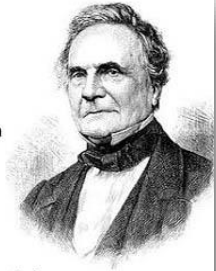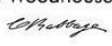# Computer Fundamentals

FATHER OF COMPUTER

Charles Babbage (26Dec 1791 – 18Oct 1871) was an English polymath. A mathematician, philosopher, inventor and mechanical engineer, Babbage originated the concept of a digital programmable computer.

Considered by some to be a "father of the computer", Babbage is created with inventing the first mechanical computer that eventually led to more complex electronic designs, though all the essential ideas of modern computers are to be found in Babbage's Analytical Engine. His varied work in other fields has led him to be described as "pre-eminent" among the many polymaths of his century. Part of Babbage's incomplete mechanisms are on display in the Science Museum in London. In 1991, a functioning difference engine was constructed from Babbage's original plans. Built to tolerances achievable in the 19th century, the success of the finished engine indicated that Babbage's machine would have worked.

Born	26 December 1791 London(likely Southwalk)
Died	18 October 1871(aged79) London
Nationality	English
Citizenship	British
Known for	Difference engine
Fields	Mathematics,engineering,computer Science
Institutions	Trinity College, Cambridge
Influenced	Karl Marx, John Stuart Mill, Ada Lovelace
Influences	Robert Woodhouse,John Herschel,Gaspard Monge
Signature	

Computer History

The computer as we know it today had its beginning with a 19th century English mathematics professor name Charles Babbage ("Father of Computer Science"). He designed the Analytical engine and it was this design that the basic framework of the computers of today are based on.

In 1823 the British government supported him to create the project of a machine of differences, a mechanical device to make repeated sums. The idea that Charles Babbage had about a computer born because the elaboration of the mathematical tables was a tedious and error-prone process. The features of this machine include a memory that can store up to 1000 members of up to 50 digits each. The operations to be executed by the arithmetic unit are stored in a punch card. It is estimated that the machine would take a second to make a sum and a minute in a multiplication.

In the 1880, the Hollerith machine was invented which was expedite the 1890 census process. In order to carry out this task, Herman Hollerith, a statistician, was hired to design a technique that could accelerate the survey and analysis of the data obtained in the census. Among many things, Hollerith proposed the use of the cards in which the data would be drilled, according to a pre-established format. Once the cards were punched, they would be tabulated and sorted by special machines. The idea of punch cards was not Hollerith's original.

He replied on the work done in the loom of Joseph Jacquard, who devised a system where the plot of a design of a fabric as well as the information necessary to make its construction was stored in punch cards. Each generation lasted for a certain period of time and each gave us either a new and improved computer or an improvement to the existing computer.

List of pioneers in Computer Science

3000 BC	Chinese People	Abacus – the first calculating tool for addition and subtraction
1617	John Napier	Napier Bone – first device used for multiplication via addition. He has also discovered the speedometer which was used in calculation.
1622	William Oughtred	Slide rule – Invented in Germany, with the concept based on logarithm consisting two graduated scale, one small and other one is larger. It is used in calculation like multiplication, division, roots, trigonometry etc.
1642	Blaise Pascal	Pascaline – invented a mechanical theory. The device had gear and wheel shifted in it. Each wheel had digits from 0-9. When one wheel completed next wheel shifted one place.
1821	Charles Babbage	Difference Engine – first steam driven calculating machine with size of room. This machine could solve tables of number, such as logarithm tables.

1837	Charles Babbage	Analytical engine – invented a theory of calculation or calculating device which is earliest model of modern computer so , He is known as "Father of Computer Science"
1843	Ada Lovelance	Machine Algorithm – She is considered as first lady computer programmer.
1942	John Vincent Atanasoff	Electronic Digital Computer (ABC) – first electronic digital computer uses of 270 vacuum tubes.
1944	Howard Aiken	Havard Mark I – IBM Automatic sequence controlled calculator
1946	John Mauchly and John Presper Eckert	ENIAC – Electronic Numerical Integrated Automatic and Computer was first electronic general purpose computer.

1949	Eckret and Mauchy	EDVAC- Electronic Discrete Variable Automatic Computer was one of the earliest electronic computer which stores binary data.
1951	J.Presper Eckert and John Mauchy	UNIVAC I – Universal Automatic Computer I was second commercial computer produce in USA.
1957	John Lentz	Personal Computer (PC) – general purpose computer use for playing games, keeping records, sharing files etc.
1975	Bill Gates	Microsoft – Operating system used for general purpose

Generation of Computers

In the history of computers, we often refer to the advantages of modern computers as the generation of computers. We are currently on the fifth generation of the computers. So, let us look at the important features of these five generations of computers.

I. **1st Generation**: This was from the period of 1940 to 1956. This was when machine language was developed for the use of computers. They used vacuum tubes for the circuitry. For the purpose of memory, they used magnetic drums.
   Features
   - Use of vacuum Tubes (18,000)
   - Big in size
   - To protect from heat many sir conditioners were installed
   - Weight of computer was 27 tons
   - Punch card were used for input and magnetic tapes for storage
   - Example: ENIAC, EDVAC, UNIVAC, IBM-650,702,705, MARK-II, UNIVAC-II etc.

II. **2nd Generation**: This was from the period of (1956-1964). Here they advanced from vacuum tubes to transistors. This made the computers smaller, faster and more energy efficient. And they advanced from binary to assembly languages.
   Features
   - Transistor were used
   - Smaller in size than 1st generation
   - Cheaper then 1st generation computer
   - Easy to operate and no need of large number of operator
   - Example: IBM 700,1401, 1620, 7064, RCA 501, ATLAS, ICL 1901 etc.

III. **3rd Generation**: The hallmark of this period (1964-1971) was the development of the integrated circuit. This development made computers smaller in size, reliable, and efficient. In this generation remote processing, time-sharing, multiprogramming operating system were used.
   Features
   - IC (Integrated Circuit) was used
   - Cheaper than 2nd generation computer
   - Smaller in size and less heat is generated
   - High level language (Fortran) was used
   - Memory capacity was increased
   - Example: IBM 370, PDP-11, UNIVAC 1108 etc.

IV. **4th Generation**: The period of fourth generation was from 1971-till now. Computers of fourth generation used Very Large Scale Integrated (VLSI) circuits. VLSI circuits having about 5000 transistors and other circuit elements with their associated circuits on a single chip made it possible to have microcomputers of fourth generation. Fourth generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to Personal Computer (PC) revolution. In this generation, time sharing, real time networks, distributed operating system were used.
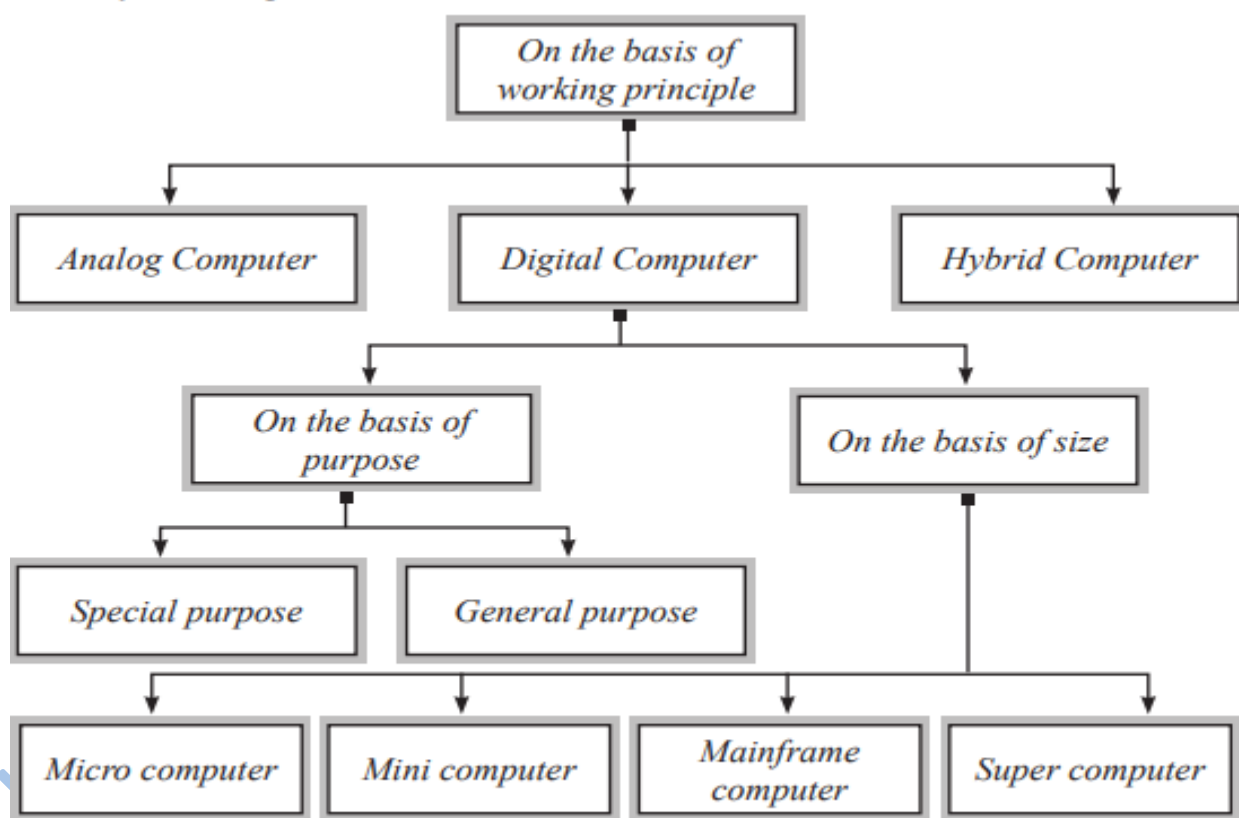   **Features**
   - VLSI (Very Large Scale Integrated)/ULSI (Ultra Large Scale Integrated) was used
   - Cheaper than previous generation
   - Smaller in size and easily portable
   - High Storage Capacity
   -

V. **5th Generation**: The period of fifth generation is Present - Future date. In the fifth generation, VLSI technology became ULSI (Ultra Large-Scale Integration) technology, resulting in the production of microprocessor chips having ten million electronic components. This generation is based on parallel processing hardware and AI (Artificial Intelligence) software. AI is an emerging branch in computer science, which interprets the means and method of making computers think like human beings.

Features
- Micro electronic technologies with high computing speed and parallel processing.
- Use of AI (Artificial Intelligence)
- More powerful computer till now
- It is also called future computer
- Because of AI, these computers will do each and every work itself on time
- Example KIPS (Knowledge Information Processing System)

Types of Computers

Classification of Computer

Computer classified on the basis of working principle

I. **Analog Computer**: Analog computers are special-purpose computers which can measure continuously changing data such as pressure, temperature, voltage, etc. It can perform a single task. For example, speedometer which displays speed of vehicles, voltmeter, analog watch, seismograph, etc. The features of analog computer are given below:

- ➤ cheaper than other device.
- ➤ Work on continuous data.
- ➤ Storage capacity is low.
- ➤ Works in real-time.
- ➤ Gives output in the form of graph and signals

Analog computer

II. **Digital Computer**: Digital computers are general-purpose computers which solve problems by computing discrete data. It works on digital values, binary digits (0 or 1). It can perform many tasks according to user requirements. Computer in school, home and office are examples of digital computer. Feature of digital computer

- ➤ works on discontinuous.
- ➤ highly accurate and reliable.
- ➤ used for general purpose.
- ➤ based on discrete data (digit 0 and 1).

On the basis of purpose, digital computers are classified into two types.

1. **Special Purpose Digital Computer:** These types of digital computer are designed to perform a single specific task. The program is loaded during manufacturing time in this type of digital computer which cannot be changed by user. Digital thermometer, digital watch, self-driven vehicle, washing machine, digital television, etc. are the example of special-purpose digital computers.

2. **General Purpose Digital Computer:** These types of digital computer are designed to perform more than one task. The user can load programs into the computer as per requirement to perform a different task. Desktop computer, laptop, notebook, etc. are the example of general-purpose digital computers.

Computers can be broadly classified by their size.

I. **PC (Personal Computer) Microcomputer:** A PC can be defined as a small, relatively inexpensive computer designed for an individual user. PCs are based on the microprocessor technology that enables manufacturers to put an entire CPU on one chip. Businesses use personal computers for word processing, accounting, desktop publishing, and for running

Notebook Computer

spreadsheet and database management applications. At home, the most popular use for personal computers is playing games and surfing the Internet. Microcomputers are used in the home, school, college, hospital, offices, etc. for data processing purpose.

II. **Mini Computers**: It is a midsize multi-processing system capable of supporting up to 250 users simultaneously. A minicomputer is a type of computer that possesses most of the features and capabilities of a large computer but is smaller in physical size. A minicomputer fills the space between the mainframe and microcomputer and is smaller than the former but larger than the latter. IBM-System/3, Honeywell 200, etc. are some examples of minicomputer.

Minicomputer

III. **Mainframe Computers:** Mainframe is very large in size and is an expensive computer capable of supporting hundreds or even thousands of users simultaneously. Mainframe executes many programs concurrently and supports many simultaneous executions of programs. IBM 1401 mainframe computer was brought to Nepal for the first time to process census data in year. IBM-2 series, system 210 servers, CDC (Control Data Cyber) 6600 etc. are the popular examples of mainframe computer.

Mainframe Computer

IV. **Super Computers**: Supercomputers are the most powerful, most expensive and have the highest processing speed most than other computers. It has parallel processing for performing any task. These computers are mainly used in weather forecasting, nuclear energy research, national security, space-related research, etc. Nowadays, most powerful supercomputer is Sunway Taihulight from National Super

Sunway Taihulight

Computing Centre, Wuxi, China. Supercomputer can perform more than one trillion

calculations per second. Piz Daint, Tianhe-z, Titan, Seq voie, Cori, ETA-10, etc. are the popular examples of supercomputer.

