FUNDAMENTALS OF INFORMATION TECHNOLOGY

UNIT-1

Computer Definition:-A Computer is an electronic device that can accept and store input data, process them and produce output result according to the instruction given to it. In other words a an electronic data processing machine.

Characteristics/Capabilities of Computer:-

1. **Speed**:- Computer is a very fast device. It is capable of performing calculation of very large amount of data. The computer has units of speed in microsecond, nanosecond, and even the picosecond. It can perform millions of calculations in a few seconds as compared to man who will spend many months to perform the same task.
2. **Accuracy**:- It gives accurate results for the correct input data. Accuracy means correctness of the process data. In addition to being very fast, computers are very accurate. The calculations are 100% error free. Computers perform all jobs with 100% accuracy provided that the input is correct.
3. **Diligence/Consistency**:- Unlike human beings, a computer is free from monotony, tiredness, and lack of concentration. It can work continuously without any error and boredom. It can perform repeated tasks with the same speed and accuracy.
4. **Reliability**:- A computer is a reliable machine. Modern electronic components have long lives. Computers are designed to make maintenance easy.
5. **Arithmetical and Logical operations**:- A Computer can perform Arithmetical & Logical operations. In Arithmetical operations , it performs the Addition, Subtraction, Multiplication & Division on the numerical data. In Logical operation it compares the numerical data as well as alphabetical data.
6. **Versatility**:- Its role is versatile, used for scientific, business, training, simulation, games, music, and fine art purposes.
7. **Storage**:- Computer stored internal and external data. The Computer has an in-built memory where it can store a large amount of data. You can also store data in secondary storage devices such as floppies, which can be kept outside your computer and can be carried to other computers.
8. **Communication**:- Exchange message or data through computer network.

Evolution /History of computer:-

1. **ABACUS**:- It is the first mechanical calculating device. It was invented 5000 years ago in Asia minor and still use in today. It consists of a wooden frame with vertical rods with the frame.
2. **Pascaline**:- It was the first mechanical calculator device invented by Blaise Pascaline in 1642. Pascaline used to perform calculation based on the base ten system.
3. **Leibniz multiplier**:- In 1694, a German Mathematician Von Leibniz improved pascaline by creating a machine that could also multiply Leibniz's mechanical.
4. **Charles Babbage**:- Charles Babbage is known as "Father of Computers". Babbage developed a machine to performed differential equation in 1822.

5. **Herman Hollerith**:- In 1899, an American inventor Herman Hollerith, used punch cards to store data and Information.

Limitations of Computer:-

Although a computer is far better in performance than a human being, it fails in certain ways as follows:

(i) Computers can't Think:- Computers cannot think and they can't do any job unless they are first programmed with specific instructions for same. They work as per stored instructions. Algorithms are designed by humans to make a computer perform a special task. This is also called artificial intelligence.

(ii) Computers can't Decide:- Computers are incapable of decision making as they do not possess the essential elements necessary to take a decision i.e. knowledge, information, wisdom, intelligence and the ability to judge.

(iii) Computers can't Express their Ideas:- In any type of research ideas plays a vital role. In this context, computers can't express their ideas.

(iv) Computers can't Implement:-Though computers are helpful in storage of data and can contain the contents of encyclopaedias even, but only humans can decide and implement the policies.

(v) No IQ :- A computer is a machine that has no intelligence to perform any task. Each instruction has to be given to the computer. A computer cannot take any decision on its own.

(vi) No Feeling:- Computers have no feelings or emotions. It cannot make judgment based on feeling, taste, experience, and knowledge unlike humans.

Generation of Computer:-

Computer generation means a step of Advancement in Technology. /It also reflects the growth of computer industry. The Advancement in technology existed not only in Hardware but also in Software.

There are Five Generation of Computer.

1. First Generation of Computer(1940-1956).
2. Second Generation of Computer(1956-1963).
3. Third Generation of Computer(1964-1971).
4. Four Generation of Computer(1971 and Present).
5. Fifth Generation of Computer(Present & Beyond).

First Generation of Computer(1940-1956):-

The First Generation of Computer were mainly developed by Government for the purpose of War. The First Computers used Vacuum tubes and Magnetic Drums for memory, and were often enormous, taking up entire rooms. The Early Computer which were developed are as follows.

- Mark-I:- An Electronically Computer developed by Howard H Aiken. The purpose of the Computer was creates for the U.S.Navy.
- ENIAC:- Electronic Numerical Integrator Automatic Computer. It was developed by John Presper Eckert and John W Mauchly. It was a First Electronic Computer consisting of 18000 vacuum tubes 70000 Resistors. It was 1000 times faster than Mark-I.
- EDVAC:- Electronic Discrete Variable Automatic Computer. It was developed by John Von Neumann. It had Advanced concepts like" Stored Memory Technique" and "Conditional Control transfer",
- UNIVAC:- Universal Automatic Computer. It was developed by Remington Rond. It was commercially available computers.

Features:-

- Vacuum tubes were used for Internal Operation..
- It did not have much memory. Magnetic drums were used for memory.
- Machine level language used for programming.
- Processing speed was very slow.
- It was very expensive.
- The system were huge and non portable.

Second Generation of Computer(1956-1963):-

In the mid-1950's Bell Labs developed the transistor. Transistors were capable of performing many of the same tasks as vacuum tubes but were only a fraction of the size. The first transistor-based computer was produced in 1959. Transistors were not only smaller, enabling computer size to be reduced, but they were faster, more reliable and consumed less electricity.

The other main improvement of this period was the development of computer languages. Assembler languages or symbolic languages allowed programmers to specify instructions in words. which were then translated into a form that the machines could understand (typically series of 0's and 1's: Binary code). Higher level languages also came into being during this period. Whereas assembler languages had a one-to-one correspondence between their symbols and actual machine functions, higher level language commands often represent complex sequences of machine codes. Two higher-level languages developed during this period (Fortran and Cobol) are still in use today though in a much more developed form.

