtual memory**. When the program is too large to be executed in the memory the entire program does not load but only a Portion of it which is to be executed comes to the RAM and the rest of it is stored in the hard disk in the form of virtual memory. This process is called paging.
c) **External storage:**-External data is a storage devise to store data externally for the following reasons.
   I. Easy data migration.
   II. Vital Data remains safe in case computer crashes and everything can be rebuilt in less time by the process called restoration.
   III. It helps to store maximum data and keeps the computer drives empty to store data.

   Examples of external storage are:

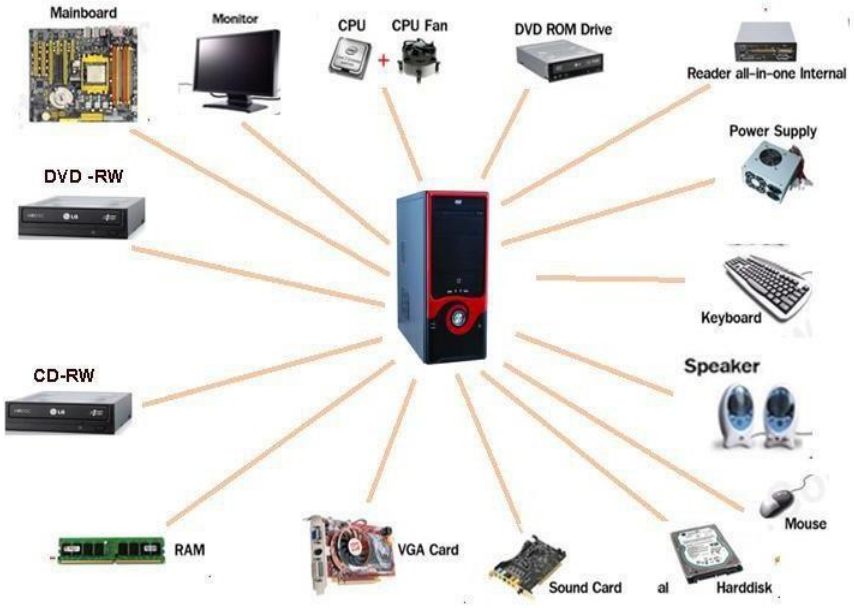
   I. **Pen drive: -** A pen drive/USB flash drive is a data storage device that includes flash memory with an integrated Universal Serial Bus (USB) interface. USB flash drives are typically removable and rewritable, and

physically much smaller than an optical disc. It comes in forms 4GB, 8GB, 16GB, 32GB, and 64 GB.

II. **External Hard disk: -** An external hard drive is a Portable storage device that can be attached to a computer through a USB or FireWire connection, or wirelessly. External hard drives typically have high storage capacities and are often used to back up computers or serve as a network drive. Capacity 500 GB,1 GB

III. **Google Drive /Cloud storage:-**Google Drive is a file storage and synchronization service created by Google. It allows users to cloud, share, and edit documents, spreadsheets, and presentations with collaborators. Google Drive encompasses Google Docs, Sheets, and Slides, an office suite that permits collaborative editing of documents, spreadsheets, presentations, drawings, forms, and more.

Components of computer (Detailed Overview)



(COMPONENTS OF CENTRA PROCESSING UNIT)

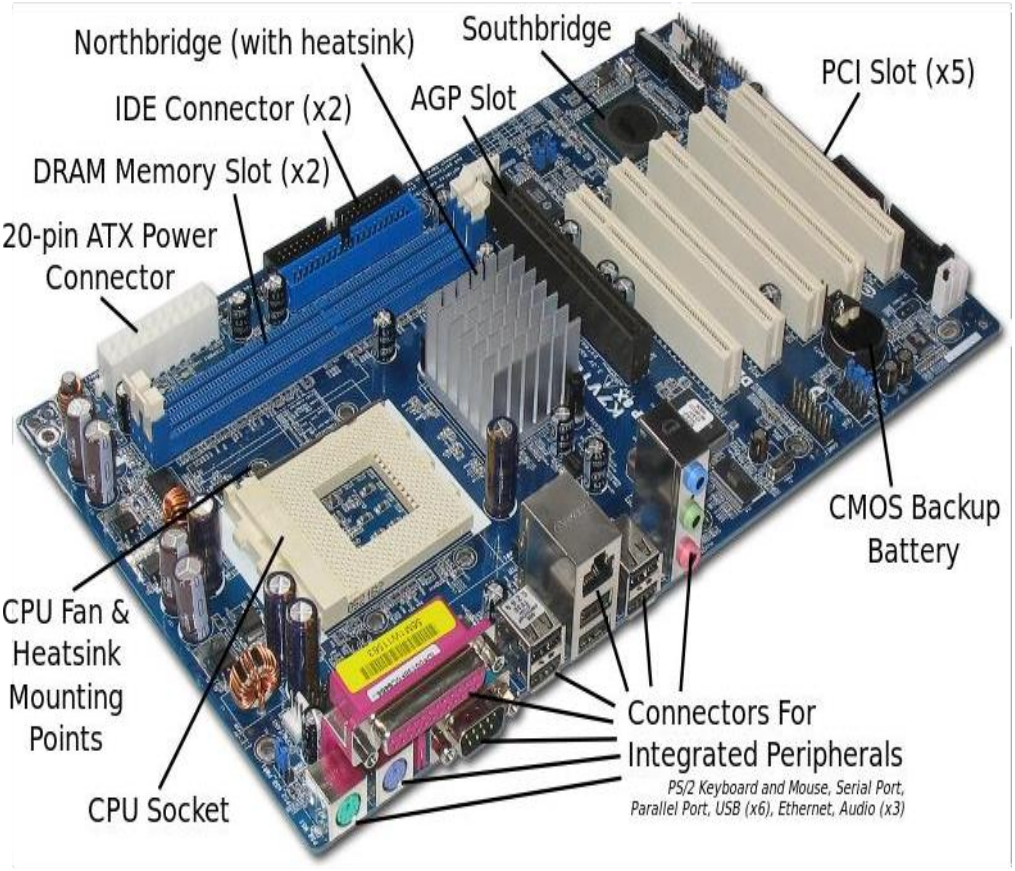
1. SMPS: - SMPS stands for switch mode power supply. 240 A/C Current that comes from the switch board and gets converted in low D/C voltage for the mother board and other devices at this unit. A switched-mode power supply (SMPS) is an electronic circuit that converts power using switching devices that are turned on and off at high frequencies, and storage components such as

inductors or capacitors to supply power when the switching device is in its non-conduction state.

SMPS (Switch mode power supply)

2. Motherboard: - A motherboard (sometimes alternatively known as the main board, system board, baseboard, planar board or logic board, or colloquially, a mob) is the main printed circuit board (PCB) found in general purpose microcomputers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals. A motherboard usually contains significant sub-systems such as the central processor, the chipset's input/output and memory controllers, interface connectors, and other components integrated for general purpose use.

3. Port: - A computer Port is a connection point or interface between a computer and an external or internal device. Internal Ports may connect such devices as hard drives and CD ROM or DVD drives; external Ports may connect modems, printers, mice and other devices.