III. **Hybrid Computer**: The computer-designed with combined features of analog computer and the digital computer is called a hybrid computer. These computers are designed for a special purpose. They are used in hospital for Ultra Sound, ECG (Electro Cardio Graph), CT scan (Computed Tomography scan), etc., in aero planes for air pressure, temperature, speed, weight, in scientific lab, in ships, large industries etc. Features of Hybrid Computer are as follow:
  - ➢ Expensive
  - ➢ Designed for special purpose computer
  - ➢ Work on both continues and discrete value (data)
  - ➢ More complex and limited storage

Hybrid Computer

ASSIGNMENT

1. Answer the following questions
   a. How are computers classified into different types?
   b. What is Analog computer? And its uses.
   c. Define Digital Computer. What are the types of digital computer?
   d. Differentiate between General Purpose computer and Special Purposes Computer
   e. Classify the computer on the basic of Size.
   f. What is mainframe computer? And its uses.
   g. What are super computers? Write their Application?
   h. Define Hybrid Computer? How it is used in hospital?

2. Write short notes on
   a. Mainframe Computer
   b. Super Computer
   c. Personal Computer
   d. Hybrid computer
   e. Analog Computer

COMPUTER HARDWARE

The physical parts of a computer which can be seen, felt and touched are called computer hardware. Computer hardware is important component of computer system. The user can perform a task by using a set of instructions through the computer hardware. So, the combination of computer hardware and software makes up a full functioning computer system that performs specific task.

Motherboard, microprocessor, RAM, ROM, hard disk, pen drive, keyboard, scanner, monitor, etc. are the examples of computer hardware.

COMPUTER SOFTWARE

The set of instructions or programs written by using a programming language to solve a problem is called computer software. So, software controls and operates computer hardware to perform a task. The set of instruction or command is called program. The set of program to perform a specific task is called software. Generally, computer software is classified into two types.

1) System Software
2) Application Software

System Software: The software that manages controls and supports computer system is called system software. So, system software creates link between computer and user. It is a platform for running application software. It manages files and folders. It can be sub-divided into the operating system, utility software, device driver software, language processing software, etc.

I) Operating System: An operating system is the system software that manages and controls the overall operation of computer. It coordinates, controls and manages computer hardware. The operating system is installed in C: drive of hard disk. It is the first software that is loaded into computer memory (RAM). The popular operating system are Windows XP, Windows 7, Windows 8, Windows 10, Linux based fedora, UNIX, MS-DOS etc. Android KitKat, Android Marshmallow, Android Oreo are the popular operating system of Android smartphone and IOS is the operating system of Apple iPhone.

Operating System can be classified into two types based on the mode of the user as:
1) **Single User Operating System:** It is designed to manage the computer so that one user can effectively do one thing at a time. The Palm Operating System for palm handheld computers is a good example of a modern single-user, single-task operating system. This is the most common type of operating system used on a home computer as well as on computer in offices and other work environments. Single User Operating system is designed to manage computer so that only one user can work on it at a time. MS-DOS, Windows 8/10 etc. are the examples of single-user operating system.
2) **Multi User Operating System:** Multi-user operating system is designed to manage computer so that many users can Computer Science. Many computers are connected to network through one operating system. So operating system coordinates and controls all computers connected to network. Mainframe computer uses multiuser operating system. UNIX, VMS (Vertical Memory System), Windows Server 2016, MVS (Multiple Virtual

Storage), etc. are examples of multi-user operating system. The operating system can be classified into two types based on the user interface as

A) **Language Processor**: A computer is an electronic machine. So it understands machine level language (binary language: 0 or 1). A computer program is a set of instructions to perform tasks. System software that converts different programming language into machine level language is called language processor. So language processor converts high-level language or assembly language into machine level language and vice versa.

The three types of language processor are explained below:
   a) Assemblers
   b) Compilers
   c) Interpreter

B) **Utility Software:** Utility software is also called service program. A set of programs that perform task related to the maintenance of computer software and hardware is called utility software. The main objective of utility software is the smooth functioning of computer system. The examples of utility software are:
   1) Antivirus software (Kaspersky, Norton Antivirus)
   2) Backup Software (Nova BACKUP Professional, Ashampoo Backup Pro)
   3) File Compression Tools (Winzip, WinRAR)
   4) Disk Utilities (Disk Defrag, WinDirstat)

C) **Device Driver Software**: Operating system often provides programs for working with special devices such as printers. These programs are called drivers because they allow the operating system and another program to activate and use the hardware device. Most new software you buy will work with your printer, monitor and other equipment without requiring you to install any special driver because the device driver for common peripherals are already included in the operating system.

II) **Application Software:** Application software is designed to fulfil the requirement of user. A set of programs designed to do specific tasks is called application software. The application software is used to type e-mail, edit photos, prepare presentation, listen to music, design engineering work, edit videos, produce bills etc. The popular two types of application software are given below. Example
Ms Office (Word, Excel, Power point), Adobe Photoshop, Auto CAD, Auto desk Maya etc

Hardware	Software
It is the physical component of computer system.	It is the programming language that makes hardware function.
It has the permanent shape and structure which cannot be modified.	It can be modified and reused as it has no permanent shape and size.

The external agent like dust, humidity, insect, mouse etc can affect the hardware(as it is tangible).	The external agent like dust, humidity, insect, mouse etc cannot affect the software (as it is intangible).
It works with binary code (1 to 0)	It functions with help of high level language like COBAL, BASIC, JAVA etc.
It takes in only machine language.	It takes in higher level language easily readable by human
It is not affected by computer virus or bug.	It is affected by computer virus or bug.
It cannot be transferred from one to another electrically.	It can transfer from one place to another electrically.
Duplicate copy of hardware cannot be created easily	Duplicate copy of software can be created easily
Example:- Keyboard, monitor, printer etc.	Example:- Ms word, Excel, powerpoint etc.

Input device	Output Device
It accepts data from user.	It reflects processed data to user.
It is directly commanded by user.	It is commanded by processor.
It converts user friendly instruction into machine friendly.	It converts machine's instructions to user intelligible.
It takes the data from the user and sends it to the processor for execution.	It takes the processed data from the processor and sends it back to the user.
It helps the computer is accepting the data.	It helps the computer is displaying the data.
The design of input devices are more complex.	The design of output devices are less complex.
Ex: Keyboard, Image Scanner, Microphone, Pointing device, Graphics tablet, Joystick.	Ex: Monitor, Printers, Plotters, Projector, Speakers.

ASSIGNMENT

A) Answer the following questions
   a) Define computer hardware with its importance in computer system
   b) What is computer memory? Write its classification.
   c) What is mother board?
   d) What is printer? Write its classification.

B) Write short notes
   a) Motherboard
   b) Monitor
   c) Output device

C) Differentiate Between

a) RAM and ROM
b) Primary and Secondary Memory
c) Input and Output Device
d) Impact and Non-Impact Printer
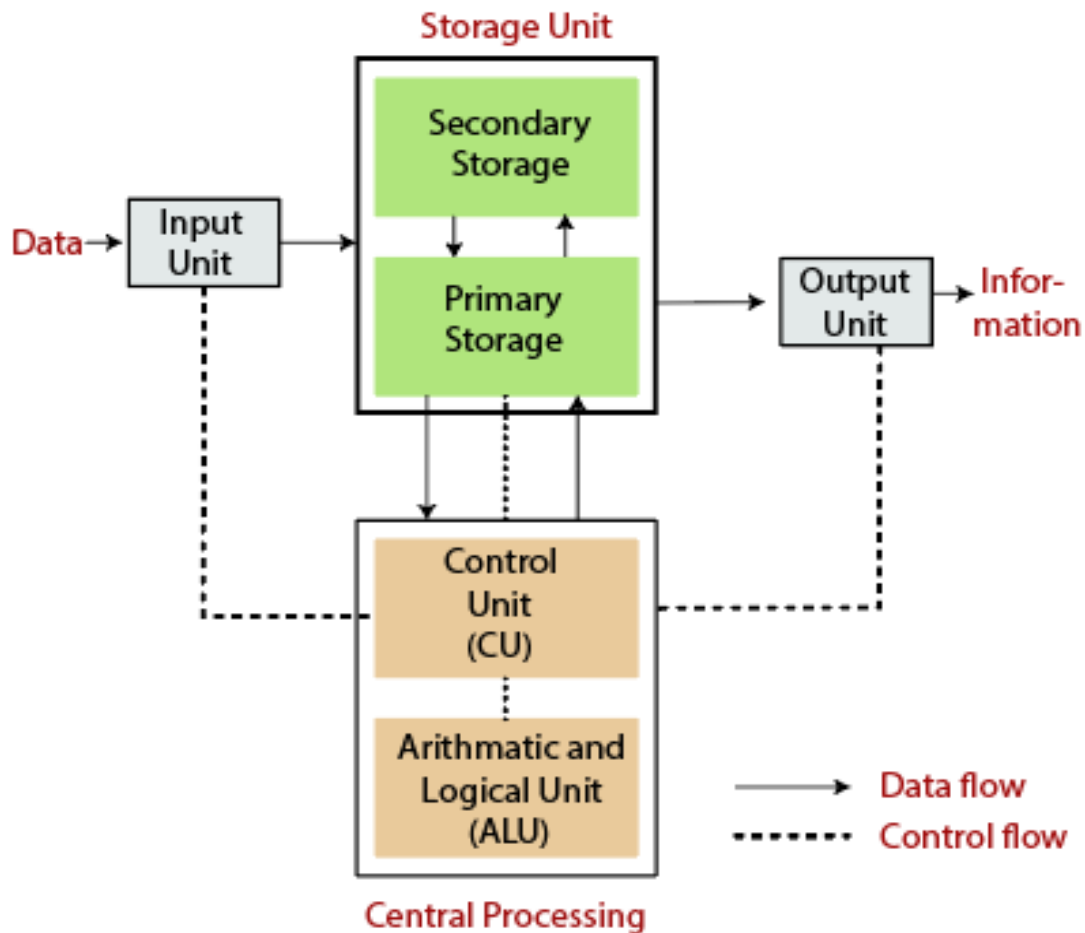
ASSIGNMENT

A) Answer the following question
   a) Define computer software with its importance in computer system.
   b) Explain operating system with examples.
   c) What is computer memory? Write its major classification.
   d) Mention major functions of operating system.
   e) Briefly explain about application software with its types.
   f) Distinguish between system software and application software.

B) Write Short note
   a) Multiuser operating system.
   b) System Software

BLOCK DIAGRAM OF DIGITAL COMPUTER

Block diagram of Computer

Mainly computer system consists of three parts, that are central processing unit (CPU), Input Devices, and Output Devices. The Central Processing Unit (CPU) is divided into two parts again: arithmetic logic unit (ALU) and the control unit (CU). The set of instruction is in the form of raw data.

A large amount of data is stored in the computer memory with the help of primary and secondary storage devices. The CPU is like the heart/brain of the computer. The user does not get the desired output, without the necessary option taken by the CPU. The Central processing unit (CPU) is responsible for the processing of all the instructions which are given by the user to the computer system.

Input Device

An **input device** is any hardware device that sends data to a computer, allowing you to interact with and control it. The most commonly used or primary input devices on a computer are the keyboard and mouse. Example Keyboard, mouse, joystick, scanner, light pen etc.

Keyboard: Keyboard is the most common and very popular input device which helps to input data to the computer. The most common layout of the keyboard is "QWERTY" keyboard. The keyboard which is connected to a computer without wire is called wireless keyboard. The character keys are used to type text data into the computer, control keys help perform additional control over documents (example print, screen lock), function keys are used as shortcut keys to perform various functions like saving file. The layout of the keyboard is similar to that of typewriter.

Mouse: The mouse is a pointing input device. It is used to point object, give command, draw paint, etc. into the computer. The common three buttons of a mouse are Left Button, Right Button and Scroll Button. The user uses buttons for clicking, double clicking, right-clicking, dragging, scrolling, etc. to give command into the computer.

Joystick: Joystick is a lever that moves in all directions and control the movement of a pointer. Joystick is an input device which is mostly used to play video games. It includes two buttons called triggers. There are different types of joystick available for various video games. It has more buttons that help in playing and controlling objects in games.

Scanner: Scanner is an input device which scans drawing or document and enters into computer in digital format. Scanner come in hand-held, feed-in and flatbed types and for scanning black and white or color. The photocopy machine gives the facility of the scanner. Scanner converts hardcopy into soft copy.

TYPES OF SCANNER

FLATBED SCANNER
Flatbed scanners will take up some desktop space but provide a lot of bang for the buck. They look like miniature printers with a flip-up cover protecting the glass platen. Flatbed scanners are some of the most commonly used scanners as it has both home and office functions. The way they scan documents is that a mechanism rolls under the document to obtain the image. For a businesses that have a need for high processing abilities, the flatbed scanner can scan any number of documents with a click of a button.

SHEET-FED SCANNER
Sheet-fed scanner is smaller in size than flatbed scanner. This type of scanner works like a flatbed scanner except that the document is fed through the scanner and moves along the beam to be read rather than the beam moving along document. This type is not useful for books, but only single sheets.
A small size is its advantage but improper mechanism can skew the paper.

DRUM SCANNER

Drum scanner is used for scanning a document and produce at very high resolution rate. There is no any type of scanner that will give you the kind of resolution, detail, sharpness, dynamic range, and color rendition that drum scanning can give you. There are only a few companies that make these scanners, considering the high cost of producing a scanner such as this. It is considered as a tremendous upgrade to a regular flatbed scanner.

A drum scanner uses a photo-multiplier (PM) tube, which is a light sensing device. That's why it offers a high sensitivity and good signal-to-noise ratio. The image to be scanned is placed on spinning.