Features:-

- Transistor were used for Internal Operation.
- It had more Magnetic Core was used for memory.
- Assembly language used, but in later stage High level language were used for programming. Ex COBOL(Common Business Oriented Language) FORTRAN(Formula Translator).
- The system were faster and powerful worked at milliseconds speed.
- The system's size decreased and become cheaper.

Third Generation of Computer(1964-1971):-

In 1965 the first **integrated circuit (IC)** was developed in which a complete circuit of hundreds of components were able to be placed on a single silicon chip 2 or 3 mm square. Computers using these IC's soon replaced transistor based machines. Again, one of the major

advantages was size, with computers becoming more powerful and at the same time much smaller and cheaper. Computers thus became accessible to a much larger audience. An added advantage of smaller size is that electrical signals have much shorter distances to travel and so the speed of computers increased.

Another feature of this period is that computer software became much more powerful and flexible and for the first time more than one program could share the computer's resources at the same time (multi-tasking). The majority of programming languages used today are often referred to as 3GL's (3rd generation languages) even though some of them originated during the 2nd generation.

Features:-

- Integrated Circuits(IC) on silicon chips were used for Internal Operations.
- Processing speed increased from millisecond(10^{-3}) to microsecond(10^{-6}).
- Minicomputer were introduced.
- Software industry emerges and operating system developed.
- Computer were general purpose that could be used for a number of commercial applications.

Four Generation of Computer(1971 and Present):-

In 1970 large-scale integration was achieved where the equivalent of thousands of integrated circuits were crammed onto a single silicon chip. This development again increased computer performance (especially reliability and speed) while reducing computer size and cost. Around this time the first complete general-purpose microprocessor became available on a single chip. In 1975 Very Large Scale Integration **(VLSI)** took the process one step further. Complete computer central processors could now be built into one chip. The microcomputer was born. Such chips are far more powerful than ENIAC and are only about 1cm square whilst ENIAC filled a large building.

During this period Fourth Generation Languages **(4GL's)** have come into existence. Such languages are a step further removed from the computer hardware in that they use language much like natural language. Many database languages can be described as 4GL's. They are generally much easier to learn than are 3GL's.

Features:-

- Developed of LSI-That could fit 100 of components on to one chip and VLSI(very large scale integrated circuit) could fit 1000 of components on to chip and also ULSI(ultra large scale integrated circuit) fitted million of components on to one chip.
- Computer could be Networked which lead to the development of LAN.
- Hardware failure were reduced.
- The system were faster, more powerful, more reliable, cheaper and had more memory.
- Microprocessor are used.

Fifth Generation of Computer(Present & Beyond):-

Fifth Generation using recent technology computer are able to spoken instruction.

Features:-

- Emergency of Artificial Intelligence. Ex development of Robot to assist human.

- ❖ Computers become extremely powerful.
- ❖ Super computers were used.
- ❖ System become more reliable, faster and cheaper.

Classification of Computers:- Computer are classified based on different concepts. Thet can be as follows

- Classification based on Purpose.
- Classification based on Technology and Operation.
- Classification based on Size and Speed.

Classification based on Purpose:- Computers are designed for different purposes they can be used either for general or for specific purposes.

- ❖ General purpose:- It is works on different types of programmers and these can be used for different application.
- ❖ Specific purpose:- It is designed to perform a specific task.

Classification based on Technology and Operation:- The different types of computers process the data in different forms. According to processing computer can be classified into 3 categories. 1. Analog 2. Digital 3. Hybrid

Analog Computer:- Analog computers operates by Measuring physical units such as Voltage, Pressure, Temperature, Speed etc. In Analog computers, continuous quantities are used.

Characteristics:-

- ❖ It operates by Measuring.
- ❖ They are fast in operation but accuracy is poor.
- ❖ The output is generally represented in the form of graph.
- ❖ It has limited memory space and application.

Digital Computer:- The Digital computers works upon discontinuous data. Computer that operates with numerical or non-numerical information represented in digital form is known as Digital Computer. These computers operates in bits ie 0's & 1's. All the Analog quantities must be converted into digital quantity.

Characteristics:-

- ❖ It operates by Counting.
- ❖ Calculation can be done by converting into binary numbers 0's &1's.
- ❖ Accuracy is good and execution speed is high.
- ❖ It has a large memory space.
- ❖ It also accepts numbers, words & symbols.

Hybrid Computers:- Hybrid computers combines both Analog & Digital computers. In these computers some calculation take place in Analog manner & some calculation take place in Digital manner. Hybrid computers are used in Hospital to measure Patient Heartbeats, Temperature. The Robot is the best ex of Hybrid computer.

Classification of Computer Based on Size and Speed:- Computers are classified according to their data processing speed, amount of data that they can hold and price. Depending upon their speed & memory size. Computer are classified following four main groups.

1. Super Computers.
2. Mainframe Computer.
3. Mini Computers.
4. Micro Computers.

Super Computers:-

- ❖ Super computer is the most Powerful and Fastest, and also very Expensive.
- ❖ It was developed by 1980's.
- ❖ It is used to large amount of data & to solve the complicated scientific problems.
- ❖ In a single super computer thousands of users can be connected at the same time and the super computer handles the work of each user separately.
- ❖ Super computer mainly used for
- Weather forecasting.
- Nuclear energy research.
- Aircraft design.
- Automotive Design.
- Online banking.
- To control industrial units.