(Motherboard)

Motherboard/main board of the PC is a large printed circuit that holds many of the most essential parts of the computer which are

1. **North Bridge**
    a. RAM
    b. Microprocessor
        i. Cache Memory
        ii. ALU
        iii. Control Unit
    c. Heat Sink
    d. CPU Fan And Heat Sink Mounting Points
    e. AGP Slot (port)
2. **South bridge**
    a. BIOS/EPROM
    b. ROM
    c. I/O (port)
    d. PCI (port)
e. EIDE (port)
    f. USB (port)
3. **Chipset**

4. **20 pin ATX Power Connector (port)**
5. **CMOS Battery Slots**
6. **PS2 Port(Mouse +Keyboard) (port)**
7. **Parallel Ports (port)**
8. **Serial Ports (port)**
9. **LAN Ports (port)**
10. **Audio Port (port)**
11. **Other connected devices like**
    a. Printers
    b. Hard Disks
    c. CD-R/W
    d. DVD-R/W
    e. VGA Card
    f. Sound Card
    g. Mouse
    h. Keyboard
    i. Monitor
    j. Speaker

1. North Bridge

a) **RAM: -** RAM (Random access memory) is the place in a computer where the operating system, application programs, and data in current use are kept so that they can be quickly reached by the computer's processor.

(Random Access Memory)

RAM is much faster to read from and write to than the other kinds of storage in a computer, the hard disk, floppy disk, and CD-ROM. However, the data in RAM stays there only as long as your computer is running. When you turn the computer off, RAM loses its data. When you turn your computer on again, your operating system and other files are once again loaded into RAM, usually from your hard disk.

b) **Microprocessor: -** A microprocessor is a computer processor that incorporates the functions of a computer's central processing unit (CPU) on a single integrated circuit (IC), or at most a few integrated circuits.

(Microprocessor)

I. **Arithmetic logic unit (ALU):** The ALU performs operations such as addition, subtraction, and operations such as AND, OR.

II. The control unit retrieves instruction operation codes from memory, and initiates whatever sequence of operations of the ALU requires carrying out the instruction. A single operation code might affect many individual data paths, registers, and other elements of the processor.
As integrated circuit technology advanced, it was feasible to manufacture more and more complex processors on a single chip. The size of data objects became larger; allowing more transistors on a chip allowed word sizes to increase from 4- and 8-bit words up to today's 64-bit words. With the ability to put large numbers of transistors on one chip, it becomes feasible to integrate memory on the same die as the processor.

III. **Cache Memory: -** C a c h e memory, also called CPU memory, is random access memory (RAM) that a computer microprocessor can access more quickly than it can access regular RAM. This memory is typically integrated directly with the CPU chip.

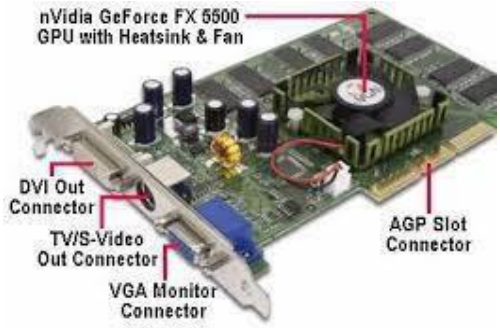
c) Heat sink: - The role of the heat sink is to remove the hightemperature of the motherboard generated due to high speed processing and give a cooling effect to the motherboard to work efficientlyand effectively.

(Heat Sink)

d) CPU Fan and Heat sink mounting points: - The CPU Fan and heat sink are mounted on the CPU to remove the heat from the CPU. When the CPU works a lot of heat is generated and this heat has to remove and this is done by the CPU fan and the sink mounting points.

(CPU fan with heat sink)

e) AGP (Accelerated Graphics Port) Slot: - This slot is used to attach AGP Cards a high-speed point-to-point channel for attaching a video card to a computer system, primarily to assist in the acceleration of 3D computer graphics. The primary advantage of AGP over PCI is that it provides a dedicated pathway between the slot and the processor rather than sharing the PCI bus.



AGP card

AGP slot

2. South bridge:- South bridge is an Intel chipset that manages the basic forms of input/output (I/O) such as Universal Serial Bus (USB), serial , audio, Integrated Drive Electronics (IDE), and Industry Standard Architecture (ISA) I/O in a computer.

South bridge overhead view

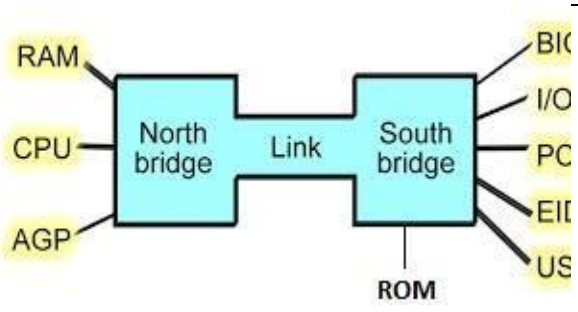
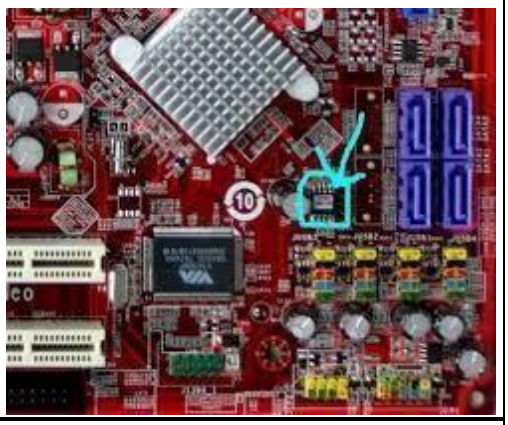
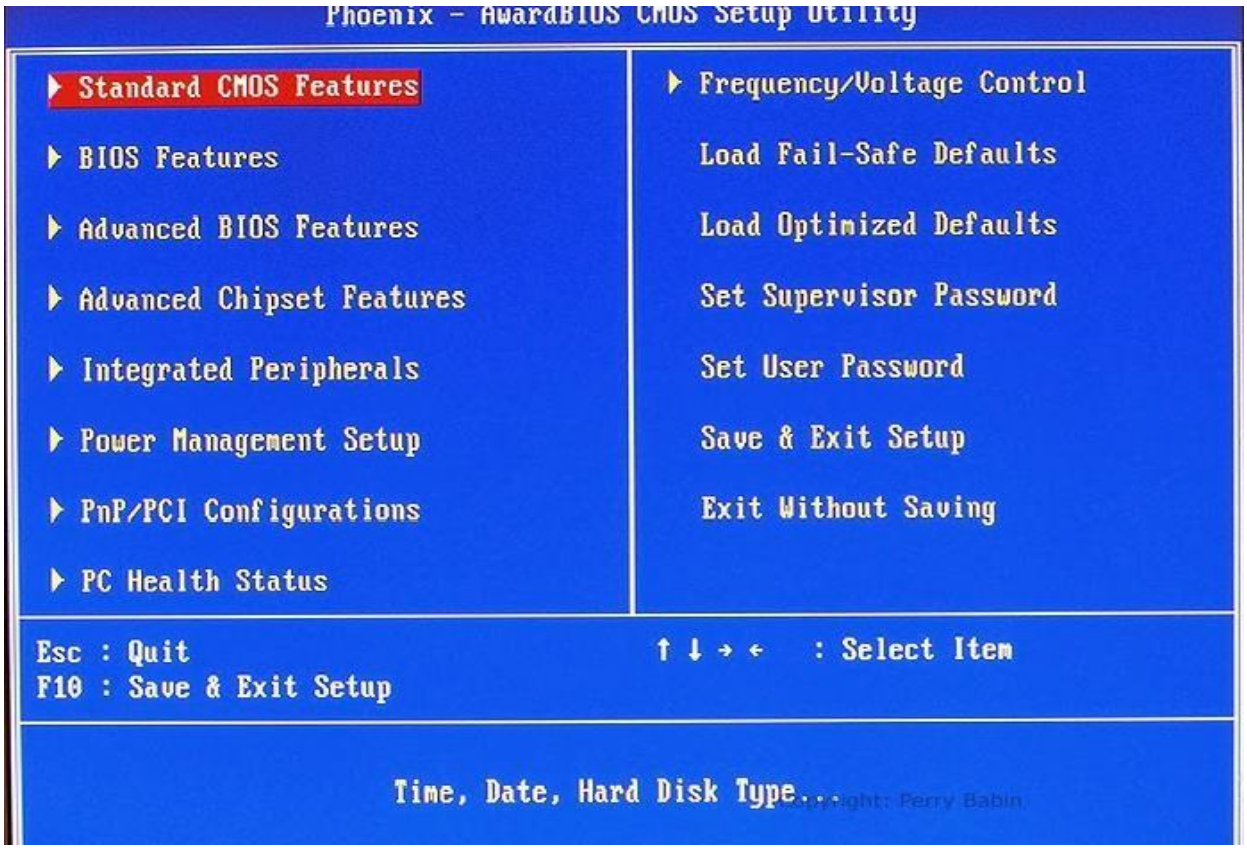