HANDHELD SCANNER

Handheld scanner is much like a flatbed scanner. Handheld scanners are small helpful electronic devices that are widely used for digitizing printed documents. Handheld scanner provides lower quality scanners, they are still very popular because they are small and less expensive than their flatbed. They are able to scan items that could not fit in a flatbed scanner due to size or location. Their function includes moving them over the material being captured with the aid of a tray to keep it in a straight line. Experience is required to operate and handle the device since it is very important to keep the scanner straight so that a distortion-free scan is possible.

Light pen: Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube. When the tip of a light pen is moved over the monitor screen and the pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

Output

The device which displays information produced by a computer system to a user either in hardcopy or soft copy form called an output device. So, an output is the result produced by processing unit. The common output devices are monitor and printer. Some other output devices are: monitor, printer, plotter, sound card, speaker etc.

Monitor: Monitor is the most common output device. It is also called VDU (Visual Display Unit) in computer system. The output displayed on monitor's screen in the form of text, videos and graphics is called soft copy output.

Printer: Printer is a hard copy output device. It prints text & graphics on paper. There are many different types of printers available in market. Its speed is measured by CPS (Character per second), LPM (Line per minute) and PPM (Page per minute). The printers are classified in two types on the basis of printing quality.

There are two types of printer

- ➢ **Impact Printer:** An impact printer is a type of printer that works by direct contact of an ink ribbon with paper. A metal or plastic head strikes the ink ribbon, whereby the ribbon is pressed against the paper and the desired character (letter, digit, dot, line) impression is printed on the sheet. Dot matrix, daisy-wheel and ball printers are some commonly used types of impact printers.
- ➢ **Non- impact Printer:** The non-impact printer does not use the printing head to strike against ribbon and paper. Instead, small drops of ink are sprayed onto the paper. So non-impact printers are faster and are of high quality than impact printer. It does not produce sound while printing. Inkjet printer, laser printer, 3D printer are the popular types of non-impact printer.

Plotter: Plotters are specialized pieces of equipment designed to print out vector graphics in a variety of colors. Plotter are widely used to print designs of things such as cars, ships and buildings on a piece of paper using pen. Plotter are different than printer as they are more precise and they are most commonly used in engineering. More expensive than ordinary printers. Three types of plotters are most popular for their ability to allow you to create different designs. Advantages of plotter are

- ➢ Plotters can work on very large sheets of paper while maintaining high resolution.
- ➢ They can print on a wide variety of flat materials including plywood, aluminum, sheet steel, cardboard, and plastic.
- ➢ Plotters allow the same pattern to be drawn thousands of times without any image degradation.
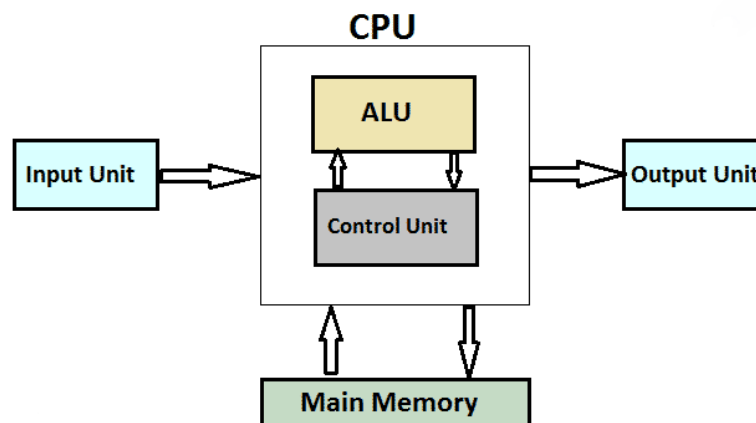
Sound card: A sound card is an expansion component used in computers to receive and send audio. Sound cards are configured and utilized with the help of a software application and a device driver. The input device attached to receive audio data is usually a microphone, while the device used to output audio data is generally speakers or headphones. The sound card converts incoming digital audio data into analog audio so that the speakers can play it.

Speaker: Speaker is a common audio output device that connects to a computer to generate sound. It is used to receive sound or music from computer system. The sound produced that comes from a computer speaker is created by the sound card. It is used to covert digital data into audio analog data which user can understand. The quality of sound output depends on the speaker's quality. For example, loud speakers, sub woofers, in- wall/ceiling speaker, outdoor speaker, etc. are the different types of speakers.

Speaker

CPU (Central Processing Unit)

CPU (Central Processing Unit). CPU is the main processing unit of a computer system. It is also known as the brain of computer system. It receives data from input unit, processes it as instructed by the user and produces information as output.

CPU (Central Processing Unit)

The speed of CPU is measured in hertz. Hertz is also called CPU clock rate or CPU clock speed. Nowadays, CPU speed is measured in Gigahertz (GHz). 1 GHz = 1000 MHz (Mega Hertz). = 1,000,000 KHz (Kilo Hertz). = 1,000,000,000 Hz (Hertz).

The CPU consists of the three main parts

CU (Control Unit): Control Unit is a part of the CPU that controls and coordinates activities of other units of computer system. It acts as a nervous system of computer. It controls the execution of instructions given to system. It coordinates the flow of data in or out of ALU, memory and various input or output devices.
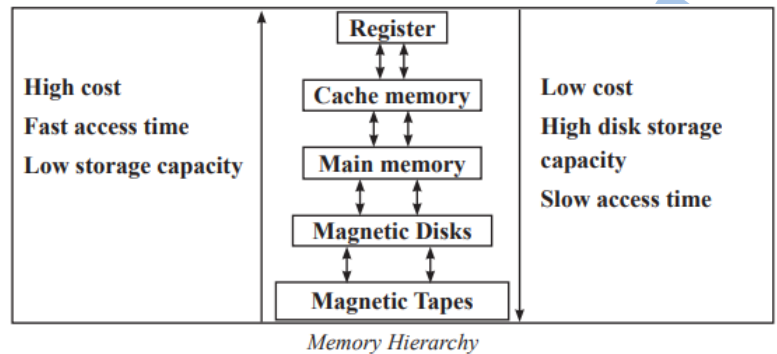
ALU (Arithmetic Logic Unit): Arithmetic logic unit is a part of CPU that can perform arithmetic operation like addition, subtraction, multiplication and division. It also performs logical comparison like equal to, greater than, less than, etc. to compare between two numbers.

MU (Memory Unit- Register Array): Memory unit is also a part of CPU but not the part of main memory that store currently executing task. It is located inside the microprocessor and has very limited storage. It is used to store very active data and instructions temporarily during processing.

Memory Unit

The physical part of a computer that store data, information and software temporarily or permanently is called memory or storage. Storage device or memory device is used to store data and information. The three types of memory are as follows:

> **Primary Memory:**
> **Secondary Memory:**
> **Cache Memory:**

Memory Hierarchy

The units of memory measurements are as follows:

S.N.	Memory Unit	Description
1	Bit	1 Bit = 0 or 1
2	Nibble	1 Nibble = 4 Bits
3	Byte	1 Byte = 8 Bits
4	Kilobyte (KB)	1 Kilobyte (KB) = 1024 Bytes
5	Megabyte (MB)	1 Megabyte (MB) = 1024 KB
6	Gigabyte (GB)	1 Gigabyte (GB) = 1024 MB
7	Terabyte (TB)	1 Terabyte (TB)= 1024 GB
8	Petabyte (PB)	1 Petabyte (PB) = 1024 TB

1. **Primary Memory:** The main memory is called primary memory. Primary memory stores data temporarily or permanently. It stores information during the processing of raw data. The two types of primary memory are: RAM (Random Access Memory) ROM (Read Only Memory).

> **RAM (Random Access Memory):** RAM is the main memory of computer system. It is volatile or temporary memory. Volatile memory means that RAM loses its information when the computer is switched off or faces power failure. So, it needs constant power supply to hold currently running program. It is also called semiconductor memory. It is read/write memory.

RAM

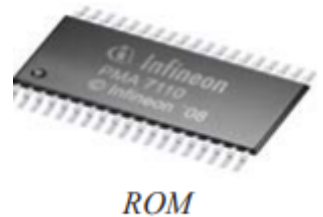There are two types of RAM. They are SRAM and DRAM.

SRAM stands for Static Random Access Memory. It does not need periodic refreshing to preserve the information. It is faster and expensive than DRAM. Characteristic of Static RAM

- Long life and no need to refresh
- Faster and used as cache memory
- Large size and expensive
- Expensive and high power consumption

DRAM: DRAM stands for Dynamic Random Access Memory. It needs a periodic refreshing to preserve the information. It is slower and cheaper than SRAM. Characteristics of Dynamic RAM

- Short data lifetime and needs to be refreshed continuously
- Slower as compared to SRAM and used as RAM
- Smaller in size and less expensive
- Less power consumption

➢ **ROM (Read Only Memory):** ROM is a non-volatile or permanent memory. Non-volatile means never loses data in ROM. It stores data permanently even when the computer is switched off or power failure. It is read-only memory because the programs in ROM are stored at the time of manufacture of the computer. It is fixed on motherboard. The three types of ROM are PROM, EPROM and EEPROM.

PROM PROM stands for Programmable Read Only Memory. Once a program has been written onto the PROM, it remains there forever and can't be updated and deleted. PROMs are manufactured blank and depending on the technology, can be programmed at final test, or in system. Blank PROM chips are programmed by plugging them into a device called a PROM programmer.

EPROM EPROM stands for Erasable Programmable Read Only Memory. **EPROM** of computer memory that does not lose its content when the power supply is cut off and that can be erased and reused. EPROMs are generally employed for programs designed for repeated use but that can be upgraded with a later version of a program.

Advantages of EPROM
- It is cost-effective.
- It can reprogram.
- An EPROM is convenient for testing and debugging.
- Here, no external memory is required.
- An EPROM memory can retain the data even without the power.

Disadvantages of EPROM

- An EPROM makes use of a transistor which has higher resistance.
- It has high static power consumption.
- An EPROM makes use of ultraviolet light for erasing the data, unlike EEPROM.
- For erasing and reprogramming of the data, you have to remove the EPROM chip from the computer.
- An EPROM takes some time to erase the data.
- EPROM is costly as compared to PROMs.

EEPROM EPROM stands for Electrical Erasable Programmable Read Only Memory. It is called flash ROM. It can be erased by exposing it to an electrical charge and reprogramming. We can reprogram EEPROM infinite number of times. We can program and erase the contents of EEPROM without removing the chip from the computer. It is also called hybrid memory with a combined feature of RAM and ROM.

Advantages of EEPROM
- We can reprogram EEPROM infinite number of times.
- The method of erasing the data is immediate and is electrical.
- There is no requirement of additional equipment for changing the contents.
- We can erase the data on EEPROM byte by byte basis.

Disadvantages of EEPROM

- There is a requirement of different-2 voltages for erasing, reading and writing the data onto the EEPROM memory.
- EEPROM has limited retention time.
- It is expensive as compared to the PROM and EPROM.
- The serial EEPROM memory requires more time for execution.

EPROM	EEPROM
• EPROM stands for Erasable Programmable Read-Only Memory.	• EEPROM stands for Electrically Erasable Programmable Read-Only memory.
• In EPROM, ultraviolet (UV) light is used to erase the content.	• In EEPROM, the data is erased using an electrical signal.
• We have to remove the EPROM chip from the computer for erasing and reprogramming of the data.	• There is no requirement of removing the chip from the computer for erasing and reprogramming of the data.
• An EPROM has a transparent quartz crystal window at the top.	• EEPROM completely encased in an opaque plastic case.
• EPROM is an older technology.	• An EEPROM is modern technology.

Firmware: Firmware is software that's embedded in a piece of hardware. So, the firmware is software for hardware.

CPU Register: CPU Register is a small storage memory, located inside the microprocessor and has a high-speed data transfer rate. It stores data and instructions used by the microprocessor.

2. **Secondary Memory:** Secondary memory is also called auxiliary memory or backup memory. These memories are used to store data and instructions permanently for future use. CD/DVD, pen drive, hard disk, etc. store data and instruction for future. The various types of secondary memory are Magnetic Tape, Hard disk, SSD (Solid State Drive), Optical Storage Disc, Pen drive, etc.

3. **Cache Memory:** Cache memory is also like CPU Register, located inside the microprocessor but has high storage capacity than CPU Register and high-speed data access rate. It also stores the data and instruction used by the microprocessor. So, it stores very active data and instructions temporarily during processing. If required data and instruction are not found in cache memory, then the searching is done in primary memory.

Auxiliary Storage

Auxiliary storage is any storage that is made available to the system through input/output channels. This term refers to any addressable storage that is not within the system memory (RAM). These storage devices hold data and programs for future use and are considered nonvolatile storage that retains information even when power is not available. They trade slower read/write rates for increased storage capacity. Example pen drive, external hard disk, SSD (Solid State Drives), memory card etc.

Features

- They are external from the actual computer system.
- They are offline storage media, meaning data is not lost when it is not in use.
- Data from the ASU is copied to the main memory before it is used or displayed by the user.
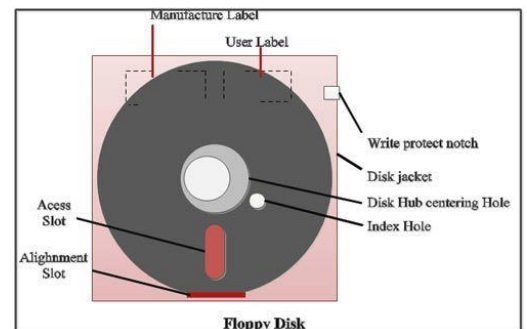
Advantages

- They are portable, which is enhanced by them being detachable from the computer system.
- They are mostly embedded with plug-and-play abilities.
- They can be used to extend the memory capacity of your system.
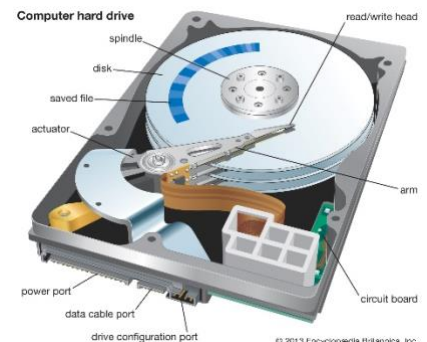- They are relatively cheap.