Mainframe Computers:-

- ❖ Mainframe computer are also large scale computers but super computers are larger than mainframe.
- ❖ These are also very Expensive.
- ❖ The mainframe computer specially requires a very large clean rooms with air conditional.
- ❖ It is a multiple processor.
- ❖ Example IBM, S/390.
- ❖ There are basically two types of terminals used with mainframe systems. They are
- Dumb Terminal:-
- Intelligent Terminal:-
- ❖ The mainframe computers are specially used as servers on the world wide web.
- ❖ The mainframe computers are used in large organization such as Banks, Airlines and Universities.

Mini Computers:-

- ❖ These are smaller in size , have power processing speed and also have lower cost than mainframe.
- ❖ These computers known as minicomputers because of their small size as compared to other computers at that time.
- ❖ The capabilities of a minicomputer are between mainframe and personal computer.
- ❖ These computers are known as midrange computers.
- ❖ The first minicomputers introduced in mid 1960's by Digital Equipment Corporation.

- The minicomputer are used as web servers.

Micro Computers:-

- The micro computer are also known as Personal Computer.
- Microprocessor is used for in this type of computer.
- These are very small in size.
- The cost is less.
- The IBM's first micro computer was designed in 1981 and was named as IBM-PC. After this many computer hardware companies copied the design of IBM-PC.
- The most popular types of personal computers are the PC and the Apple.
- Personal computers are available in two models. These are
- Desktop's PC's:-
- Tower PC's:-
- Microcomputers are further divided into following categories.

1. Laptop Computer
2. Workstation
3. Network Computer
4. Handheld Computer

Laptop Computer:-

- Laptop computer is known as note book computer.
- It is small size(85 by 11) inch notebook computer and can fit inside a briefcase.
- The laptop computer is operates on a special battery and it does not have to be plugged in like desktop computer.
- It is mostly used during journey.
- It can be used on your lap in an airplane.
- The memory and storage capacity of laptop computer is almost equivalent to the PC or Desktop computer.
- It also has the hard disk, floppy disk drive, ZIP disk drive, CD ROM drive, CD writer etc it has built keyboard and built in track ball as pointing device.
- Laptop computer are more expensive than desktop computer.
- These laptop computers are frequently used in business travellers.

Workstation:-

- Workstation are special e processing single user computers have the same features as personal computers but have the processing speed equivalent to minicomputer or mainframe computer.
- A workstation computer can be fitted on a desktop.
- Scientist, Engineers, Architects and Graphical designers mostly use these computers.
- Workstation computers are expensive and powerful computers.
- These have advanced processors, more RAM and storage capacities than personal computers.
- These are usually used as single user application but these are used as servers on computer network and web servers.

Network Computers:-

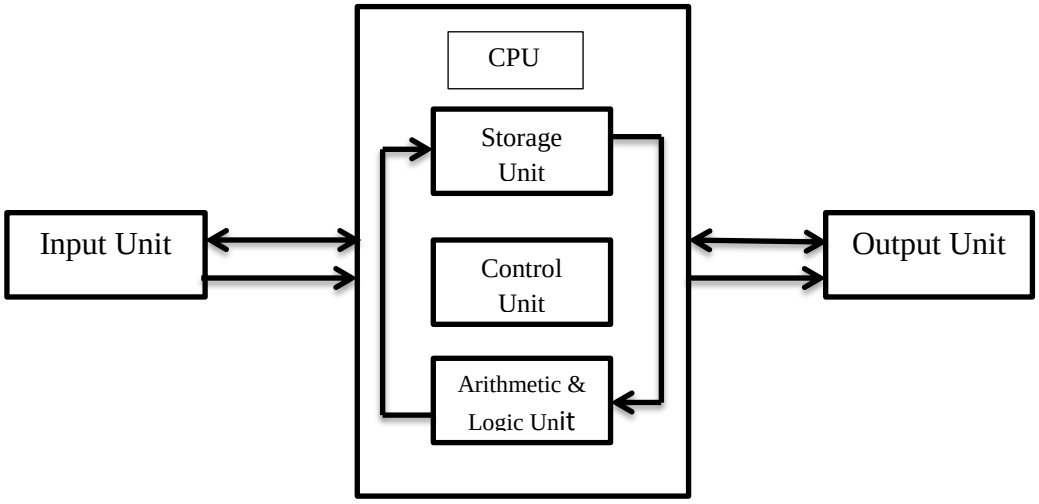
- Network computers are also version of personal computers having less processing power, memory and storage.
- These are specially designed as terminals for network environment.
- Some type of network computers designed for network, internet and intranet.
- The network computer depends upon the network's server for data storage and use to software.
- Some network computer are designed to access only the internet or to an intranet. These devices are sometimes called PC's, internet boxes.
- Network computers are cheaper to purchase and to maintain than personal computer.

Handheld Computer:-

- In the mid 1990,s, many new type of small personal computing device have been introduced and these are referred to as handheld computer.
- These computer is also referred to as palmtop computer.
- The handheld computers sometime called mini note book computer.
- The type of computer is named as handheld computer because it can fit in one hand while you can operate it with the other hand.
- It is reduced size, the screen of handheld computer is quite small.
- Similarly it also has small keyboard.
- The handheld computers are preferred by business travellers.
- These computers are used by mobile employees, such as meter readers and parcel delivery people, whose jobs require them to move from place to place.
- The examples of handheld computers are

- **Personal Digital Assistance(PDA)**:- The PDA is one of the most popular light weight mobile devices is use today. A PDA provides special functions such as taking notes, organizing telephone numbers and addresses. Most PDAs also offer a variety of other application software such as word processing, spread sheet and games etc.
- **Cellular Phones**:- A cellular phone is a web telephone having features of analog and digital devices. It is also referred smart phone. In addition to basic phones capabilities, a cellular phone also provide the functions to receive and send E-mails and faxes and to access the internet.
- **H/PC Pro Devices**:- H/PC Pro Devices is new development in handheld technology. These system are larger than PDAs but they are not quite as large as typical notebook PCs. These devices have features between PDAs and notebook PCs. The H/PC Pro Device includes a full size keyboard but it does not include disk. These system also have RAM with very low storage capacity and slow speed of processor.