Diagram showing south bridge and north bridge jobs

The southern bridge manages the following devices as defined below

a) BIOS (Basic Input Output System/EPROM:-

	
BIOS Chips	**BIOS Chips on Motherboard**



(Bios Setting)

BIOS setting

Basic input output system

The BIOS software has a number of different roles, but its most important role is to load the operating system. When you turn on your computer and the microprocessor tries to execute its first instruction, it has to get that instruction from somewhere. It cannot get it from the operating system because the operating system is located on a hard disk, and the microprocessor cannot get to it without some instructions that tell it how. The BIOS provides those instructions**.** The BIOS is special software that interfaces the major hardware components of your computer with the operating system. It is usually stored on a Flash memory chip on the motherboard, but sometimes the chip is another type of ROM. When you turn on your computer, the BIOS do several things.

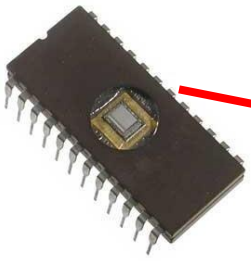
This is its usual sequence:

1. Check the CMOS Setup for custom settings
2. Load the interrupt handlers and device drivers
3. Initialize registers and power management
4. Perform the power-on self-test (POST)
5. Display system settings
6. Determine which devices are bootable
7. Initiate the bootstrap sequence
8. Managing a collection of settings for the hard disks, clock, etc.

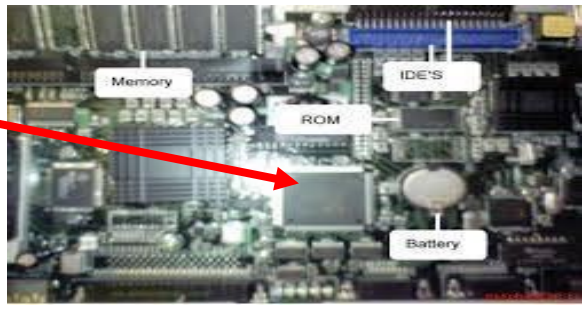
The first thing the BIOS do is check the information stored in a tiny (64 bytes) amount of RAM located on a complementary metal oxide semiconductor (CMOS) chip. The CMOS Setup provides detailed information particular to your system and can be altered as your system changes. The BIOS uses this information to modify or supplement its default programming as needed.

Setting up the Bios: - To set up the bios Start the computer and press the Del key repeatedly

b) ROM (Read Only Memory): - This is a nonvolatile memory that stores the instructions as how the computer should function.



(Read Only Memory)

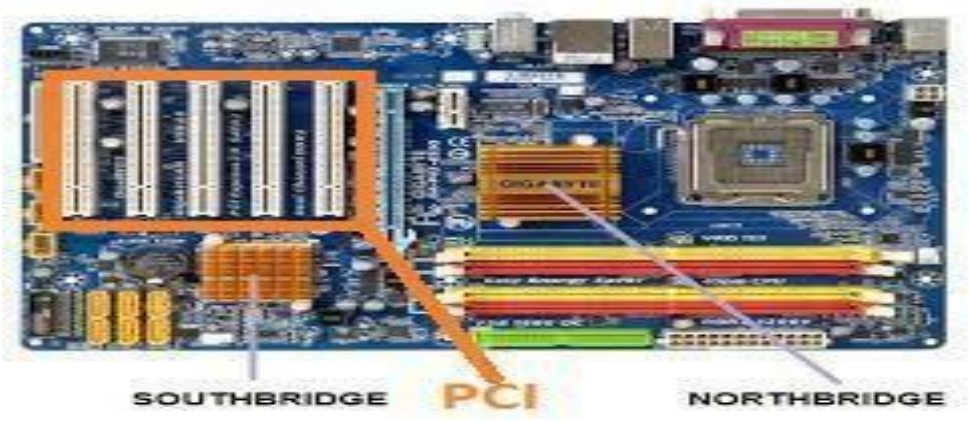


c) **I/O (Input Output System):-** Input/output or I/O (or, informally, Io or IO) is the communication between an information processing system, such as a computer, and the end user, possibly a human or another information processing system. Inputs are the signals or data received by the system and outputs are the signals or data sent from it. The term can also be used as part of an action; to "perform I/O" is to perform an input or output operation. I/O devices are used by a human (or other system) to communicate with a computer. For instance, a keyboard or mouse is an input device for a computer, while monitors and printers are output devices. Devices for communication between computers, such as modems and network cards, typically perform both input and output operations.

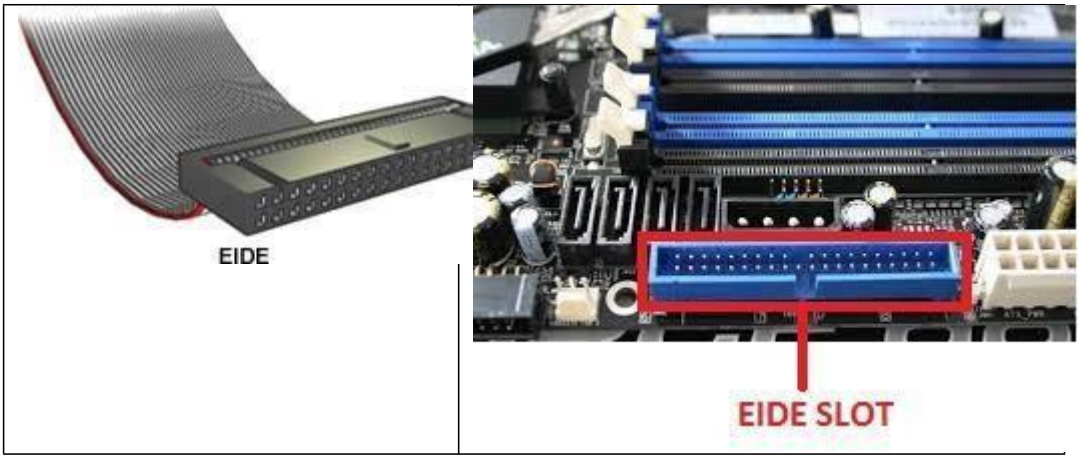
There are 2 types of devices: input device and output device**.**