Magnetic Storage

Computer systems need to store data in digital format. One of the most widely used types of digital data storage is magnetic storage. This refers to any type of data storage using a magnetized medium. Several types of magnetized media are used in computer systems, including magnetic tape, floppy disks, Super disks, hard disks, etc.

Floppy Disk: A floppy disk is a type of storage media that reads data storage information that is used to store electronic data, like a computer file. It was extremely expensive as it was one of the first types of hardware storage created in 1967 by IBM, which could read/write a portable device. It is composed of a disk of thin and flexible magnetic storage medium, sealed in a rectangular plastic carrier lined with fabric that remove dust particles.

Floppy Disk

Hard Disk: Hard disk is commonly used storage device. It stores large amount of data and information permanently. It is also called fixed disk. It is made of aluminum materials and the surface is coated with the ferromagnetic element. Circular metal discs also called platters to rotate while writing or reading the data and information into them. It stores a large amount of data on hard disk. The speed of the hard disk is measured in rpm (revolutions per minute). The hard disks with 5400 rpm or 7200 rpm are generally used in present-day computer system.

Magnetic Tape: Magnetic Tape is a usable secondary storage device to store and retain a large volume of data. It is made up of a plastic strip of which one surface is coated with magnetic ink. Analog and digital data are stored in magnetic tape. Normally, minicomputer, mainframe computer, large scale business organization server, etc. uses magnetic tape for backup data and information. Magnetic tape driver is used to store and retrieve the data and information from magnetic tape. The main important function of magnetic tape is to store data safely for a long period of time.

Magnetic Tape and Tape Drive

Optical Storage

The disc that uses laser light technology to store and retrieve data is called optical storage disc. The most commonly used optical storage discs are CD, DVD, Blu-ray disk, etc.

CD-ROM: A CD-ROM drive uses a low-power laser beam to read digitized (binary) data that has been encoded in the form of tiny pits on an optical disk. The drive then feeds the data to a computer for processing. Compact disk which was 12cm in diameter and had 72 minutes' audio/video storage capacity with 18gm and width 1mm (millimetre). The storage capacity of a CD is 700MB. The information stored on it is read-only.

CD (Compact Disk)

DVD (Digital Versatile Disc): DVD stands for Digital Versatile Disc or Digital Video Disc. Its storage capacity is higher than CD. It stores multiple layers of data. The various DVD storage capacities are λ.

- Single Side Layer- 4.7 GB
- Single Side Double Layer-8.5 GB
- Double Layer Single Side- 9.4 GB
- Double Layer Double Side-17.08 GB

Differences between CD and DVD

S.N.	CD	DVD
1	Its storage capacity is 700MB.	Its storage capacity is up to 20GB.
2	It is cheaper.	It is more expensive.
3	It is used to store audio and software.	It is used to store video and software.
4	Its types are CD-R, CD-RW, etc.	Its types are: DVD-RW, DVD+RW, etc.
5	It was developed by Philips and Sony.	It was developed by Philips, Sony, Toshiba, Panasonic etc.

Pendrive: Pen drive is a popular flash storage device. It is also called flash memory. It is connected through the USB ports. It is a small size and portable device. It can be carried in a pocket like pen. So, it got its name as a pen drive. It is used to transfer data, information and software from one computer to another. It is made up of semiconductor chip which is EEPROM technology. The writing speed of pen drive of USB 3.0 is up to 60 MB/S and data reading speed up to 120 MB/S.

Pen drive

Flash Memory Card: A memory card is an electronic data storage device used for storing digital information, typically using flash memory. These are commonly used in portable electronic devices, such as digital cameras, mobile phones, laptop computers, tablets.

Operating System

Operating System is a system software which provides an environment to help the user to executes the programs. The operating system is a resource manager which allocates and manages various resources like processor, main memory, input/output devices and information on secondary storage device. Operating system enables user interaction with computer system by acting as an interface between users or application program and computer hardware.

Function of Operating System

- File Management
- Memory Management
- Process Management
- Device Management

Memory Management –
The operating system manages the Primary Memory or Main Memory. Main memory is made up of a large array of bytes or words where each byte or word is assigned a certain address. Main memory is fast storage and it can be accessed directly by the CPU. For a program to be executed, it should be first loaded in the main memory. An Operating System performs the following activities for memory management:

It keeps track of primary memory, i.e., which bytes of memory are used by which user program. The memory addresses that have already been allocated and the memory addresses of the memory that has not yet been used. In multiprogramming, the OS decides the order in which processes are granted access to memory, and for how long. It Allocates the memory to a process when the process requests it and deallocates the memory when the process has terminated or is performing an I/O operation.

Processor Management –
In a multi-programming environment, the OS decides the order in which processes have access to the processor, and how much processing time each process has. This function of OS is called process scheduling. An Operating System performs the following activities for processor management.

Keeps track of the status of processes. The program which performs this task is known as a traffic controller. Allocates the CPU that is a processor to a process. De-allocates processor when a process is no more required.

Device Management –
An OS manages device communication via their respective drivers. It performs the following activities for device management. Keeps track of all devices connected to the system. designates a program responsible for every device known as the Input/Output controller. Decides which process gets access to a certain device and for how long. Allocates devices in an effective and efficient way. Deallocates devices when they are no longer required.

File Management –
A file system is organized into directories for efficient or easy navigation and usage. These directories may contain other directories and other files. An Operating System carries out the following file management activities. It keeps track of where information is stored, user access settings and status of every file, and more… These facilities are collectively known as the file system.

Importance of Operating System

- It keeps account of different jobs and the where about of their results and locations in the memory.
- It schedules jobs according to their priority passing control from one program to the next.
- Operating system makes a communication link between user and the system and helps the user to run application programs properly
- Operating system helps the user in file management, making of directions, and saving files in them.
- Multiprogramming is a very important feature of operating system.
- It provides program editors that help the user to modify and update the program lines.

Types of Operating System

1. Single User System: It can run only one program at a time for example Disk Operating System DOS.
2. Multi User System: It can run more than one program at a time for example UNIX system.

DOS (Disk Operating System)

Disk Operating System was the first widely installed operating system for personal computers. The first personal computer version of DOS was developed by Bill Gates for IBM computers are called PC-DOS. MS-DOS was the main operating system for IBM PC compatible personal computers during the 1980s. DOS is a single-tasking, single-user operating system with a command-line interface. DOS acts on commands. Because DOS is ready to perform when given proper command hence, it is also known as Command Prompt.

Features of Ms-Dos

- It is a 16-bit operating system.

- The mouse cannot be used to operate it e, Input in it is through basic system commands.

- The maximum space available is 2 GB.

- It is a free OS.

- It does not support a graphical interface.

- It is a single-user operating system.

- It is a Character-Based interface system.

- It helps make file management, e.g., creating, editing, deleting files, etc.

Internal Command:- Those commands which are already stored in the "Command.Com" file of DOS are known as internal commands. For example, CLS, VOL, TIME, DATE, COPY etc.

External Command:- Those commands which are not included in the command.com file of DOS rather included in other files of DOS are known as external commands. It is formatted according to programme. For example, TREE, FORMAT, MODE etc.

Some Internal Commands:-

1. **CLS**   To clear the screen.
    \>cls ↵

2. **DIR**   To view the directory and files
    C:\>Dir ↵

3. **DATE**   To View and change the date
    C:\>Date ↵
    Current date is: 01-01-2008
    Enter new date (mm/dd/yy):21-03-2009 ↵

4. **TIME**   To view and change the time.
    C:\>Time ↵
    The current time is: 06:11:56.45a
    Enter new time:1:15:48.57p ↵

5. **Exit**   To exit from DOS screen.
    C:\>Exit

6. **Cd**   To go to the root/main directory
    C:\Computer\Monitor>cd\ ↵
    C:\>

7. **Cd**   To change the directory.
    C:\>CD φ<Directory Name> ↵

8. **Cd..**   To go one directory back.
    C:\Computer\Monitor>cd.. ↵
    C:\Computer>

9. **Cd...**   To go two directory back.
    C:\Computer\Monitor>cd... ↵
    C:\>

10. **Md**   To make a new directory
    C:\> MD φ<Directory Name> ↵

11. **Rd**   To remove any existing directory
    C:\>RD φ <Directory Name> ↵

12. **Copy Con**   To create a file.
    C:\>COPY φ CON φ<FILE NAME> ↵

13. **COPY** To copy the file.
    C:\>Copyø<File Name>ø<New File Name> ↵

14. **Del**   To delete a file
    C:\>DEL φ <File Name>

15. **Ren**   To rename the file
    C:\>REN φ <OLD FILE NAME> φ <NEW FILE NAME> ↵

16. **Ver**   To check the version of DOS
    C:\>VER↵

17. **Type**   To display the contents.
    C:\>TYPE φ<File Name> ↵

18. **Vol**   To check DOS volume.
    C:\>Vol ↵

19. **Label**   To apply label to any drive.
    C:\> Label <Name> ↵

20. **Attrib**   To change the attribute of a directory or a file.
    c:\>Attribø<File Name>ø+h/-hø+s/-sø+r/-r ↵

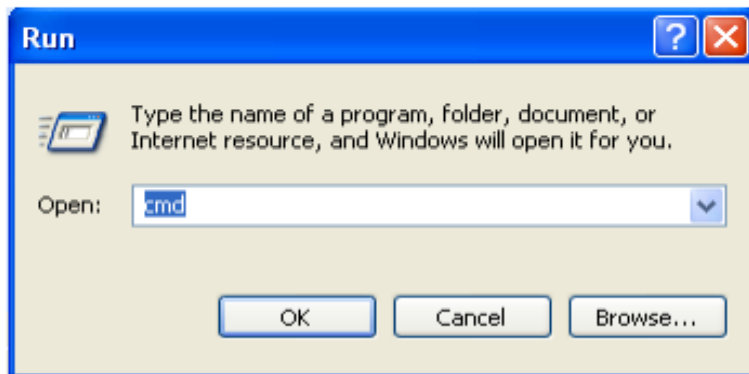21. **Color**   To change the colour of background and font of DOS screen
    c:\>color <any digit from 0 to 9 or ABCDEF>

Some External Commands:-

1. **FORMAT**   To format any Drive.
    C:\>FORMAT φ<DRIVE> ↵

2. **TREE**   To view directory & Sub directory
    C:\>Treeø<Directery Name> ↵

3. **CHKDSK**   To Check disk or drive
    C:\>Chkdsk ↵

4. **MOVE**   To move any file to any location.
    C:\>Move<sorce File Name>ø<Destination> ↵

5. **Edit**   To edit or modify the contents of the text file.
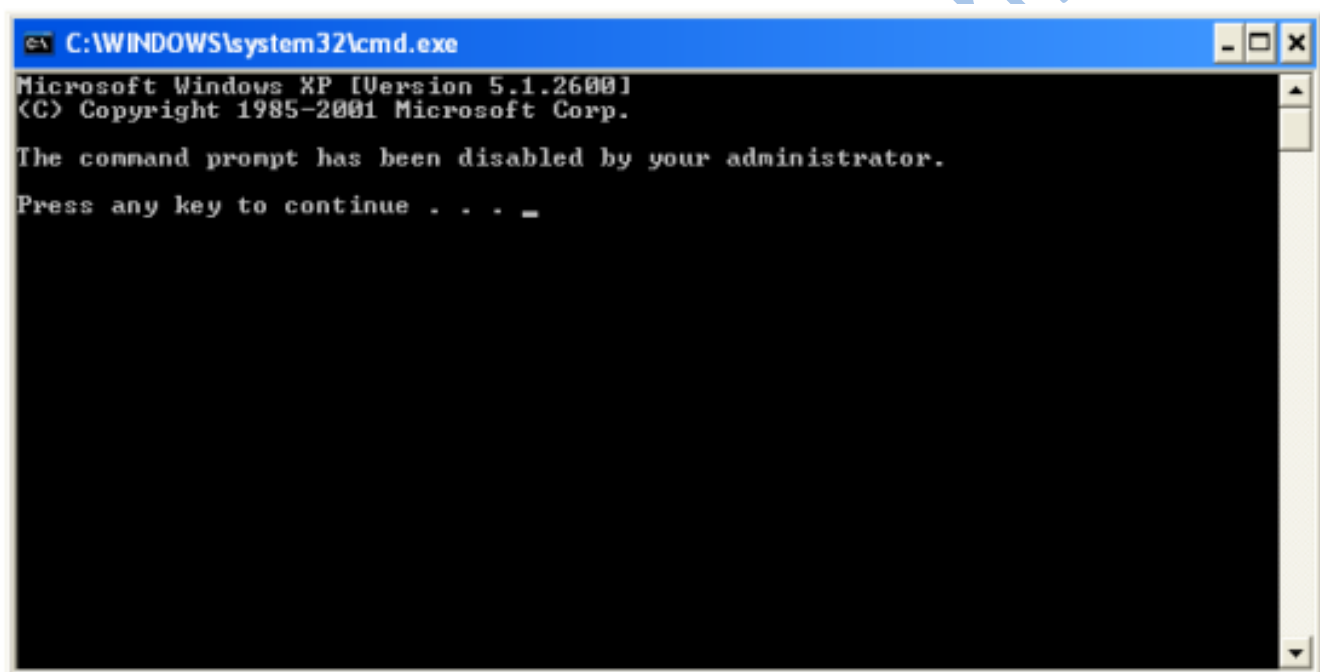   C:\> EDIT φ <File Name> ↵

If we have installed WINDOWS as our main Operating System then we get a DOS environment within WINDOWS. MS DOS (Microsoft DOS) environment can be run on computer through WINDOWS in following way:

Click on start button and in the list produced click on "RUN" option. A dialog box appears. In this dialog box, type cmd or command in the given box next to label "Open". Press enter or click on OK button. DOS will open on your computer screen.