Block Diagram Of Computer:-



Computers are built from many components. They are

- Input Unit.
- Central Processing Unit.
- Output Unit.

Input Unit:- Computer need to received data and instruction in order to solve any problem. Therefore we need to input the data and instruction into the computers. The input unit consists of one or more input devices.

Keyboard is the one of the most commonly used input device. All the input devices perform the following functions.

- Accept the data and instruction from outside the world.
- Convert it to form that the computer can understand.
- Supply to converted data to the computer system for further processing.
  Ex: Keyboard, Mouse, Scanner.

Central Processing Unit(CPU):- The control unit and ALU of the computer are together known as the CPU. The CPU performs the following functions.

- It is the brain of computer.
- It performs all calculations.
- It takes all decisions.
- It controls all units of the computer. A PC may have CPU-IC such as Intel 8088,80286, Celeron, Pentium etc..

The CPU Consists of

- **Arithmetic Logical Unit(ALU)**:- An ALU is the part of processor(CPU) that carries out arithmetic and logic operations on the operand in computer instruction words. Typically, the ALU as direct input and output access to the main memory and input and output devices. In arithmetic unit arithmetic operations such as addition, subtraction, multiplication and division are performed. In the logic unit, one of 16 possible logic operations can be performed. Function

of logic section is to perform logic operations such as comparing, selecting, matching, and merging of data.

- **Control Unit(CU)**:- The control unit is the controls the flow of information through the processor and co-ordinates the activities of other unit with in it. The control unit performs the task of fetching, decoding, execution and then storing results.

  Functions of this unit are –

- It is responsible for controlling the transfer of data and instructions among other units of a computer.
- It manages and coordinates all the units of the computer.
- It obtains the instructions from the memory, interprets them, and directs the operation of the computer.
- It communicates with Input/Output devices for transfer of data or results from storage.
- It does not process or store data.

- **Storage Unit or Memory Unit**:- The Storage unit of the computer holds Data and instruction that are entered through the input unit, before they are processed. It preserves the intermediate and final results before these are sent to the output devices. It also saves the data for the later use.

  Functions of the memory unit are

- It stores all the data and the instructions required for processing.
- It stores intermediate results of processing.
- It stores the final results of processing before these results are released to an output device.
- All inputs and outputs are transmitted through the main memory.

Memory size:- 1 Byte= 8Bit, 1KB=1024Byte, 1MB=1024KB, 1GB=1024MB

Output Unit:- The result of the data processing is normally produces either on a display unit such as monitor or on a paper. The paper on which the result is printed is generally referred to as a hard copy. The most commonly used devices are Printer, Monitor, Speaker.

Computer Applications:-

1. **Business**:- A computer has high speed of calculation, diligence, accuracy, reliability, or versatility which has made it an integrated part in all business organizations.

   Computer is used in business organizations for –

- Payroll calculations
- Budgeting
- Sales analysis
- Financial forecasting
- Managing employee database
- Maintenance of stocks, etc.

2. **Banking:-** Today, banking is almost totally dependent on computers.

   Banks provide the following facilities −

- Online accounting facility, which includes checking current balance, making deposits and overdrafts, checking interest charges, shares, and trustee records.
- ATM machines which are completely automated are making it even easier for customers to deal with banks.

3. **Insurance**:- Insurance companies are keeping all records up-to-date with the help of computers. Insurance companies, finance houses, and stock broking firms are widely using computers for their concerns.

   Insurance companies are maintaining a database of all clients with information showing −

- Procedure to continue with policies
- Starting date of the policies
- Next due instalment of a policy
- Maturity date
- Interests due
- Survival benefits
- Bonus

4. **Education:-** The computer helps in providing a lot of facilities in the education system.

- The computer provides a tool in the education system known as CBE (Computer Based Education).
- CBE involves control, delivery, and evaluation of learning.
- Computer education is rapidly increasing the graph of number of computer students.
- There are a number of methods in which educational institutions can use a computer to educate the students.
- It is used to prepare a database about performance of a student and analysis is carried out on this basis.

5. **Marketing:-** In marketing, uses of the computer are following −

- **Advertising** − With computers, advertising professionals create art and graphics, write and revise copy, and print and disseminate ads with the goal of selling more products.
- **Home Shopping** − Home shopping has been made possible through the use of computerized catalogues that provide access to product information and permit direct entry of orders to be filled by the customers.

6. **Healthcare:-** Computers have become an important part in hospitals, labs, and dispensaries. They are being used in hospitals to keep the record of patients and medicines. It is also used in

scanning and diagnosing different diseases. ECG, EEG, ultrasounds and CT scans, etc. are also done by computerized machines.

Following are some major fields of health care in which computers are used.

- **Diagnostic System** − Computers are used to collect data and identify the cause of illness.
- **Lab-diagnostic System** − All tests can be done and the reports are prepared by computer.
- **Patient Monitoring System** − These are used to check the patient's signs for abnormality such as in Cardiac Arrest, ECG, etc.
- **Pharma Information System** − Computer is used to check drug labels, expiry dates, harmful side effects, etc.
- **Surgery** − Nowadays, computers are also used in performing surgery.

7. **Engineering Design:-** Computers are widely used for Engineering purpose.

   One of the major areas is CAD (Computer Aided Design) that provides creation and modification of images. Some of the fields are −

- **Structural Engineering** − Requires stress and strain analysis for design of ships, buildings, budgets, airplanes, etc.
- **Industrial Engineering** − Computers deal with design, implementation, and improvement of integrated systems of people, materials, and equipment.
- **Architectural Engineering** − Computers help in planning towns, designing buildings, determining a range of buildings on a site using both 2D and 3D drawings.