- **Input device**: - An input device is a peripheral (piece of computer hardware equipment) used to provide data and control signals to an information processing system such as a computer or information appliance. Example: Keyboard, mouse, light pen
- **Output device**: - An output device is any piece of computer hardware item used to communicate the results of data processing carried out by an information processing system (such as a computer) which converts the electronically generated information into human-readable form. The example of output devices are printer, projector, monitor

d) **PCI (Peripheral Component Interconnect):-** The Peripheral Component Interconnect slots, commonly known as the PCI slots, refer to a computer bus. The computer bus is used by the computer to connect to peripheral add-on devices, such as a PCI video card, network cards, sound cards, TV tuners, fire wire cards, graphics cards and many other types of extension cards.



e) EIDE SLOT:-



Enhanced (sometimes "Expanded") IDE is a standard electronic interface between computer and its mass storage drives. EIDE's enhancements to Integrated Drive Electronics (IDE) make it possible to address a hard disk larger than 528 Mbytes. EIDE also provides faster access to the hard drive, support for Direct Memory Access (DMA), and support for additional drives, including CD-ROM and tape devices through the AT Attachment Packet Interface. When updating your computer with a larger hard drive (or other drives), an EIDE "controller" can be added to computer in one of its card slot.

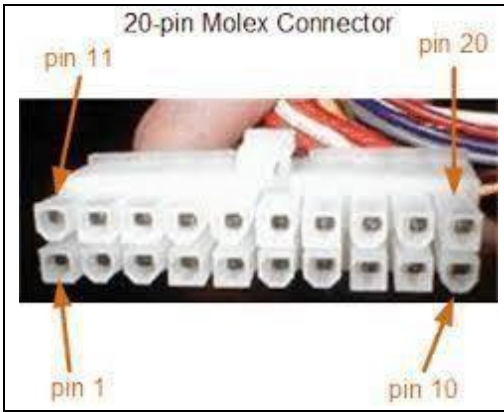
f) USB (Universal Serial Bus):- USB, short for Universal Serial Bus. USB was designed to standardize the connection of computer peripherals (including keyboards, pointing devices, digital cameras, printers, Portable media players, disk drives and network adapters) to personal computers, both to communicate and to supply electric power. It has become commonplace on other devices, such as smartphones, PDAs and video game consoles. USB has effectively replaced a variety of earlier interfaces, such as serial and parallel Ports, as well as separate power chargers for Portable devices.

USB Ports	
Male ports	**Female ports**
	
USB-A –male	**USB-A-female**
	
USB-A-male (mini)	**USB-A-female(mini)**
	
USB-A-male(micro)	**USB-A-female(micro)**
	
USB-B-male	**USB-B-female**
	
USB-B-male(mini)	**USB-B-female(mini)**

	
USB-B-male(micro)	**USB-B-female(micro)**
	
USB-C-male	**USB-C-female**

3. Chipset: - In a computer system, a chipset is a set of electronic components in an integrated circuit that manages the data flow between the processor, memory and peripherals. It is usually found on the motherboard. Chipsets are usually designed to work with a specific family of microprocessors. In computing, the term chipset commonly refers to a set of specialized chips on a computer's motherboard or an expansion card.

4. **20 pin ATX power connector: -** A connector from SMPS (switch mode power supply) to Power up the Motherboard.

	
ATX power connector pin diagram	**ATX power connector connected to mother board**

5. **CMOS Battery Slots**:-

CMOS (complementary metal-oxide-semiconductor) is the term usually used to describe the small amount of memory on a computer motherboard that stores the BIOS settings.

CMOS cleaning: - CMOS clearing is done to achieve the following

I. Reset the settings to factory settings
II. Reset the password of the bios.

<u>CMOS clearing can be done in 3 ways</u>

1st Way: - The easiest way to clear the CMOS is to enter the BIOS setup utility and choose to **Reset BIOS Settings** to their factory default levels...

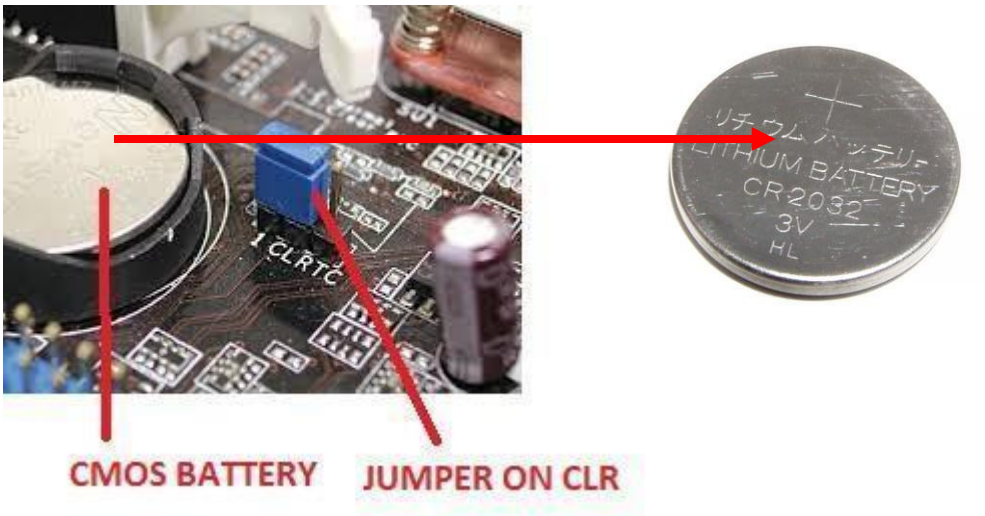
2nd Way: - Remove the CMOS battery for a minute and then replace it.

3rd Way: - Clear CMOS by changing the motherboard jumper.

Step -1 Switch off the computer .Unplug all supplies to it.

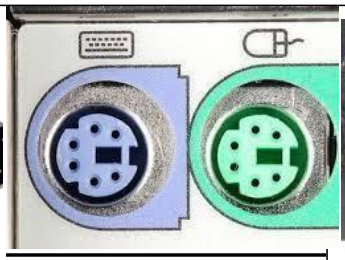
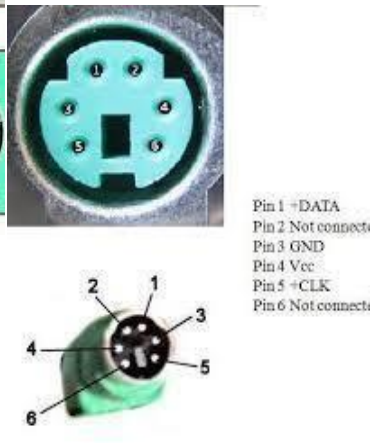
Step-2 Change motherboard jumper to pin labeled

***CLRPWD* / *PASSWORD* / CLEAR. / CLR**

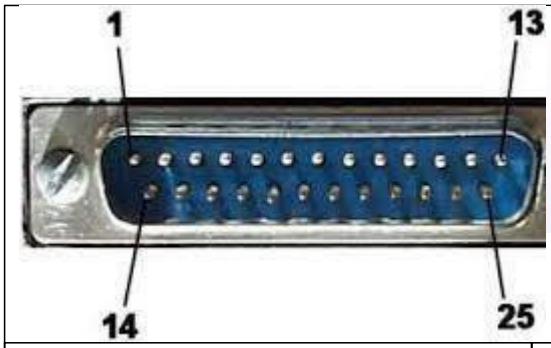


Step-3 Switch on the computer for resetting to take place.
Step-4 Switch off the computer.
Step-5 Reset the motherboard jumper
Step-6 Start the computer and press Del key to enter bios settings.
Check if settings are changed. And change settings.