Start → RUN

RUN dialog box.

DOS Screen

Windows

Windows or Microsoft windows is developed, marketed and sold by Microsoft. It consists of several families of operating system, each of which later to a certain sector of the computing industry.

Advantages

- **Ease of use:** All versions of Microsoft Windows have something common in it which makes users easy to shift from one version to another. Windows 7 users have no difficulty in

migrating to Windows 10 because most of the features of Windows 10 are the same as windows 7.

- **Available software:** There is a huge selection of software available for Windows. This is both due to and the reason for Microsoft's dominance of the world market for PC computer operating systems and office software.
- **Support for new hardware.** Virtually all hardware manufacturers will offer support for a recent version of Windows when they go to market with a new product.
- **Plug and play feature:** Most hardware can be detected automatically by plug and play feature. You do not need to manually install the hardware but it is ready to use when attached e.g. webcam, keyboard, mouse, mobile device etc.
- **Desktop and touch screen:** Windows 10 is made for both touch screen devices and desktop computers. The user interface of Windows 10 is made in such a way that it works better for any type of windows device.

Disadvantages

- **Virus attacks:** Windows have a high amount of hacker attacks. The hackers can easily break windows security. So windows users are dependent on anti-virus software and have to pay monthly charges to companies to protect their data. Also, windows users have to update OS to keep up-to-date with security patches.
- **Poor security.** Compared to other operating systems, Microsoft security is weak. According to their own developers, their products "just aren't engineered for security." The result is that Windows computers are more likely than other systems to be hijacked
- **High computer resources:** If you are installing windows OS then your computer should have high ram capacity, a lot of hard drive space and good graphics card. This is because of features that are used in windows.

UNIX

UNIX is an operating system which was first developed in the 1960s, and has been under constant development ever since. By operating system, we mean the suite of programs which make the computer work. It is a stable, multi-user, multi-tasking system for servers, desktops and laptops. UNIX systems also have a graphical user interface (GUI) similar to Microsoft Windows which provides an easy to use environment.

Advantages

- **Ecommerce:** Many big online stores use UNIX or Linux servers to host their websites. UNIX has also used to manage mobiles and electronic machines.
- **Portable:** As UNIX is made from using C language so it is a highly portable OS. You can use this OS on any PC or MAC computers. C is a very popular language and most programmers can work easily in this language. You can communicate with hardware by using the C language.
- **Memory usage:** UNIX use less memory while running sophisticated programs. UNIX OS can handle virtual memory nicely. The virtual memory expands as more programs come into the main memory. Most of the tasks in UNIX is done by using fewer resources.

- **No anti-virus needed:** As you know that Chrome OS, macOS, Linux, Ubuntu and android are developed by using UNIX OS. These OS are considered safe from any virus. You don't need to install any anti-virus in newly build Chrome OS.
- **Safe and secure:** UNIX provides a safe and secure platform in which multiple users can interact with the servers online without any security issues. The interaction with the UNIX servers is fast and without any bugs. UNIX uses UID and GID for controlling permissions for users and files are accessed by users through these permissions.

Disadvantages

- **Not user friendly:** Novice user has difficulty in using UNIX. Most of the work in UNIX is done by using commands in CLI so beginner has to remember a different type of commands. UNIX is solely made for programmers and not for beginner users. Some experience people also feel difficulty in using commands because some commands are very different from their name.
- **Poor documentation:** There is not any proper documentation available for UNIX. If the user gets any problem, then he has to consult some expert and getting online help from the documentation is very difficult. If you compare this with Windows and macOS then you will get proper and easy to follow the documentation that is available online.

Linux

Linux is one of popular version of UNIX operating System. It is open source as its source code is freely available. It is free to use. Linux was designed considering UNIX compatibility. Its functionality list is quite similar to that of UNIX.

Features

- **Portable** – Portability means software can work on different types of hardware in same way. Linux kernel and application programs supports their installation on any kind of hardware platform.

- **Open Source** – Linux source code is freely available and it is community based development project. Multiple teams work in collaboration to enhance the capability of Linux operating system and it is continuously evolving.

- **Multi-User** – Linux is a multiuser system means multiple users can access system resources like memory/ ram/ application programs at same time.

- **Multiprogramming** – Linux is a multiprogramming system means multiple applications can run at same time.

- **Security** – Linux provides user security using authentication features like password protection/ controlled access to specific files/ encryption of data.

   Example

- Ubuntu
- Debian
- Fedora
- Linux mint

- Zorin OS
- Elementary OS
- Manjaro Linux

File Management by OS

File management is one of the basic and important features of operating system. Operating system is used to manage files of computer system. All the files with different extensions are managed by operating system.

A file is collection of specific information stored in the memory of computer system. File management is defined as the process of manipulating files in computer system, it management includes the process of creating, modifying and deleting the files. It allows the user to browse, move, and sort them according to different criteria such as date of last modification, date of creation, file type/format, size, etc.

Features
- It helps to create new files in computer system and placing them at the specific locations.
- It helps in easily and quickly locating these files in computer system.
- It makes the process of sharing of the files among different users very easy and user friendly.
- It helps to stores the files in separate folders known as directories. These directories help users to search file quickly or to manage the files according to their types or uses.
- It helps the user to modify the data of files or to modify the name of the file in the directories.

Device Management by OS

Device management in an operating system means controlling the Input/output devices like disk, microphone, keyboard, printer, magnetic tape, USB ports, camcorder, scanner, other accessories, and supporting units like supporting units' control channels. A process may require various resources, including main memory, file access, and access to disk drives, and others. If resources are available, they could be allocated, and control returned to the CPU.

The system has multiple devices, and in order to handle these physical or virtual devices, the operating system requires a separate program known as an ad device controller. It also determines whether the requested device is available.

Function

- It keeps track of data, status, location, uses, etc. The file system is a term used to define a group of facilities.

- It enforces the pre-determined policies and decides which process receives the device when and for how long.

- It improves the performance of specific devices.
- It monitors the status of every device, including printers, storage drivers, and other devices.
- It allocates and effectively deallocates the device. De-allocating differentiates the devices at two levels: first, when an I/O command is issued and temporarily freed. Second, when the job is completed, and the device is permanently release.

Features

- The OS interacts with the device controllers via the device drivers while allocating the device to the multiple processes executing on the system.
- Device drivers can also be thought of as system software programs that bridge processes and device controllers.
- The device management function's other key job is to implement the API (Application Programming Interface).
- Device drivers are software programs that allow an operating system to control the operation of numerous devices effectively.
- The device controller used in device management operations mainly contains three registers: command, status, and data.

Memory Management by OS

Memory management is the functionality of an operating system which handles or manages primary memory and moves processes back and forth between main memory and disk during execution. Memory management keeps track of each and every memory location, regardless of either it is allocated to some process or it is free. It checks how much memory is to be allocated to processes. It decides which process will get memory at what time. It tracks whenever some memory gets freed or unallocated and correspondingly it updates the status.

Functions

- managing the system memory (primary memory)
- handling the movement of processes between main memory and disk during execution.
- keeping track of every memory location, whether allocated or free
- checking the amount of memory to be allocated to a process.
- deciding which process will get memory and at what time
- tracking when some memory is free or unallocated and updating its status

MS-DOS system files

Io.sys: IO.SYS is a hidden executable binary file or hidden system file which processes instructions when the operating system is booted. It was an essential part of MS-DOS. The instructions tell the operating system how the computer is set up. Together with the MSDOS.SYS system file, they made up Microsoft's MS-DOS and were loaded into the memory of the computer.

IO.SYS is an important part of MS-DOS since it contains its default drivers and the DOS initialization program. After the introduction of Microsoft's Windows 95, the MSDOS.SYS file was merged with IO.SYS, but it still exists in computers as a text file which determines whether the computer booted into DOS or Windows.

Msdos.sys: The MSDOS.SYS file is a hidden, system, read-only file created on the root of the boot drive. There are several configurations that can be changed using this file. Most values in the MSDOS.SYS are either 0 or 1, which is off or on.

Command.com: COMMAND.COM is the default shell for Microsoft operating systems, including MS-DOS and Windows. It has an additional role as the usual first program run after boot. It allows users to execute commands and run scripts known as batch files. It has been superseded (replace) in Windows NT and by extension all modern versions of Windows by CMD.EXE and PowerShell.

Config.sys: the primary configuration file for DOS is known as config.sys. It is a special ASCII text file that contains configuration directives evaluated by the operating system during boot. They are introduced with DOS 2.0. It is a text file containing special system configuration commands, found in the root directory on MS-DOS.

Autoexec.bat: Autoexec.bat is a file containing disk operating system commands that are executable when the computer is booted. The commands in AUTOEXEC.BAT tell the operating system in which the application program are to be automatically started.

GUI (Graphic User Interface)

A **GUI** (graphical user interface) is a system of interactive visual components for computer software. A GUI displays objects that convey information, and represent actions that can be taken by the user. The objects change color, size, or visibility when the user interacts with them.

A GUI includes GUI objects like icons, cursors, and buttons. These graphical elements are sometimes enhanced with sounds, or visual effects like transparency and drop shadows. A GUI uses windows, icons, and menus to carry out commands, such as opening, deleting, and moving files. Although a GUI operating system is primarily navigated using a mouse, a keyboard can also be used via keyboard shortcuts or the arrow keys.

Unlike a command-line operating system or CUI, like Unix or MS-DOS, GUI operating systems are easier to learn and use because commands do not need to be memorized. Because of their ease of use and more modern appearance, GUI operating systems have come to dominate today's market.

Windows Environment

The Windows environment is the onscreen work area provided by Windows, analogous to a physical desktop, and the operating system's core extension points. Learn how to utilize the desktop, taskbar, notification area, control panels, help, and user account control for your app.

Advantages of windows Environment

- **Ease of use:** Users familiar with earlier versions of Windows will probably also find the more modern ones easy to work with.
- **Available software.** There is a huge selection of software available for Windows.
- **Backwards compatibility.** Update the software that without losing the old data.
- **Support for new hardware.** Virtually all hardware manufacturers will offer support for a recent version of Windows when they go to market with a new product.

File/Folder Management

The File and Folder Operation allows you to copy, move, rename, delete files and folders in computers. Desktop Central File and Folder Operation Configuration enables you to copy/move/delete files for several computers from central location. Folder is a container for storing programs and files, similar to a folder in a file cabinet.

Windows allows you to organize folders and files in a file hierarchy. Windows file hierarchy allows you to organize your files in folders and then place folders in other folders.

Advantages

- It centralizes the important documents in one place
- It reduces rework
- It minimizes the project delay
- It makes reviewing and approving content easier
- It gives you control over information access
- It makes file more secure

GNU open source operating system

GNU is an operating system that is free software—that is, it respects users' freedom. The GNU operating system consists of GNU packages (programs specifically released by the GNU Project) as well as free software released by third parties.

GNU is a Unix-like operating system. That means it is a collection of many programs: applications, libraries, developer tools, even games. The development of GNU, started in January 1984, is known as the GNU Project. The program in a Unix-like system that allocates machine resources and talks to the hardware is called the "kernel". GNU is typically used with a kernel called Linux.

Advantages

- Flexibility: Every types of software are free to use
- Speed: Every function will get faster without any limitation
- Less cost: Most of the software and application are free to use for every purpose
- Solid information security: It has got high security because you can design or develop your own system by your self

.

Device Driver

A device driver is a particular form of software application that allows one hardware device (such as a personal computer) to interact with another hardware device (such as a printer). A device driver may also be called a software driver.

Device Drivers are very essential for a computer system to work properly because without device driver the particular hardware fails to work accordingly means it fails in doing a particular function/action for which it has been created.

Advantages

- Device Driver automatically updates the program
- Easy on installation of new hardware devices
- It will automatically detect the missing driver in the system
- It will update the driver in a group which make easier for the users

Basis	Command Line Interface (CLI)	Graphic User Interface (GUI)
Definition	Interface is by typing commands	Interface with devices is by graphics and visual components and icons.
Understanding	Commands need to be memorized	Visual indicators and icons are easy to understand
Memory	Less memory is required for Storage	More memory is required as visual components are involved
Working Speed	Use of keyboard for commands makes CLI quicker	Use of mouse for interaction makes it slow
Resource used	Only Keyboard	Mouse and keyboard both can be used
Accuracy	High	Comparatively low
Flexibility	Command line interface does not change, remains same over time	Structure and design can be change with updates

Application Package

Application package software, or simply an application package, is a collection of software programs that have been developed for the purpose of being licensed to third-party organizations. Application

packages are generally designed to support commonly performed business functions and appeal to multiple types of user organizations.

Advantages of Application Package

- Lowering support cost
- Software Management
- Ease of distribution
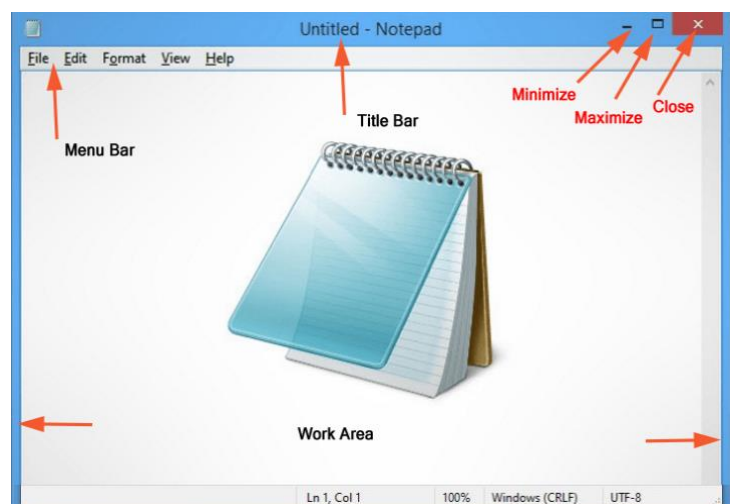- Minimize security risk
- Control over software installation

Edit in DOS: MS-DOS Editor, commonly called edit or edit.com, is a character based text editor that comes with MD-DOS and 32-bit version of Microsoft Windows. MS-DOS editor which is a text editor used to create and edit ASCII text files.