8. **Military** - Computers are largely used in defence. Modern tanks, missiles, weapons, etc. Military also employs computerized control systems. Some military areas where a computer has been used are −

- Missile Control
- Military Communication
- Military Operation and Planning
- Smart Weapons

9. **Communication:-** Communication is a way to convey a message, an idea, a picture, or speech that is received and understood clearly and correctly by the person for whom it is meant. Some main areas in this category are −

- E-mail
- Chatting
- Usenet

- FTP
- Telnet
- Video-conferencing

10. **Government:-** Computers play an important role in government services. Some major fields in this category are −

- Budgets
- Sales tax department
- Income tax department
- Computation of male/female ratio
- Computerization of voters lists
- Computerization of PAN card
- Weather forecasting

Basic Components of Computer:- There are Four components of Computer system.

1) Hardware
2) Software
3) Users
4) Data

Hardware:- The Physical devices that can be touch & feel. Hardware units are responsible for entering storing and processing the given data and then displaying the output to the user.

Ex:- Monitors, Keyboards, Mouse, Speakers, Printers, Scanners.

Data:- Data refers to the raw facts and pieces of information that is usually entered into the computer system by the user.

Ex:- Alphabets(A to Z), Numbers(0 to 9), Special symbols, Images, Videos, Audios etc.

Users:- Computer system are designed by the people for the people. Users who actually user computer system for their applications. User might include a variety of people in different areas of applications. Such as Education, Business, Entertainment.

Software:- Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.

There are two types of software −

- **System Software**:- The programs, which are designed to control the different operations of the computer. It mainly manages the activities of the computer hardware and interacts with the application software to perform a particular task.

  Ex:- Operating System, Linux, Unix.

- **Application Software**:- The program which are designed to perform a specific task for the user. There are software which are installed by the user for the use.

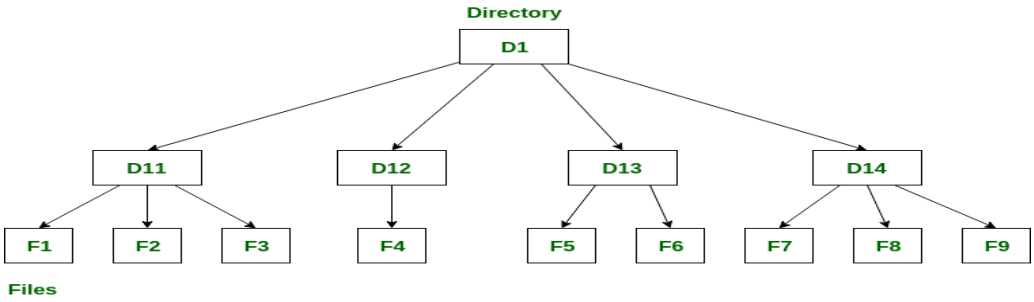
  Ex:- Microsoft office, C, C++,Java, Tally. Nudi etc.

Files:- A computer file is used to store data in digital format like plain text, image data, or any other content. Computer files can be organized inside different directories. Files are used to keep digital data, whereas directories are used to keep files.

Computer files can be considered as the digital counterpart of paper documents. While programming, you keep your source code in text files with different extensions, for example, C programming files end with the extension **.c**, Java programming files with **.java**, and Python files with **.py**.

Directories:

Generally, file systems have directories to keep track of files. Directories are itself files in many systems. A **directory** is like a container which contains folders and file. It organises files and folders into hierarchical manner.



Advantages of maintaining directories are:

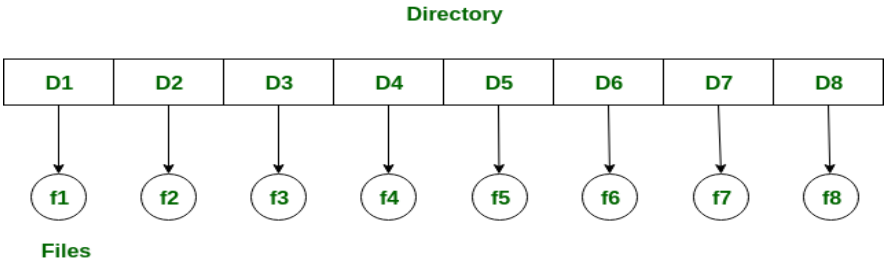
- **Efficiency:** A file can be located more quickly.
- **Naming:** It becomes convenient for users as two users can have same name for different files or may have different name for same file.
- **Grouping:** Logical grouping of files can be done by properties e.g. all java programs, all games etc.

There are several **logical structures of directory**, these are given as below.

1. **Single-level directory:**

Single level directory is simplest directory structure. All files are stored in single directory called root directory, which make it easy to support and understand. This system was common in the earlier PCs as there was only one user.

A single level directory has significant limitation, when the number of files increases or when the system has more than one user. Since all the files are in the same directory, they must have the unique name.



Advantages:

- Since it is a single directory, its implementation is very easy.
- If files are smaller in size, searching is faster.
- The operations like file creation, searching, deletion, updating is very easy.