6. PS2 Port (Mouse + Keyboard: -The **PS/2** connector is a 6-pin mini-DIN connector used for connecting some keyboards and mice to a PC compatible computer system.

		
PS2-male port	**PS2 –female port**	**PS2 needle positions**

7. Parallel Ports: - A parallel Port is an interface allowing a personal computer (PC) to transmit or receive data down multiple bundled cables to a peripheral device such as a printer. The most common parallel Port is a printer Port known as the Centroids Port.

	
Parallel port male	**Parallel port female**

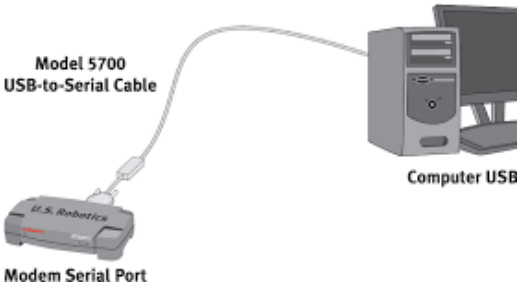
.

8. Serial port:-

A serial port is a serial communication physical interface through which information transfers in or out one bit at a time serial Ports to devices such as modems, terminals and various peripherals.

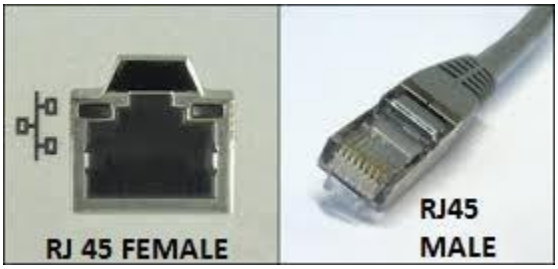
While such interfaces as Ethernet, FireWire, and USB all send data as a serial stream, the term "serial port" usually identifies hardware intended to interface with a modem or with a similar communication device.

Modern computers without serial ports may require serial-to-USB converters to allow compatibility with RS 232 serial devices such as modems.

	
Serial to USB	**Model Serial port connected to CPU USB**

Serial ports are still used in applications such as industrial automation systems, scientific instruments, point of sale systems and some industrial and consumer products. Server computers may use a serial Port as a control console for diagnostics.

9. LAN ports:-LAN stands for Local Area Network



(Local area network port) An RJ-45 Ethernet socket on a computer or network device such as a switch or router. All client machines, servers and network devices on the local network are cabled together at their LAN ports.

Rj45 are connected to cat 5/6 cables to prepare LAN cable,

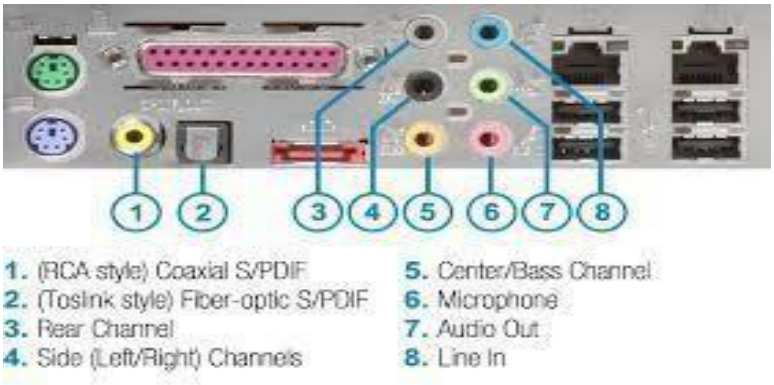
CAT 5 male Rj45 AND CAT6 male RJ45

CAT -5 female

CAT -6 female

	
CAT-5 cable with CAT5 male RJ45 connector	**CAT-6 cable with CAT6 male R45 connector**

10. Audio Port: - Audio Port is used to listen to music and make use of a microphone to transmit voice and sound into the system in order to record it.



11. Other connected devices :- The other connected devices are

a. Printers
b. Hard Disks
c. CD-ROMS
d. DVD Writers

a. Printers: - Printers are used to output data as a hard copy. Printers are classified into 2 types

1. **Impact printers: -** Impact printer refers to a class of printers that work by banging a head or needle against an ink ribbon to make a mark on the paper. This includes dot-matrix printers, daisy- wheel printers, and line printers.

Dot matrix printer

Daisy wheel printer

Line printer

2. **Non-Impact Printers: -** A type of printer that does not operate by striking a head against a ribbon. Examples of nonimpact printers include laser and ink-jet printers.

Laser printer

Ink jet printer

b. Hard disks: - A hard disk drive (HDD), hard disk, hard drive or fixed disk is a data storage device used for storing and retrieving digital information using one or more rigid ("hard") rapidly rotating disks (platters) coated with magnetic material. The platters are paired with magnetic heads arranged on a moving actuator arm, which read and write data to the platter surfaces. Data is accessed in a random-access manner, meaning that individual blocks of data can be stored or retrieved in any order rather than sequentially. HDDs retain stored data even when powered off.

(Hard Disk)

HDD Capacity is specified in unit prefixes corresponding to powers of 1000: a 1-terabyte (TB) drive has a capacity of 1,000 gigabytes (GB; where 1 gigabyte = 1 billion bytes). The two most common form factors for modern HDDs are 3.5-inch, for desktop computers, and 2.5-inch, primarily for laptops. HDDs are connected to systems by standard interface cables such as PATA (Parallel ATA), SATA (Serial ATA), USB or SAS (Serial attached SCSI) cables.

How it works: - An HDD records data by magnetizing a thin film of ferromagnetic material. A typical HDD design consists of a spindle that holds flat circular disks, also called platters, which hold the recorded data. The platters are made from a non-magnetic material, usually aluminum alloy, glass, or ceramic, and are coated with a shallow layer of magnetic material typically 10–20 nm in depth, with an outer layer of carbon for protection.

c. CD: - CD stands for compact disk. It comes in two types.

- **CD-R:-** It follows the principle of WORM(write once read many)
- **CD-R/W: -** It can be written as many times and read as many times. Erasing the entire disk and loading new data is possible.

d. DVD: - DVD stands for Digital versatile disk. It is a digital optical disk storage which was developed in the year 1995 by Sony, Phillips, Toshiba and Panasonic to store data. Capacity ranges from 4.7GB /single density to 8.5GB/double density. DVD is of 2 types.

DVD-R: - It follows the principle of WORM (write once read many).

DVD-R/W: - It can be written as many times and read as many times. Erasing the entire disk and loading new data is possible.

e. VGA Card: - A VGA card connects to the motherboard of a computer system and generates output images to display. Video cards are also referred to as graphics cards. Video cards include a processing unit, memory, a cooling mechanism and connections to a display device.

(VGA Card)

Sound card: - A sound card (also known as an audio card) is an internal computer expansion card that facilitates economical input and output of audio to andfrom a computer under control of computer programs. The termsound card is also applied to external audio interfaces that use software togenerate sound, as opposed to using hardware inside the PC. Typical uses ofsound cards include providing the audio component for multimedia applications such as music composition, editing video or audio, presentation, education and entertainment (games) and video projection.