Editor can edit files that are up to 65,279 lines and up to approximately 5 MB in size. MS-DOS versions are limited to approximately 300KB, depending on how much conventional memory is free.

Editor can be launched by typing it into the Run command dialog on windows, and by typing edit into the command-line interface.

Notepad in Windows: Notepad is a generic text editor included with all versions of Microsoft Windows that allows you to create, open, and read plaintext files. It was first released as a mouse-based MS-DOS program in 1983 and has been included in all versions of windows since windows 1.0 in 1985. Notepad allows you to create, open and read plaintext files.

VI editor in Linux: Vi or Visual Editor is the default text editor that comes with most Linux system. It is a terminal based text editor that users need to learn, essentially when more user friendly text editors are not available on the system.
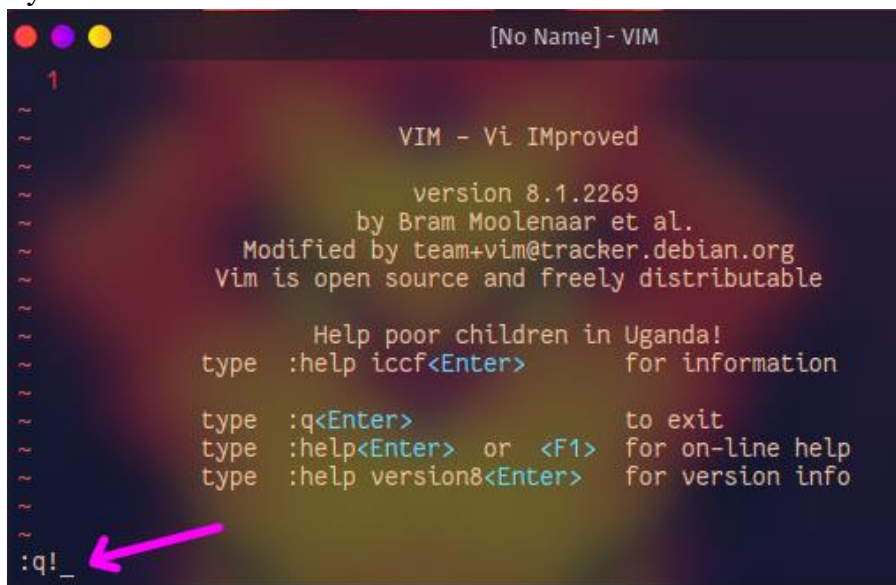
Some of the reason due to which

It is widely use are as follow

- It is available in almost all Linux Distribution.
- It works the same across different platforms and distributions.
- It is user friendly.

Nowadays, there are advanced versions of the vi editor available, and the most popular one is **VIM** which is **Vi Im**proved.

Some of the other ones are Elvis, Nvi, Nano, and Vile. It is wise to learn vi because it is feature-rich and offers endless possibilities to edit a file.

Microsoft Word

This software is specially used for the documentation and file management system. Most people know that Microsoft Word is a word processing program used to create text documents. In fact, Microsoft Word has become the measure for all word processing programs on the market today because of all the features and tools it offers.

1) How to **start the Microsoft Office Word**?
   ➢ Click on the windows icon on the left down of your screen
   ➢ Search for the word called "Word "
   ➢ Click on the "word "
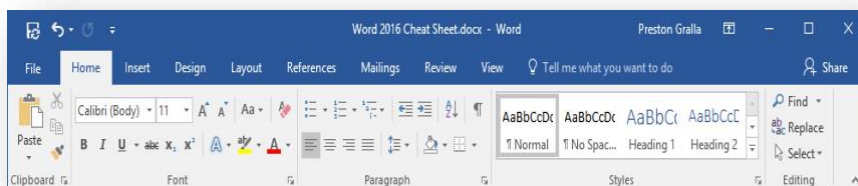   ➢ Finally, you get the home screen of Microsoft word
2) **Title bar**: Top most part of your Word is title bar. The content at the title bar are as follow
   ➢ Minimize: It helps to put the program at the taskbar
   ➢ Maximize: It helps to increase the screen size of the program
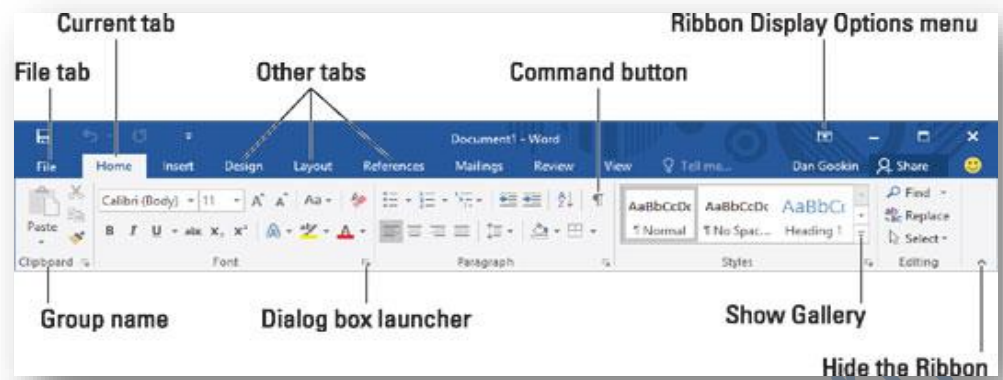   ➢ Close: It helps to shut down/Close the program
3) **Tab menu**: Just below the Title bar there is tab menu. The content at the tab menu are as follow
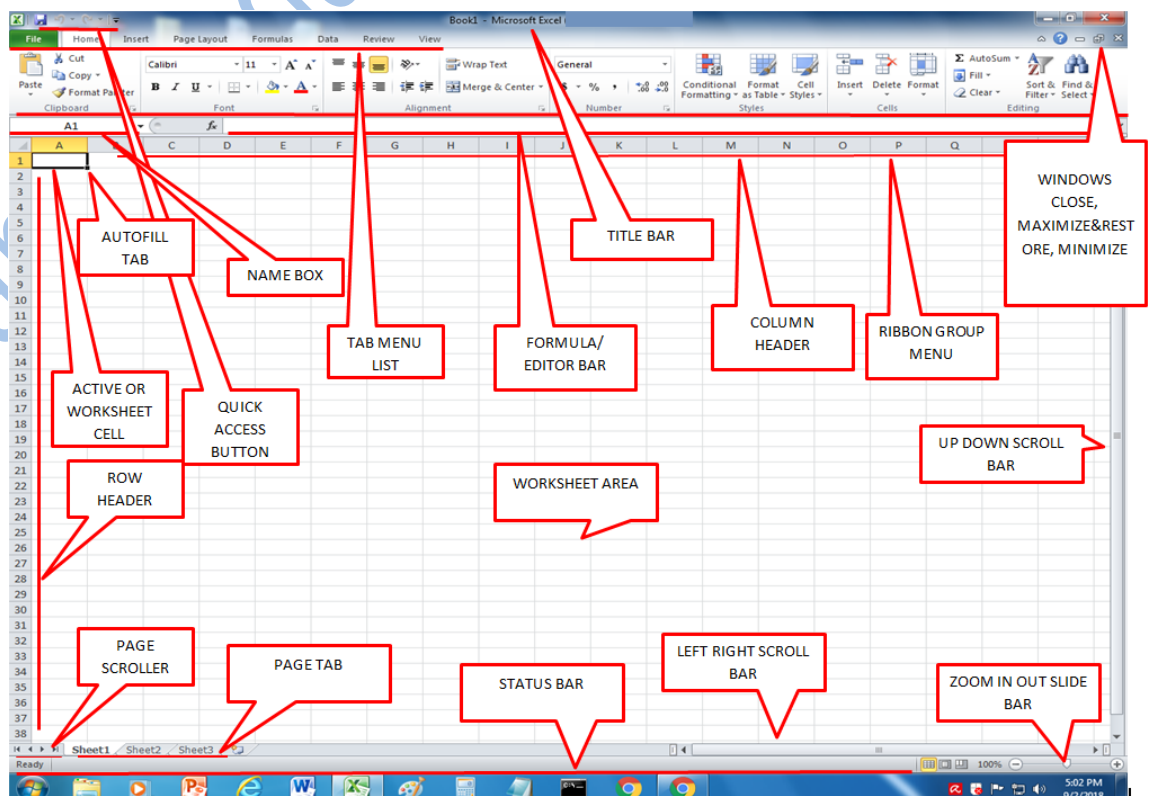   ➢ File

- ➢ Home
- ➢ Insert
- ➢ Design
- ➢ Layout
- ➢ References
- ➢ Mailing
- ➢ Review
- ➢ View Help
- ➢ Share

Features of Ms Word

- Change page margins, orientations, size and columns
- Insert headers and footers
- Page numbering
- Styles
- Changing text colors, fonts, effects
- Insert pictures, tables, charts, figures, equations etc

Microsoft Excel (Spreadsheet Package): Excel is a commercial spreadsheet application produced and distributed by Microsoft for Microsoft Windows and Mac OS. It features the ability to perform basic calculations, use graphing tools, create pivot tables and create macros. Excel has the same basic features as all spreadsheet applications, which use a collection of cells arranged into rows and columns to organize and manipulate data. They can also display data as charts, histograms and line graphs.

Features

- Create spreadsheets
- Data filtering
- Data Sorting
- Inserting formula
- Insert Chart
- Mail Merge

General idea on the Excel for the mathematical calculation

C=column and Row=row
Addition	=(CR+CR)
Subtraction	=(CR-CR)
Multiplication	=(CR*CR)
Division	=(CR/CR)
Average	=Average (CR, CR)
Maximum	=max (CR, CR)
Minimum	=min (CR, CR)

	A	B	C
		F4	10
1	first number	100	
2	second number	50	
3			
4	Addition	150	
5	Substraction	50	
6	Multiplication	5000	
7	Division	2	
8	Average	75	
9	Maximum	100	
10	Minimum	50	
11	total	5427	
12			

How to calculate the Simple Interest?

	A	B	C	D	E	F
1		BG Department Store				
2						
3	S.N	Price	Rate	Years	Interest	
4	1	100000	10%	1	10000	
5	2	50000	10%	1	5000	
6	3	25000	10%	1	2500	
7	4	10000	10%	1	1000	
8	5	1000	10%	1	100	
9			Total Amount		18600	
10						
11						

➢ To calculate the Simple Interest, the formula **I=PTR**

➢ To use this formula, the data is given on the table

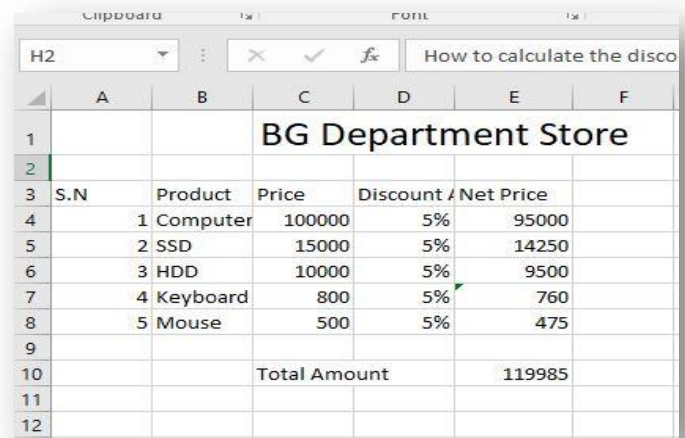➢ Always select the **row*column** to calculate the formula

➢ **Rate*Time(Year)*Price / =CR*CR*CR**

➢ Interest will be calculated

How to calculate the Discounted amount?

➤ To calculate the discounted amount, use the discounted amount given on the table
➤ Use the Formula = **Price-Price*Discounted amount**
➤ **CR-CR*CR**
➤ Discounted amount will be calculated

H2			f_x	How to calculate the disco

	A	B	C	D	E	F
1			**BG Department Store**			
2						
3	S.N	Product	Price	Discount /	Net Price	
4	1	Computer	100000	5%	95000	
5	2	SSD	15000	5%	14250	
6	3	HDD	10000	5%	9500	
7	4	Keyboard	800	5%	760	
8	5	Mouse	500	5%	475	
9						
10			Total Amount		119985	
11						
12						

Concept of Database Management System

Database: A database is an organized collection of structured information, or data, typically stored electronically in a computer system. A database is usually controlled by a database management system (DBMS). Data within the most common types of databases in operation today is typically modeled in rows and columns in a series of tables to make processing and data querying efficient. The data can then be easily accessed, managed, modified, updated, controlled, and organized. Most databases use structured query language (SQL) for writing and querying data.

Database Management System: It is a computer software program that allows a user to perform a database function of storing, retrieving, deleting and modifying data. DBMS is the interface between the users and the database. Example MYSQL, Oracle, DB2 etc.