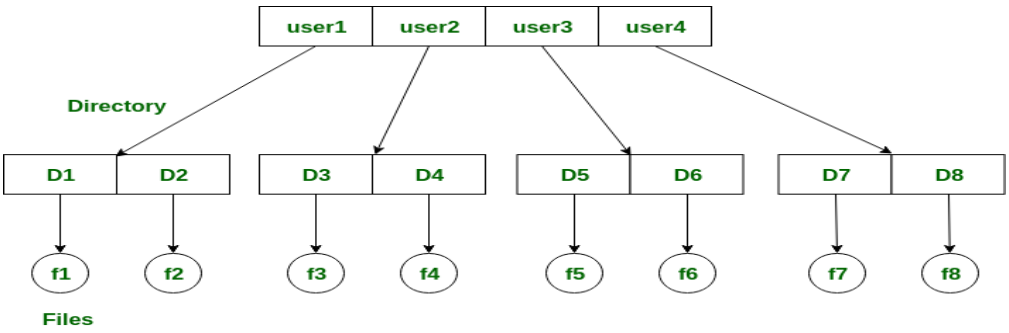
Disadvantages:

- Files must have unique name.
- Searching will take more time if directory contains more files.
- Same type of files cannot be group together.

2. Two-level directory:

As we have seen, a single level directory often leads to confusion of files names among different users. The solution to this problem is to create a separate directory for each user.

Therefore in two-level directory system, names chosen by one user don't interfere with names chosen by a different user and there is no problem is caused by the same name occurring in two or more directories.



Advantages:

- No confusion of files names among different users.
- Different users can have same file name.
- Searching of files become more easy due to path name and user-grouping.

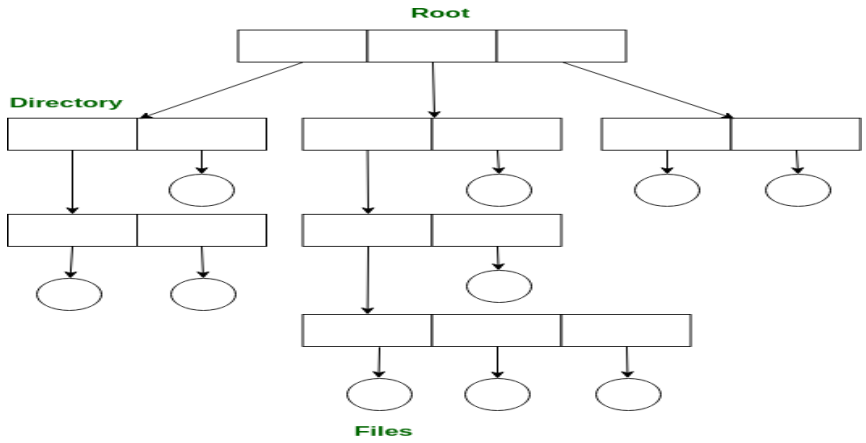
Disadvantages:

- A user is not allowed to share files with other users.
- Still it is not very scalable; two files of the same type cannot be grouped together in the same user.

3. Tree-structured directory

Tree-structured directory is also called as Hierarchy structured directory. Hierarchical directory system is used for users with a large number of files. With this approach, each user

can have as many directories as they needed, so that files can be grouped together. It also allows the user to create their own subdirectories and to organise their files accordingly. A tree structure is the most common directory structure. The tree has a root directory, and every file in the system have a unique path.



Advantages:

- Very generalize, since full path name can be given.
- Very scalable, the probability of name collision is less.
- Searching becomes very easy we can use both absolute path as well as relative.

Disadvantages:

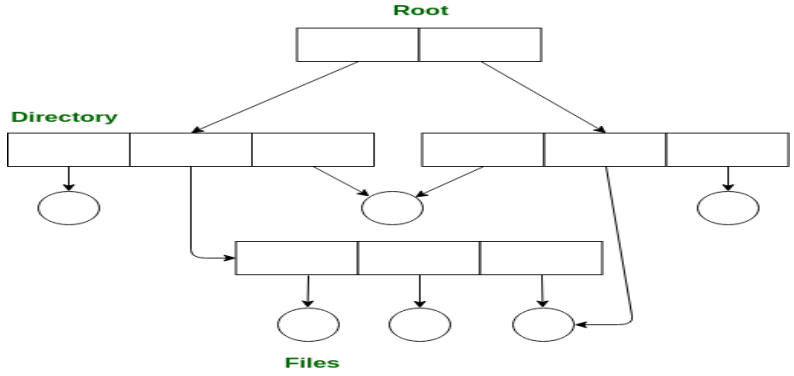
- Every file does not fit into the hierarchical model, files may be saved into multiple directories.
- We cannot share files.
- It is inefficient, because accessing a file may go under multiple directories.

4. Acyclic graph directory

An acyclic graph is a graph with no cycle and allows sharing subdirectories and files. The same file or subdirectories may be in two different directories. It is a natural generalization of the tree-structured directory.

It is used in the situation like, when two programmers are working on a same project and they need to access the files related to the project. The associated files are stored in a subdirectory, separated from other projects and files. The programmers want the subdirectories into their own directories, so the common subdirectories should be shared.

Note that shared file is not the same as copy file if any programmer makes some changes in the subdirectory it will reflect in both subdirectories.



Advantages:

- We can share files.
- Searching is easy.

Disadvantages:

- Since we share files, deletion of files may create problems.
- If the link is soft-link then after deleting the file we left with a dangling pointer.
- In case of hard-link, to delete a file we have to delete all the reference associated with it.

Input Devices:- Computer need to received data and instruction in order to solve any problem. Therefore we need to input the data and instruction into the computers. The input unit consists of one or more input devices.

Ex:- Keyboard, Mouse, Joystick, Light Pen, Scanner, Trackball, Digital Camera, OCR, OMR, MICR, Voice-Recognition System etc.

Keyboard:- The Keyboard is the one of the most input device for computers. Using a keyboard the user can type text and execute commands, both the data and program can be entered into the computer. The keyboard is much like a type writer and has all alphabetic, numerical and special character found on a type writer. The data is entered into computer by simply pressing various key present in the keyboard.

Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys. The layout of the keyboard can be divided into the following section.