(Sound Card)

f. Reader all in one internal: - A memory card reader is a device for accessing the data on a memory card such as a CompactFlash (CF), Secure Digital (SD)

or Multi Media Card (MMC). Most card readers also offer write capability, and together with the card, this can function as a pen drive. Some printers and personal computers have a built-in card reader.

A multi card reader is built- used for communication with more than one type of flash memory card. Multi card readers do not have in memory capacity, but are able to accept multiple types and styles of memory cards.

(Reader all in one internal)

The number of compatible memory cards varies from reader to reader and can include more than 20 different types. The number of different memory cards that a multi card reader can accept is expressed as x-in-1, with x being a figure of merit indicating the number of memory cards accepted, such as 35-in-1. There are three categories of card readers sorted by the type and quantity of the card slots: single card reader, multi card reader and series card reader.

g. Mouse: - A device that controls the movement of the cursor or pointer ona display screen. A mouse is a small object you can roll along a hard, flatsurface. Mouse comprises of left button, scroll button, right button.

Left mouse button is used to

1. Click often termed as left click the buttons, icons, tabs etc.
2. Select the part of the document that is needed.

Right mouse button is used to

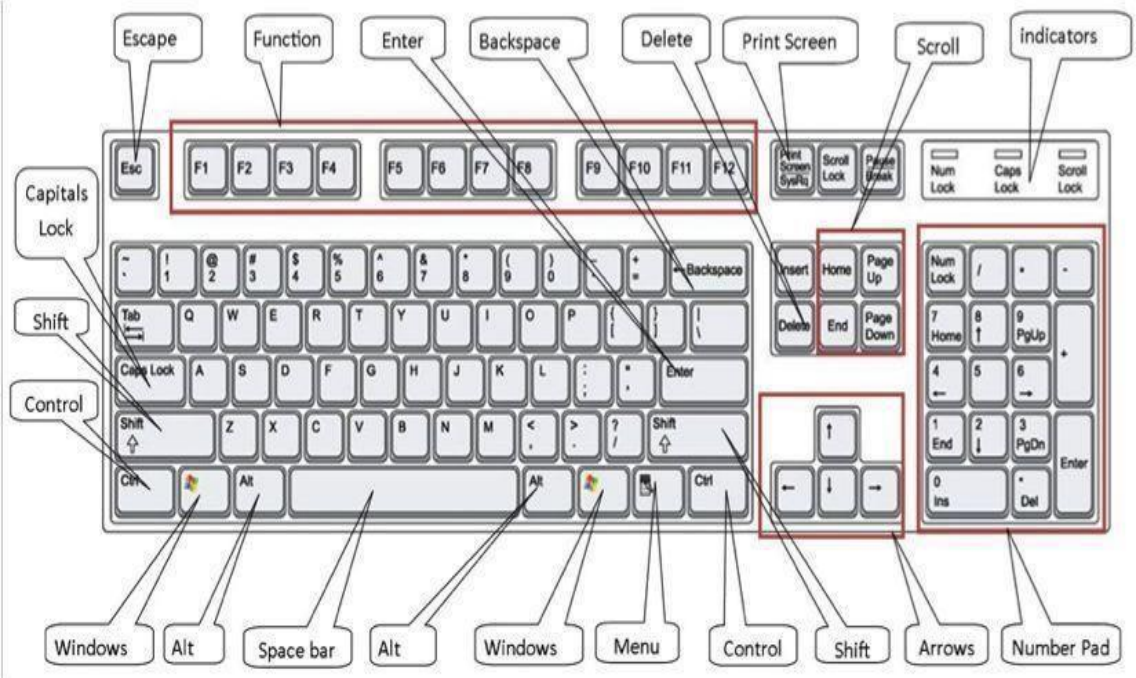
1. Cut and paste
2. Change the font
3. Any other option that is defined by the software

(Mouse)

Scroll mouse button is used to

1. Scroll the document.

i. Keyboard: - A keyboard is the set of typewriter-like keys that enables you to enter data into a computer and other devices. Computer keyboards are similar to electric-typewriter keyboards but contain additional keys. The keys typically found on computer keyboards are often classified as follows:



(Keyboard)

- Alphanumeric keys – All of the letters and numbers on the keyboard. A-Z and 0-9.
- Punctuation keys – All of the keys associated with punctuation such a the comma, period, semicolon, brackets, and parenthesis and so on. Also, all of the mathematical operators such as the plus sign, minus sign, and equal sign.
- Special keys – All of the other keys on the computer keyboard such as the function keys, control keys, arrow keys, caps lock key, delete key, etc.
- Special keys on a PC Keyboard

1. Alt key – Short for Alternate, this key is like a second control key.
2. Arrow keys – Most keyboards have four arrow keys that enable you to move the cursor (or insertion point) up, down, right, or left. Used in conjunction with the Shift or Alt keys, the arrow keys can move the cursor more than one position at a time, but this depends on which program is running.
3. Backspace key – Deletes the character just to the left of the cursor (or insertion point) and moves the cursor to that position.
4. Caps Lock key – A toggle key that, when activated, causes all alphabetic characters to be uppercase.

5. Ctrl key – Short for Control, this key is used in conjunction with other keys to produce control characters. The meaning of each control character depends on which program is running.
6. Delete key – Sometimes labeled Del, deletes the character at the current cursor position, or the selected object, but does not move the cursor. For graphics-based applications, the delete key deleted the character to the right of the insertion point.
7. Enter key – Used to enter commands or to move the cursor to the beginning of the next line. Sometimes labeled Return instead of Enter.
8. Esc key – Short for Escape, this key is used to send special codes to devices and to exit (or escape) from programs and tasks.
9. Function Keys – Special keys labeled F1 to F12. These keys have different meaning depending on which program is running.

j. Monitor: - A computer monitor is an electronic device that shows pictures for computers... Monitors often have higher display resolution than televisions. A high display resolution makes it easier to see smaller letters and fine graphics.

There are three types of computer displays:

- The CRT monitor. **Cathode ray tube** technology that was developed for television. Monitors are made with better parts which give a higher display resolution and picture sharpness than a television.

(CRT monitor)

- The LCD monitor, the most common kind of flat panel display. It is a newer technology than CRT. LCD monitors use much less desk space, are lightweight and use less electricity than CRT. They have been used for many years in the screens of laptop and notebook computers. They also work as touch screens in tablet computers, mobilephones, and other handheld technologies.

(LCD Monitor)

- An LED Monitor (short for Light Emitting Diode) or LED display is an LCD Monitor that uses light emitting diodes for back lighting.

(LED Monitor)

k. Speakers: - Speakers are the audio output devices used to listen to sound from the computer. Audio output which include sound from the audio track of music or movie or an animation.

(Speaker)

Unit -2
Number System

Definition

A set of values used to represent different quantities is known as Number System

Types of Number System

Some important number systems are as follows.

1. Decimal number system
2. Binary number system
3. Octal number system
4. Hexadecimal number system

When we type some letters or words, the computer translates them in numbers as computers can understand only numbers. A computer can understand positional number system where there are only a few symbols called digits and these symbols represent different values depending on the position they occupy in the number.

A value of each digit in a number can be determined using

- The digit
- The position of the digit in the number
- The base of the number system (where base is defined as the total number of digits available in the number system).

Decimal Number System

The number system that we use in our day-to-day life is the decimal number system. Decimal number system has base 10 as it uses 10 digits from 0 to 9. In decimal number system, the successive positions to the left of the decimal point represent units, tens, hundreds, thousands and so on.