Application od DBMS

- Banking: Transaction
- Airlines: Ticket reservation/Schedule
- Universities: Registration/Marksheet
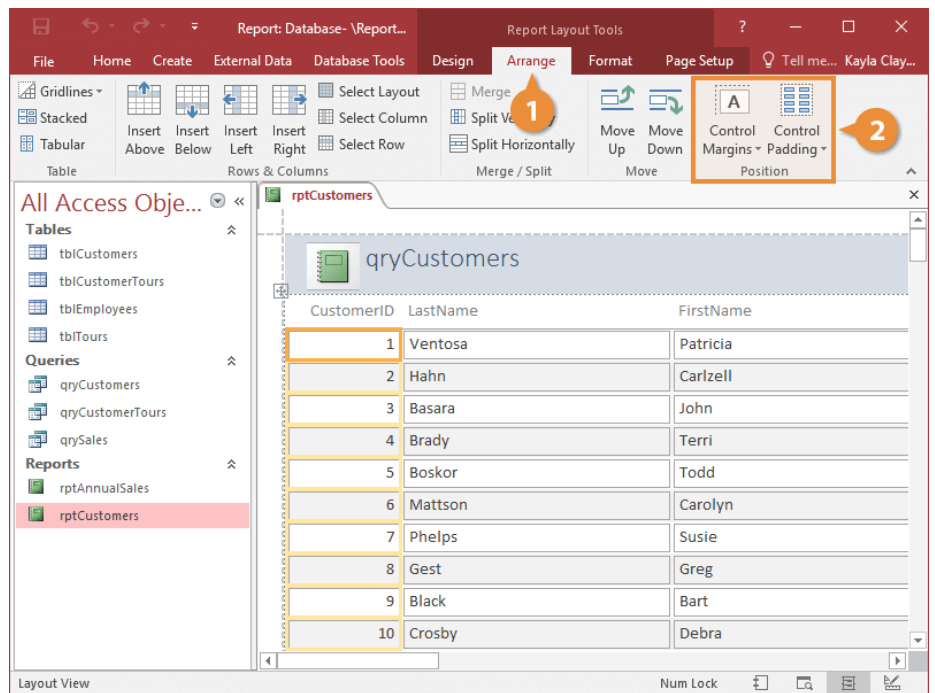- Sales: Customer detail/product detail/pricing

DBMS Package: Microsoft Access

Microsoft Access: **Microsoft Access** is a database management system (DBMS) from Microsoft that combines the relational Access Database Engine (ACE) with a graphical user interface and software-development tools. Microsoft Access stores data in its own format based on the Access Database Engine (formerly Jet Database Engine). It can also import or link directly

to data stored in other applications and databases. Access is used for both small and large database deployments.

Advantages

- Easy to install and use: It takes few minutes to install the program
- Easy to integrate: We can easily integrate(combine) Ms access with software program based on windows.
- Large amount of data: It huge amount of data storage capacity
- Compatibility with SQL: Ms Access is relatively compatible with SQL.
- Cost- Effective: It is cheaper than other database management system

Features

- Ideal for individual and smaller teams
- Easier than client server database to understand and use
- Ready templates for regular users to create and publish data
- Hide/Show option for ribbon
- Allow output reports in PDF format

Presentation Package: Microsoft Power point

Microsoft PowerPoint is a powerful slide show presentation program. It is a standard component of the company's Microsoft Office suite software. The program uses slides to convey information rich in multimedia. It is used to make presentations for personal and professional purposes.

Advantages of Power point

-

Chapter – 5

Computer Virus

Computer Virus: A computer virus is a type of malicious software, or malware, that spreads between computers and causes damage to data and software. Computer viruses are designed to spread across programs and systems. Computer viruses typically attach to an executable host file, which results in their viral codes executing when a file is opened. The code then spreads from the document or software it is attached to via networks, drives, file-sharing programs, or infected email attachments.

There are three main types of viruses

- **Worms:** This is a computer program that replicates (copy/duplicate) itself. Unlike a computer virus, it is self-contained and hence does not need to be part of another program to propagate (spread) itself.
- **Trojan Horse:** A Trojan Horse is also a sort of destructive program that remains disguised in a normal software program. It is not exactly a virus, as it cannot replicate itself. However, there is possibility that virus program may remain concealed in the Trojan Horse.
- **Direct Action Virus:** When a virus attaches itself directly to a .exe or .com file and enters the device while its execution is called a Direct Action Virus. If it gets installed in the memory, it keeps itself hidden. It is also known as Non-Resident Virus.
- **Boot Sector virus:** This virus affects the MBR (Master boot record) of a storage device of your system. These viruses infect the storage device by infusing their piece of code in the partition table of your hard disk. Then it gets access into the main memory of your system when the computer starts. Booting issues, failure to find the hard disk, and precarious system performance are basic problems that may emerge after getting infected.
- **Overwrite Virus:** One of the most harmful viruses, the overwrite virus can completely remove the existing program and replace it with the malicious code by overwriting it. Gradually it can completely replace the host's programming code with the harmful code.
- **Macro Virus:** A virus written in the same macro language as used in the software program and infects the computer if a word processor file is opened. Mainly the source of such viruses is via emails.

Prevention measure

- Install Antivirus
- Always backup files
- Use a firewall
- Never download program from unauthorized sites
- Regular updates your software

Multimedia

Multimedia computer system has high capacity to integrate different media including text, image, graphics, audio, and video. The multimedia computer system stores, represents, processes, manipulates, and makes available to users. Components of multimedia are

- **Text:** It contains alphanumeric and some other special characters. Keyboard is usually used for input of text; however, there are some internal (inbuilt) features to include such text.
- **Graphics:** It contains alphanumeric and some other special characters. Keyboard is usually used for input of text; however, there are some internal (inbuilt) features to include such text.
- **Audio:** This technology records, synthesizes, and plays audio (sound). There are many learning courses and different instructions that can be delivered through this medium appropriately.
- **Video:** This technology records, synthesizes, and displays images (known as frames) in such sequences (at a fixed speed) that makes the creation appear as moving; this is how we see a completely developed video. In order to watch a video without any interruption, video device must display 25 to 30 frames/second.

Network and Internet

Computer network is a group of two or more computers and devices connected to each other through wired or wireless media to exchange data and information and share hardware, software and other resources. In other word, the interconnection of many computers to share information is called computer network. It can share resources like scanner, printer, hard disk, operating system software, application software, etc. within the networking computer.

Advantages of Computer Network

- A network connected computers can share hardware devices such as scanner, printer, hard disk, etc.
- It can communicate and share information all over the world through Internet.
- Computer network supports centralized administration.
- Networking also provides the facility of data and software backup system.

Disadvantage of Computer Network

- Networking also provides the facility of data and software backup system.
- Skilled manpower is required to manage and operate computer network.
- The initial setup cost is very high to build computer network.
- Cybercrimes are originated from computer network.

Types of Network

Computer network can be classified according to its area covered. The main three types of computer network on the basis of geographical location (area covered) are:
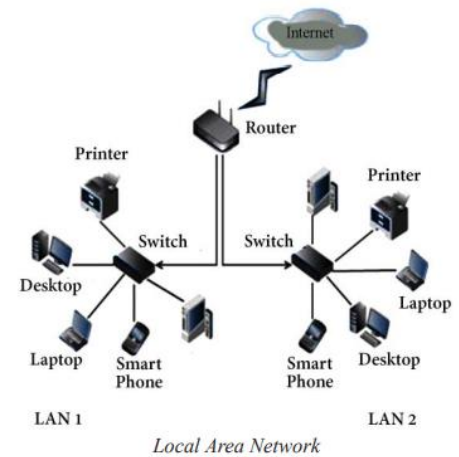
1. LAN (Local Area Network)
2. MAN (Metropolitan Area Network)
3. WAN (Wide Area Network)

LAN (Local Area Network): Local Area Network is a network limited within a small area like a room, a building, school, college, etc. generally connected through wire media. It can cover up to one kilometre for transferring data and information between the computers. It has high speed data transfer capacity than MAN and WAN. Computer in LAN can be connected through wireless media and is referred to as WLAN (Wireless Local Area Network).

Computer lab networking and cyber networking are examples of LAN. LAN supports a variety of communications transmission medium such as an Ethernet cable (thin cable, thick cable, and twisted pair), fiber and wireless transmission.
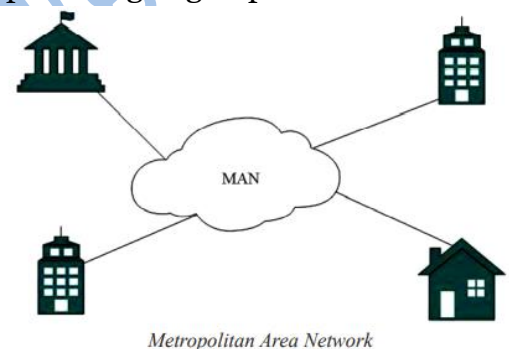
Features of LAN

- LAN runs the multiple devices to share a transmission medium.
- The different topology used mainly bus and ring in LAN.
- The communication quality is better in LAN; the transmission error rate is low as compare to WAN.

Local Area Network

MAN (Metropolitan Area Network): Metropolitan Area Network (MAN) is a network within the area like valley, city, metropolitan, etc. connected through wire or wireless technology or media. It covers more area than LAN and less area than WAN. It has high speed data transfer capacity than WAN and is slower than LAN. It is used in medium size organization having various branches within city or valley. Cable TV network and telephone networks providing high-speed DSL lines are examples of MAN.
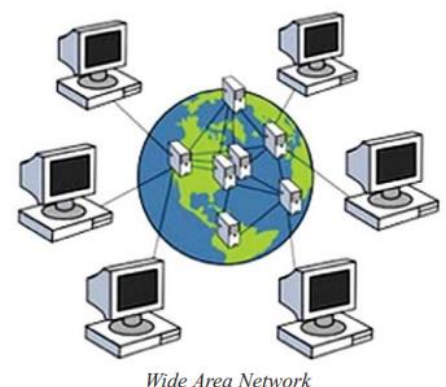
Features of MAN

- Network size up to 50 km. It may be as small as a group of buildings in a campus to as large as covering the whole city.
- It is normally owned by single or multiple organizations.
- It facilitates sharing of regional resources.
- They provide uplinks for connecting LANs to WANs and Internet.

Metropolitan Area Network

WAN (Wide Area Network): Wide Area Network is a network that is extended to a large area i.e. world in which computers are connected through wireless technology or media as satellite communication. It is the largest computer network. Internet, 4G Mobile Broadband Systems and satellite communication are the best examples of WAN.

Features of WAN

- It covers the whole world and cannot be restricted to any geographical location. It uses satellite and microwave communication.
- It is normally owned by multiple organizations.
- Communication links are provided by public carriers like telephone networks, satellites, network providers, cable systems, etc.
- They have low data transfer rate and high propagation delay so they have low communication speed.

Wide Area Network

Network Topology

Network topology is the inter-connected pattern of network components. A network topology may be physical, mapping hardware configuration, or logical, mapping the path that the data must take in order to travel around the network. The three main types of topology are:

- Bus Topology
- Ring Topology
- Star Topology

Bus Topology: This type of topology uses a segment of single cable to connect nodes. All nodes and network devices are connected to single cable called bus topology. Terminators are attached at the cable's start and end points. When it has exactly two end points, it is called linear bus topology.
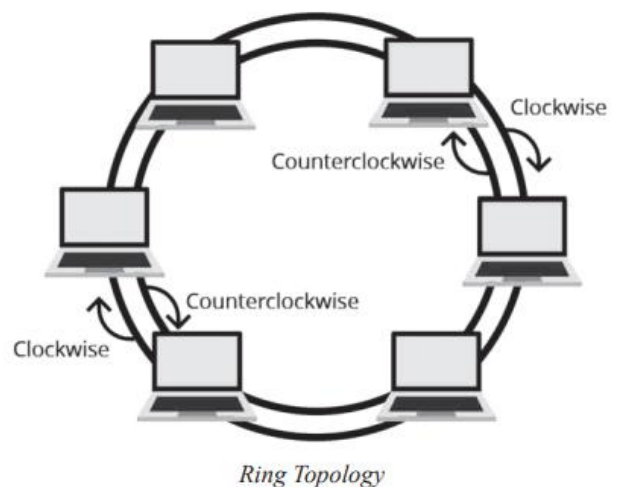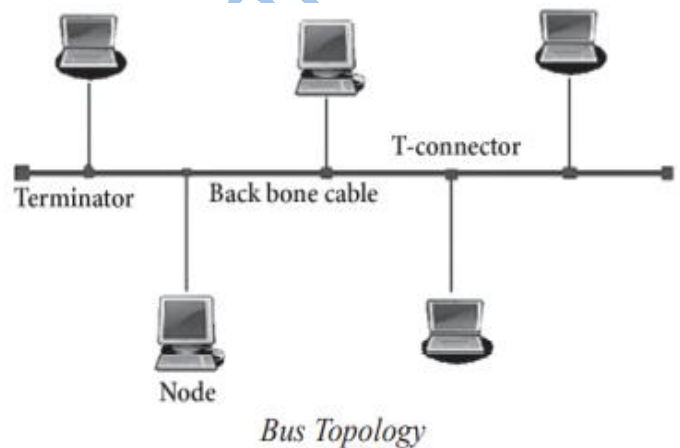
Advantages of Bus Topology

- It is cost effective and cable required is least compared to other network topology.
- It is used in small networks and easy to understand.
- It is easy to expand networks.

Bus Topology

Disadvantages of Bus Topology

- Break/Failure in main cable will make the whole network to malfunction.
- Heavy network traffic or increase in nodes will degrade performance of network.
- Terminators are necessary at both ends of the cable.
- **Ring Topology:** Ring topology forms a closed-loop as each computer is connected to another computer with the last one connected to the first is called ring topology. It uses fiber optic cable to transfer data. Each and every computer has equal responsibilities. A number of repeaters are used for Ring topology with large number of nodes. Data is transferred in a sequential manner.

Ring Topology

Advantages of Ring Topology

- In this topology all computers, in close loop, act as a client or server to transfer the information.
- Transmitting network is not affected by high traffic or by adding more nodes.
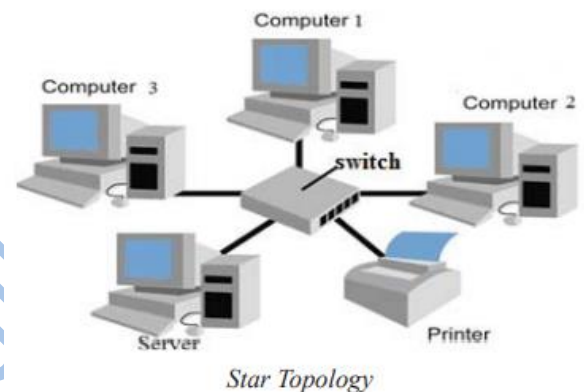
- It is cheap to install or setup and expand.