1. **Typing Keys:-** These keys include the letter keys (A-Z) and digit keys (09) which generally give the same layout as that of typewriters.
2. **Numeric Keypad**:-It is used to enter the numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machines and calculators.
3. **Function Keys**:- The twelve function keys are present on the keyboard which are arranged in a row at the top of the keyboard. Each function key has a unique meaning and is used for some specific purpose.
4. **Control keys**:- These keys provide cursor and screen control. It includes four directional arrow keys. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).
5. **Special Purpose Keys:-** Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

Mouse:- Manually Operated User Serial Engine. In computing, a mouse is a pointing device that function by detecting two dimensional motion relative to its supporting surface. It is the most popular pointing device. It can be rolled on a desk, which effects a pointer on the screen move around. It has two or three buttons for execution of some operations like selecting text for editing, open menus, move objects, drag images etc.

Three types of mouse.

- Mechanical Mouse:- User a rubber ball whose movement sends electrical signals to the system unit, which causes the pointer to move around.
- Optical Mouse:- Uses diodes to emit light onto a metal pad, performing the some task, but usually with greater accuracy.
- Opto-mechanical mouse:- Uses both a rubber ball diodes to emit light and has usually greater accuracy.

Pen drive:- A USB flash drive consists of a flash memory data storage device integrated with a USB(Universal Serial Bus) interface. USB flash drives are typically removable and rewritable, much smaller than a floppy disk, and most weight less than an 30g. Storage capacities can range from 64MB to 256 GB with steady improvements in size and price per capacity.

Joystick:- Joystick is also a pointing device, which is used to move the cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions.

The function of the joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

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.

Scanner:- Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation.

Scanner captures images from the source which are then converted into a digital form that can be stored on the disk. These images can be edited before they are printed.

Track Ball:- Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse. This is a ball which is half inserted and by moving fingers on the ball, the pointer can be moved.

Since the whole device is not moved, a track ball requires less space than a mouse. A track ball comes in various shapes like a ball, a button, or a square.

Digitizer:-Digitizer is an input device which converts analog information into digital form. Digitizer can convert a signal from the television or camera into a series of numbers that could be stored in a computer. They can be used by the computer to create a picture of whatever the camera had been pointed at.

Digitizer is also known as Tablet or Graphics Tablet as it converts graphics and pictorial data into binary inputs. A graphic tablet as digitizer is used for fine works of drawing and image manipulation applications.

Microphone:-Microphone is an input device to input sound that is then stored in a digital form.

The microphone is used for various applications such as adding sound to a multimedia presentation or for mixing music.

Digital Camera:- It can capture a scene, digitize and store the images, which can be copied to a computer. It senses image by a light sensitive phototransistors which are arranged in a grid. This grid generates electrically falling on it.

Monochrome digital camera has single transistor per pixel but colour has three transistor(RBG). These transistors generate continuous electrical signals, which are converted into digital form using ADC, then sent to digital signal processor, which is programmed to handled image information.

Touch Screen:- Touch screen is a special kind of display screen which is touch sensitive. When the user touches an object on the screen, the sensors on the screen detect the touch of a finger and send the input to the CPU.

Various options can be selected by the user by touching the options displayed on the screen with his finger. Touch screens or touch panels are used for simple applications such as

- At ATM (Automated Teller Machine) of a bank where the user can deposit or withdraw money, check balance amount in the bank etc.
- Information stand, at airport or railway station which provides the information to passengers regarding hotels, restaurants etc.

Scanning Devices

Magnetic Ink Card Reader (MICR):-MICR input device is generally used in banks as there are large number of cheques to be processed every day. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable.

This reading process is called Magnetic Ink Character Recognition (MICR). The main advantages of MICR is that it is fast and less error prone.

Optical Character Reader (OCR):-OCR is an input device used to read a printed text.

OCR scans the text optically, character by character, converts them into a machine readable code, and stores the text on the system memory.

Bar Code Readers:- Bar Code Reader is a device used for reading bar coded data (data in the form of light and dark lines). Bar coded data is generally used in labelling goods, numbering the books, etc. It may be a handheld scanner or may be embedded in a stationary scanner.

Bar Code Reader scans a bar code image, converts it into an alphanumeric value, which is then fed to the computer that the bar code reader is connected to.

Optical Mark Reader (OMR):- OMR is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked.

It is specially used for checking the answer sheets of examinations having multiple choice questions.

UNIT-2

Output Devices:- The result of the data processing is normally produces either on a display unit such as monitor or on a paper. The paper on which the result is printed is generally referred to as a hard copy. The most commonly used devices are Printer, Monitor, Speaker.

Monitors:- Monitors, commonly called as **Visual Display Unit** (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Flat-Panel Display

Cathode-Ray Tube (CRT) Monitor:- The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity or resolution. It takes more than one illuminated pixel to form a whole character, such as the letter 'e' in the word help.

A finite number of characters can be displayed on a screen at once. The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed. Most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically.

There are some disadvantages of CRT – 1. Large in Size 2. High power consumption

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

The flat-panel display is divided into two categories −

- **LCD(Liquid crystal display):-** It consists of a layer of colour or monochrome pixels arranged schematically between a couple of transparent electrodes.
- **LED(Light emitting diodes):-** There are flat panel or slightly curved display which make used to LED for back lighting. LED are said to use much lesser power that CRT and LCD.

Printers:- Printer is an output device, which is used to print information on paper.

They are two types of printers.

- Impact Printers.
- Non-Impact Printers

Impact Printers:- Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper.

Characteristics of Impact Printers

- Very low consumable costs
- Very noisy
- Useful for bulk printing due to low cost
- There is physical contact with the paper to produce an image

They are two types.

- Character printers
- Line printers

Character Printers:- Character printers are the printers which print one character at a time.