Each position represents a specific power of the base (10). For example, the decimal number **3542** consists of the digit

2 in the unit's position, 4 in the tens position,
5 in the hundreds position, and
3 in the thousands position, and its value can be written as
$3 \text{ X } 10^3 + 5 \text{ x } 10^2 + 4 \text{ X } 10^1 + 2 \text{ X } 10^0$
=3 X1000+ 5 X 100 + 4 X 10 +2X1=3542

Number System Frequently Used In Computers

Synod.	Number System and Description
1	**Binary Number System** Base 2. Digits used : 0, 1
2	**Octal Number System** Base 8. Digits used : 0 to 7
3	**Hex Decimal Number System** Base 16. Digits used : 0 to 9, Letters used : A- F

Binary Number System

Characteristics of binary number system are as follows:

- Uses two digits such as 0 and 1.
- Binary called base 2 number system
- Each position in a binary number represents a 0 power of the base (2). Example 2^0
- Last position in a binary number represents a power of the base (2). Example 2^m where m represents the last position - 1.

Example

Binary Number: 10111_2

Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	10111_2	$((1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0))_{10}$
Step 2	10111_2	$(16 + 0 + 4 + 2 + 1)_{10}$
Step 3	10111_2	22_{10}

Octal Number system

Characteristics of octal number system are as follows:

- Uses eight digits, 0,1,2,3,4,5,6,7.
- Octal number system is also known as base 8 number system
- Each position in an octal number represents a power t of the base (8). Example 8^t
- Last position in a binary number represents a power of the base (2). Example 2^m where m represents the last position - 1.

Example

Octal Number: 13472_8

2.3.3.1 Calculating Decimal equivalent

Step	Octal Number	Decimal Number
Step 1	13472_8	$((1 \times 8^4) + (3 \times 8^3) + (4 \times 8^2) + (7 \times 8^1) + (2 \times 8^0))_{10}$
Step 2	13472_8	$(4096 + 1536 + 256 + 56 + 2)_{10}$
Step 3	13472_8	5496_{10}

Hexadecimal Number System

Characteristics of hexadecimal number system are as follows:

- Uses 10 digits and 6 letters, 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.
- Letters represents numbers
  A = 10.
  B = 11,
  C = 12,
  D = 13
  E = 14

F = 15.

- Hexadecimal system is also known as base 16 number system
- Each position in a hexadecimal number represents a t power of the base (16). Example 16^t
- Last position in a hexadecimal number represents an x power of the base (16). Example 16^x where x represents the last position - 1.

Example

Hexadecimal Number: $25ADE_{16}$

Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	$25ADE_{16}$	$((2 \times 16^4) + (5 \times 16^3) + (A \times 16^2) + (D \times 16^1) + (E \times 16^0))_{10}$
Step 2	$25ADE_{16}$	$((2 \times 16^4) + (5 \times 16^3) + (10 \times 16^2) + (13 \times 16^1) + (14 \times 16^0))_{10}$
Step 3	$19FDE_{16}$	$(131072 + 20480 + 2560 + 208 + 224)_{10}$
Step 4	$19FDE_{16}$	154544_{10}

Number conversion

Decimal to Binary conversion

Let us consider an example decimal to binary

$(14.25)_{10}$ is a decimal number

Break the decimal number into 2 parts namely 14 and .25

We have to first find the binary of $(14)_{10}$

14/2=7 reminder =0

7/2 =3 reminder =1

3/2 =1 reminder =1

1/2 =0 reminder=1

Going from bottom to top looking at the reminder we get **$(1110)_2$**

Now considering 0.25 the binary is

0.25 X 2 = 0.50 t a k e s the 0 on the left side of

0.50 0.50X2 =1.00 takes the 1 on the left side of

1.00 Now 0.00 has 0 on the left side

0.00 has .00 on the right side and 0 on the left and so no more calculation

Going from top to bottom we get **$(.010)_2$**

Now let us club both these two they are **$(1110)_2$ and $(.010)_2$**

We get **$(1110.01)_2$ which is $(14.25)_{10}$**

Now let us check $(1110.01)_2 = (14.25)_{10}$

$(1110.01)_2 = 1 \text{ X } 2^{3} + 1 \text{ X } 2^{2} + 1 \text{ X } 2^{1} + 0 \text{ X } 2^{0} + 0\text{X}2^{-1} + 1\text{X}2^{-2} + 0 \text{ X } 2^{-3}$

$= 8 + 4 + 2 + 0 + 0/2 + 1/4 + 0/8$

$= 14 + 0.25 = (14.25)_{10}$

Negative decimal numbers in binary.

00001010 = decimal 10
10001010 = decimal -10

Decimal To Octal conversion

$(7652.45)_{10} = (?)_8$

Operation	quotient	reminder
7652/8	956	4
956/8	119	4
119/8	14	7
14/8	1	6
1/8	0	1

$(7652)_{10} = (16744)_8$

==========

Now for the Decimal Places
==========

0.45 x 8 = 3 + 0.6: so the first yield is a 3

We take the remaining decimal now,

0.6 x 8 = 4 + 0.8 :::: so the next yield is a 4

We take the remaining decimal now,

0.8 x 8 = 6 + 0.4 :::: so the next yield is a 6

We take the remaining decimal now,

x 8 = 3 + 0.2 :::: so next yield is a 3

OK at this point if you continue you will notice a recurring theme. If we multiply 0.2 x 8 that will leave a decimal remainder 0.6, which multiplied by 8 will leave a decimal remainder of 0.8 etc.

There is no point continuing so the octal of 0.45 = 0.3463

Thus the octal of 7562.45 = 16744.3463

Decimal to Hexadecimal conversion

Steps:

1. Divide the decimal number by 16. Treat the division as an integer division.
2. Write down the remainder (in hexadecimal).
3. Divide the result again by 16. Treat the division as an integer division.
4. Repeat step 2 and 3 until result is 0.
5. The hex value is the digit sequence of the remainders from the last to first.

Note: a remainder in this topic refers to the left over value after performing an integer division.

HEXADECIMA	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
DECIMAL	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Example 1
Convert the number $(\mathbf{1128})_{10} = (?)_{16}$
(DECIMAL to HEXADECIMAL)

NOTES	DIVISION	RESULT	REMAINDER (in Hexadecimal)
Start by dividing the number by 16, that is (1128/16). 1128 divided by 16 is 70.5. So the integer division result is 70 (throw out anything after the decimal point). Record it on the RESULT column. The remainder is (70.5 - 70) multiplied with 16; or (0.5 times 16), which is 8. Record it on the REMAINDER column.	1128 / 16	70	8

Then, divide the result again by 16, that is (70/16). (The number 70 on the DIVISION column comes from the previous RESULT). In this case, 70/16=4.375. So the integer division result is 4 (throw out anything after the decimal point) The remainder is (0.375 multiplied with 16, which is 6.	70 / 16	4	**6**
Repeat. Note here that 4/16=0.25. So the integer division result is 0. The remainder is (0.25-0) multiplied with 16, which is 4.	4 / 16	0	4
Stop because the result is already 0 (0 divided by 16 will always be 0)			
Well, here is the answer. These numbers come from the REMAINDER column values (read from bottom to top)			468

Fractional Decimal to Hexadecimal conversion Procedure

The steps for the conversion are given below:

Successive multiplication is used to convert a given fractional decimal number to its equivalent hexadecimal fraction.

1. Here the given decimal fraction is successively multiplied by the base of the target number system (16, here it is hexadecimal system).
2. During each multiplication iteration, the product generated will have a carry (integer part of the product) and a fractional part.
3. The carry obtained at each multiplication step becomes a numeral in the

hexadecimal fraction.