Disadvantages of Ring Topology

- It is difficult for troubleshooting.
- In ring topology, adding or deleting the computers disturbs the network activity.
- Failure of one computer disturbs the whole network in this topology.

Star Topology: It is a type of topology which connects all nodes to central device called hub/switch through a cable. It is probably the most common topology. Switch acts as a repeater for data flow. Star topology can be used with twisted pair, optical fiber and coaxial cable.

Advantages of Star Topology

- It provides fast performance and low network traffic.
- It is easy to troubleshoot setup and modify.
- The failure of one node has not affected the rest of the nodes.

Dis advantages of Star Topology

- Hub and more wires are required, so the cost of installation is high.
- The whole network is stopped when the hub fails.
- The system crucially depends on control device switch/hub. If it fails, entire network fails.

Star Topology

HUB: Hub is a network connectivity device with multiple ports for connecting different computers on network. It connects computers in star topology. It is simple, easier to install, low in cost, as compared to other devices. It can receive or send information between the computers. Nowadays, hub is replaced by a switch.

Hub

Switch: Switch is a network connectivity device which joins multiple computers together to share information among them. It co-ordinate file server and computers. The selected computer can get information through switch. It works faster than hub.

Switch

Hub	Switch
It is cheaper than switch	It is more expensive than hub.
It transmits data slower than switch.	It transmits data faster than hub.
It broadcasts the information packets to all computer connected network.	It transfers packets to only those selected computers connected in network.
It is half duplex device.	It is half duplex device.

Modem: MODEM stands for Modulator and Demodulator. The MODEM turns the computer's digital signals into analog signals which are then transmitted across the phone line is called modulation phase. The MODEM receives analog signals from phone line and converts into digital signals for the computer is called demodulation phase.

It can convert analog signal to digital signal and the vice versa. So, it is a device which connects computers to ISP (Internet Service Provider) by the help of telephone line or router device. The MODEM which is placed inside the CPU Casing is called internal modem. MODEM which is placed outside the Casing is called an external modem.

External MODEM

Network Cabling: Network cables are used to connect and transfer data and information between computers, routers, switches and storage area networks. These cables are essentially the carrier or media through which data flows. Different types of network cables, such as coaxial cable, optical fiber cable, and twisted pair cables, are used depending on the network's physical layer, topology, and size.

NIC: NIC stands for Network Interface Card. It connects all computers in network. It is placed on expansion slot of the motherboard. It provides a port on the back of system unit to connect a computer in network. It controls flow of data to and from computers in network environment. It is used in LAN (Local Area Network). Token ring and Ethernet are the examples of NIC card.
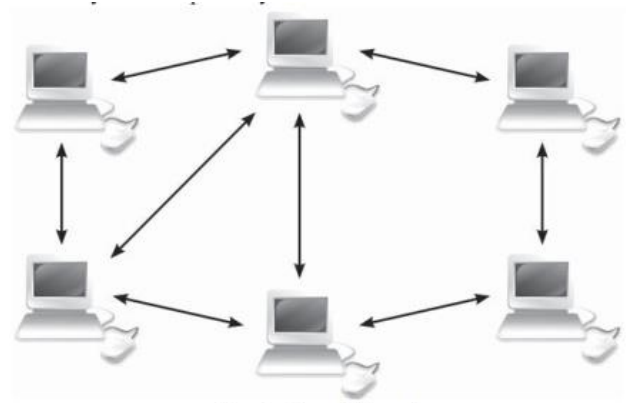
NIC Card

(NOS) Network Operating System: Network Operating System is a computer operating system that facilitates to connect and communicate various autonomous computers over a network. An Autonomous computer is an independent computer that has its own local memory, hardware, and O.S. The Network O.S. mainly runs on a powerful computer, that runs the server program. There are two types

1. Peer to Peer (NOS)
2. Client Server (NOS)

Features of Network Operating System

- Basic support for operating systems like protocol and processor support, hardware detection and multiprocessing.
- Printer and application sharing.
- Common file system and database sharing.
- Internetworking

Peer to Peer (NOS): In this type of network, all nodes on the network have an equal relationship with each other. It is also called workgroup. It can share data, hardware and software with each other. It is suitable for a small area such as small offices, small room, building, etc. Peer-to-peer usually works best for small to medium LANs and is cheaper to set up.

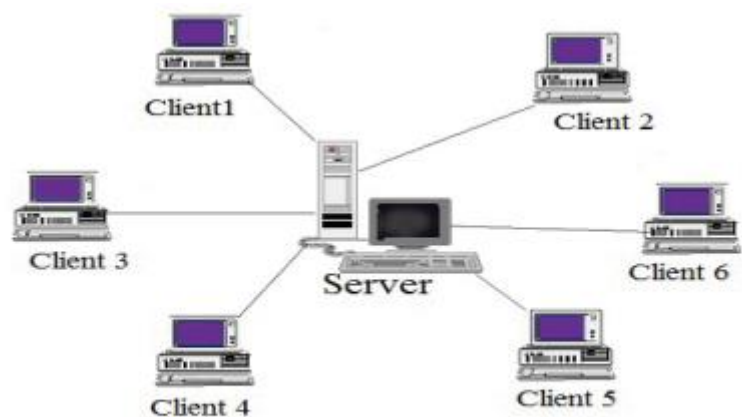*Peer to Peer Network*

Advantage of Peer to Peer

- All resources and contentions can be shared in this network
- System administrator is not required and each user can control their shared resources.
- The failure of one computer doesn't affect the functioning of other peers.

Dis advantages of Peer to Peer

- It is difficult for administrator and control as resources are decentralized in this network.
- Security is very low in this system.
- Data recovery or backup is very difficult.

Client Server Network: The Client-Server Networking Operating System operates with a single server and multiple client computers in the network. The Client O.S. runs on the client machine, while the Network Operating System is installed on the server machine. The server machine is a centralized hub for all the client machines. The client machines generate a request for information or some resource and forward it to the server machine.

The server machine is a very powerful computer, that is capable of tackling large calculations and operations. It can be multiprocessing in nature, which can process multiple client requests at the same time.

Client-Server Network

Advantages

1. It has centralized control and administration.
2. It has a backup facility for lost data.
3. Security is better in this network.

4. It has better reliability and performance.

Disadvantages

1. The setup cost is very high.
2. There is a requirement of specialized software for client and server machines to function properly.
3. There is a need for an administrator to administer the network.
4. There may be network failure, in case of central server failure.

Email/Internet

Internet: The Internet is a network of networks, a global communication system that links together thousands of individual networks. As a result, virtually any computer on any network can communicate with any other computer on any other network. These connections allow users to exchange messages, to communicate in real-time (seeing messages and responses immediately), to share data and program, and to access limitless stores of information.

Today, the internet connects thousands of networks and hundreds of millions of users around the world. It is a huge, cooperative community with no central ownership. This lack of ownership is an important feature of the Internet because it means that no single person or group controls the network. The Internet is open to anyone who can access it. If you can use a computer and if the computer is connected to the internet, you are free not only to use the resources posted by others, but to create resources of your own.

Internet technology

The seeds of the internet were planted in 1969 when the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defence began connecting computer at different universities and defence contractors. The resulting network was called ARPANET.

	Internet	Intranet	Extranet
Size of network	It's a global network with unlimited user connected	It is a private network with limited users	It is a private and limited user network
Uses	It is use for the information and communication	It is use within an organization just for employee	It is use just to share business information
Regularity	It is not regulated by any organization	It is regulated by single an organization	It is regulated by single or multiple organization

Security	Security depends up on the user and the connected network	It is secured by the firewall	It is secured by firewall and VPN
Accessed	It can be accessed by any user	It can be accessed by authorized user only	It can be accessed by the authorized user only
Training	No training is required	Training may require	Training is compulsory

Email: An electronic communication invented in the 1970s to do communication faster during the era of letters and telegrams that changed the way people communicate with each other is called an Email. A method of exchanging messages instantly from one system to another with the help of the internet is called an Email. Initially, Email usage was limited to users of the same computer, and it asked for the users to be online to receive the messages. Time changed, and now we know how the mailbox looks.

The process starts with an email client's help by connecting it through a server called Simple Mail Transfer Protocol through the internet. A dedicated port is assigned to the server to help the client transfer the messages through the mail. It is necessary to keep the header information intact so that the recipient's email address should be correct. SMTP converts the information to transfer the mail content across the ports. The @ sign acts as a divider between the name and mail server, and hence SMTP looks for the mail server after @ sign. There are different clients for emails such as Outlook, Gmail, thunderbird etc. and mails can be sent and received from different clients.

Advantages

- E-mails provides faster and easy mean of communication.
- Various folders and sub-folders can be created within inbox of mail
- It is effective and cheap means of communication because single message can be send to multiple people at same time.
- We can send multimedia within email.
- It is secure and reliable method to deliver our message.
- No need any kind of paper, thus it is environmental friendly.

Disadvantages

- It is source of viruses.
- It is informal method of communication.
- To be updated users have to check inbox from time to time.
- Email lack personal touch.

WWW (World Wide Web): World Wide Web, which is also known as a Web, is a collection of websites or web pages stored in web servers and connected to local computers through the internet. These websites contain text pages, digital images, audios, videos, etc. Users can access the content of these sites from any part of the world over the internet using their devices such as computers, laptops, cell phones, etc. The WWW, along with internet, enables the retrieval and display of text and media to your device.
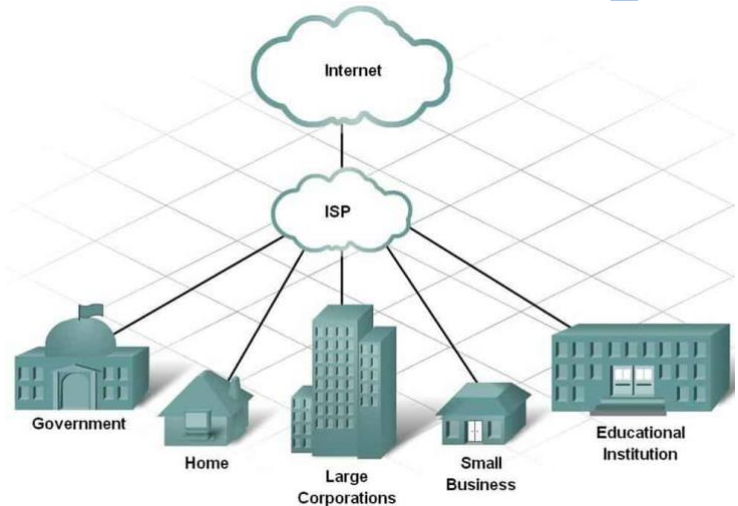

Web Server

the web provides a communication platform for users to retrieve and exchange information over the internet. Unlike a book, where we move from one page to another in a sequence, on World Wide Web we follow a web of hypertext links to visit a web page and from that web page to move to other web pages. You need a browser, which is installed on your computer, to access the Web.

ISP:

- An Internet service provider (ISP) is a company that provides web access to both businesses and consumers.

- ISPs may also provide other services such as email services, domain registration, web hosting, and browser services.
- An ISP is considered to be an information service provider, storage service provider, Internet network service provider (INSP), or a mix of all of them.
- Internet use has evolved from only those with university or government accounts having access to nearly everyone having access, whether it's paid or free.
- Access has gone from dial-up connections to high-speed broadband technology.
- Examples Vianet, Weblink, Web surfer, Worldlink, HTTP etc.

Search Engines: Search engines are - well - "engines" or "robots" that crawl the web looking for new web pages when we typed by typing one or more words. These robots read the web pages and put the text (or parts of the text) into a large database or index that you may access. The engine then displays a list of web pages that contain information related to your words called a keyword. None of them covers the whole net, but some of them are quite large. Google, Bing, Yahoo Search, Ask.com, AOL.com, Baidu are some popular search engines. For school students, an important search engine is "KidRex". It provides a list of websites based on the provided keywords suitable for school students.

Web Browser: A Web browser is a software application such as Mozilla Firefox, Google Chrome, Microsoft Edge, Brave, Safari, Opera etc. designed to find hypertext documents on the web and then open the documents on the user's computer. It is a client application that enables the client computer to gain access to a Web server or other internet servers, such as FTP and Gopher. A browser also interprets and displays documents. Mosaic was the first web browser while Mozilla Firefox and Google Chrome are the most commonly used browsers nowadays.

Brave   Mozilla firefox   Google chrome   Microsoft edge   Safari

Web browsers

Outlook Express (OE): Outlook Express is an email client that lets the user save, send, receive and manage email messages. It does the same system like other email service provider like Gmail, yahoo, Ymail etc. Outlook Express is not to be confused with Microsoft Outlook — they both perform the function of sending and receiving emails, but their codebase is entirely different from each other and they are separate programs.

Advantages of Outlook express

- **Save time by downloading email from various accounts**: This point applies to those who have multiple email accounts. You don't need to waste time in checking each email account separately. Multiple accounts can be set up in Outlook Express which means email from all these accounts will be downloaded together at one place – your computer. You can also use filters and Outlook Express message rules to segregate email messages as they arrive at your system. For example, all incoming Gmail messages can be diverted to one folder while those from Hotmail to another. You can similarly isolate emails based on sender, file size, whether they have attachments etc.

- **A copy of your emails in on your computer**: Probably the *most important advantage of using Outlook Express* and other email management software is the ability to store a copy of all your email on your computer. So even if you accidentally delete an important message from your server or if (God forbid) your account is hacked or is inaccessible, you know you can retrieve the messages from your system. Also, to play it really safe, you can take regular backups of Outlook Express.

- **Messages can still be accessed via the online GUI**: Most people presume that once Outlook Express (or any other email client) downloads email, the messages are removed from the server. In fact, users feel that this is the biggest disadvantage of using email clients because emails will, now, no longer be available from any location. However, any email client

worth its salt will let you preserve a copy of the email message on the server. This option can be activated through the settings and options in the program.