4. The fractional part of the product is again multiplied by base 16 in the next step and the process is repeated until the fractional part becomes zero or the number of multiplication iteration equals the number of digits after the decimal point in the given decimal fraction.
5. Weights are assigned for the carry obtained at each multiplication step in the increasing order starting from the first multiplication step to the last step, such that the carry obtained in the first multiplication iteration is the **most significant bit (MSD)** after the decimal point and the carry obtained in the last multiplication iteration is the **least significant bit (LSD)**
6. This procedure is illustrated in the following example.

Ex1: Convert $(0.0628)_{10}$ decimal fraction to hexadecimal fraction $(?)_{16}$ using successive multiplication method

1st multiplication iteration

Multiply 0.0628 by 16

0.0628 x 16 = 1.0048(Product) Fractional part=0.0048

Carry=1 **(MSD)**

2nd multiplication iteration

Multiply 0.0048 by 16

0.0048 x 16 = 0.0768(Product) Fractional part = 0.0768

Carry =0

3rd multiplication iteration

Multiply 0.0768 by 16

0.0768 x 16 = 1.2288(Product) Fractional part = 0.2288

Carry= 1

4th multiplication iteration

Multiply 0.2288 by 16

0.2288 x 16 = 3.6608(Product) Fractional part = 0.6608

Carry = 3 **(LSD)**

Here the fractional part doesn't become zero but we obtain required number of significant digits after the decimal point. Thus we stop the multiplication iteration and assign the weights to the digits obtained in each multiplication step in the increasing order starting from the 1st multiplication step to last multiplication step.

Carry from the 1st multiplication iteration becomes **MSD** and carry from 4th iteration becomes **LSD** after the decimal point.

Hence, the fractional hexadecimal number of the given decimal fraction **$(0.0628)_{10}$** is **$(0.1013)_{16}$.**

So a number **$(1128.0628)_{10} = (468.1013)_{16}$**

Binary to Octal Conversion

Let us take the number **$(101011.101)_2$**

Break it into 2 chunks at the decimal point.

You come across 2 binaries **$(101011)_2$** and **$(101)_2$**

$(101011)_2 = (101 \quad 011)_2$ broken from left as chunk of 3 numbers from right to left= $(101)_2 = 1 \text{ X } 2^2 + 0 \text{ X } 2^1 + 1\text{X}2^0 = 4+0+1=5$

$(011)_2 = 0 \text{ X } 2^2 + 1 \text{ X } 2^1 + 1\text{X}2^0 = 3$

$(101)_2 = 1 \text{ X } 2^2 + 0 \text{ x } 2^1 + 1 \text{ X } 2^0 = 4 + 0 + 1 = (5)_8$

Now Combining $(101011.101) = (53.5)_8$

Binary to Hexadecimal Conversion

$(10101010.1010)_2 = (?)_{16}$

First break 10101010.1010 into)2 parts Integer part = 10101010

Fractional part = .1010

Now take the integer part = 10101010

Now from the right to the left count 4 bits(0/1)

You get 1010 (from left to right) = $1X\ 2^3 + 0\ X\ 2^2 + 1X2^1 + 0X\ 2^0 = 8$
+0+2+0=**10 =A IN HEX**

Now start checking the other bits in 4 from right to left from where you left

You get 1010 (from left to right) = $1X\ 2^3 + 0\ X\ 2^2 + 1X2^1 + 0X\ 2^0 = 8$
+0+2+0=**10 =A IN HEX**

Now get the fraction .1010 =.A

= $(AA.A)_{16}$

Hexadecimal to Binary conversion

To convert hexadecimal to binary we use the following principle

Let us consider a hexadecimal number **$(4E)_{16}$**

First we break the hexadecimal number we get 2 numbers 4 and E Now we find the binary of **4** =**0100**

Now we find the binary of **E**=**14** according the hexadecimal chart as below The Binary of **14** is **1110**

Club these two you get **$(0100\ \ 1110)_2$**

Hexadecimal to Octal Conversion

Convert Hexadecimal to Binary

Now group the binary numbers as 3 bits = 1 set Say $(101)_2 = (5)_8$

And Club

Let us take the example $(AA.A)_{16} = (10101010.1010)_2$ Break

the binary number into 2 parts

Decimal = $(10101010)_2$

Fraction = $(.1010)_2$

Decimal = $(10101010)_2$

Going from right to left break in this fashion = **(010)$_2$** **(101)$_2$** **(010)$_2$** = **(252)$_8$**

Fraction = $(.1010)_2$

Remove the decimal point

$(1010)_2 = (101)_2$ the right most 0 is ignored = $(5)_8$

Now clubbing = $(252.5)_8$

Octal to Binary Conversion

$(252.5)_8$

Break 252.5 into

Numeric 252

Fraction 0.5

Numeric 252 into (2 5 2)

2= 010

5=101

2=010

Combining $(010101010)_2$

ignoring the decimal point 5 = $(101)_2$

$(010101010)_2$ and $(101)_2$

$(010101010.\ 101)_2$

Octal to Hexadecimal Conversion

$(252.5)_8 = (?)_{16}$

Break 252.5 into
Numeric 252
Fraction 0.5
Numeric 252 into (2 5 2)

2= 010
5=101
2=010

Combining $(010101010)_2$
0.5 ignoring the decimal point 5 = $(101)_2$
$(010101010)_2$ and $(101)_2$
$(010101010.\ 101)_2$
Convert Binary to Hexadecimal $(010101010.101)_2$
Break it into 4 starting from left and right
= $(0000\ 1010\ 1010.\ 1010)_2$
= $(0\ A\ A.A)_{16}$
= $(AA.A)_{16}$

Negative number to Binary, Octal, Hexadecimal conversion

Rules of Binary Addition

- 0 + 0 = 0
- 0 + 1 = 1
- 1 + 0 = 1
- 1 + 1 = 0, and carry 1 to the next more significant bit

For example, $(1010.1)_2 = (10.5)_{10}$

$+ (1010.1)_2 = (10.5)_{10}$

$1\ 0\ 1\ 0\ 1.0 = (21)_{10}$

Find the binary, octal, hexadecimal of -20

Step -1 find the binary of **$(20)_{10} = (00000000\ \ 00010100)_2$** IN **16 BIT FORM**

Step-2 Find the **2nd compliment** of **$(00000000\ \ 00010100)_2$**

=(11111111 11101011)+1

$=(1111\ \ 1111\ \ 1110\ \ 1100)_2$

$=(F\ F\ E\ C)_{16}$

$=(001\ 111\ \ 111\ \ 111\ 101\ \ 100)_2$

$=(1\ 7\ 7\ 7\ 5\ 4)_8$

Find the binary ,octal, hexadecimal of -20.5

STEP-1 Find the binary of $(20.5)_{10}$

$(00000000\ \ 00010100.1)_2$ IN 16 BIT FORM

Find the 2nd compliment of the above number

=11111111 11101011.0

+1

$(11111111\ \ 11101011.1)_2$ =-20.5

Breaking it into 4 numbers from left of decimal and right of decimal

$(\underline{1111\ 1111\ \ 1110\ \ 1011}.\underline{1000})_2$

$= (F\ F\ E\ B.1)_{16} = (001\ 111\ 111\ 111\ 101\ 011.100)_2 = (1\ 7\ 7\ 7\ 5\ 3.1)_8$

$12)_8 = (1010)_2 = (A)_{16}$