These are further divided into two types:

- Dot Matrix Printer(DMP)
- Daisy Wheel

Dot Matrix Printer:-In the market, one of the most popular printers is Dot Matrix Printer. These printers are popular because of their ease of printing and economical price. Each character printed is in the form of pattern of dots and head consists of a Matrix of Pins of size (5*7, 7*9, 9*7 or 9*9) which come out to form a character which is why it is called Dot Matrix Printer.

Advantages

- Inexpensive
- Widely Used
- Other language characters can be printed

Disadvantages

- Slow Speed
- Poor Quality

Daisy Wheel Printer:- Head is lying on a wheel and pins corresponding to characters are like petals of Daisy (flower) which is why it is called Daisy Wheel Printer. These printers are

generally used for word-processing in offices that require a few letters to be sent here and there with very nice quality.

Advantages

- More reliable than DMP
- Better quality
- Fonts of character can be easily changed

Disadvantages

- Slower than DMP
- Noisy
- More expensive than DMP

Line Printers:-Line printers are the printers which print one line at a time.

These are of two types

- Drum Printer
- Chain Printer

Drum Printer:-This printer is like a drum in shape hence it is called drum printer. The surface of the drum is divided into a number of tracks. Total tracks are equal to the size of the paper, i.e. for a paper width of 132 characters, drum will have 132 tracks. A character set is embossed on the track. Different character sets available in the market are 48 character set, 64 and 96 characters set. One rotation of drum prints one line. Drum printers are fast in speed and can print 300 to 2000 lines per minute.

Advantages

- Very high speed

Disadvantages

- Very expensive
- Characters fonts cannot be changed

Chain Printer:-In this printer, a chain of character sets is used, hence it is called Chain Printer. A standard character set may have 48, 64, or 96 characters.

Advantages

- Character fonts can easily be changed.
- Different languages can be used with the same printer.

Disadvantages

- Noisy

Non-impact Printers:- Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page Printers.

They are three types.

- Laser Printers
- Inkjet Printers
- Thermal Printer

Characteristics of Non-impact Printers

- Faster than impact printers
- They are not noisy
- High quality
- Supports many fonts and different character size

Laser Printers:- These are non-impact page printers. They use laser lights to produce the dots needed to form the characters to be printed on a page.

Advantages

- Very high speed
- Very high quality output
- Good graphics quality
- Supports many fonts and different character size

Disadvantages

- Expensive
- Cannot be used to produce multiple copies of a document in a single printing

Inkjet Printers:- Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features.

They make less noise because no hammering is done and these have many styles of printing modes available. Colour printing is also possible. Some models of Inkjet printers can produce multiple copies of printing also.

Advantages

- High quality printing
- More reliable

Disadvantages

- Expensive as the cost per page is high
- Slow as compared to laser printer

Thermal Printer:- They use heat to produce an image on special paper. The print mechanism contains a dot matrix head, which is designed to heat the surface of chemically treated paper so that a dot is produces based on the reaction of the chemical to the heat. No ribbon or ink is involved.

Plotters:- A Plotter is a pointer designed for pointing vector graphics. Instead of pointing individual dots on paper, plotters draw continuous lines. This makes plotters ideal for pointing Architectural blueprints, Engineering design and CAD drawing.

They are two types.

- **Drum Plotters:-** A Drum plotter is a pen plotter that cover the paper around a drum with a pin feed attachment. The drum then rotates the paper as pen moves across it and draw the image.
- **Flat bed:-** A flat bed plotter is a mechanism drafting device used with many Cad programs for designer. A paper remains stationary on a flat surface while a pen moves across it horizontally and vertically. This plotters may use different pen colour to create the graphics.

Screen Image Projector:-

Memory Unit:- Computer memory refers to devices that are used to store data or program on a temporary or permanent basic for use in an Electronic digital computer. Computer represents information in binary code, written as sequence of 0's and 1's. They are 2 types.

- Primary Memory
- Secondary Memory

Primary Memory:- The memory that is accessible directly by the CPU of a computer is called primary memory. This is generally used to hold the program being currently executed in the computer the data being received from input unit, the intermediate the final result of the program. In primary memory the data will be stored temporary. Example RAM and ROM.

Functions of Primary Memory:-

- To contain a copy of the main software program.
- Currently being executed files can be stored temporarily.
- Stores the data from input unit unit which is required for processing.
- Temporarily stores the data input from keyboard.

They are 2 types in primary memory.

- ✓ RAM(Random Access Memory)
- ✓ ROM(Read Only Memory)

Characteristics of Primary Memory

- These are semiconductor memories.
- It is known as the main memory.
- Usually volatile memory.
- Data is lost in case power is switched off.
- It is the working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without the primary memory.

RAM(Random Access Memory):- RAM is the internal memory of the CPU for storing data, program, and program result. It is a read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased.

Access time in RAM is independent of the address, that is, each storage location inside the memory is as easy to reach as other locations and takes the same amount of time. Data in the RAM can be accessed randomly but it is very expensive.

RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence, a backup Uninterruptible Power System (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

RAM is of two types −

- Static RAM (SRAM)
- Dynamic RAM (DRAM)

Static RAM (SRAM):-The word static indicates that the memory retains its contents as long as power is being supplied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not be refreshed on a regular basis.

There is extra space in the matrix, hence SRAM uses more chips than DRAM for the same amount of storage space, making the manufacturing costs higher. SRAM is thus used as cache memory and has very fast access.

Characteristic of Static RAM

- Long life
- No need to refresh
- Faster
- Used as cache memory

- Large size
- Expensive
- High power consumption

Dynamic RAM (DRAM):- DRAM, unlike SRAM, must be continually refreshed in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory as it is cheap and small. All DRAMs are made up of memory cells, which are composed of one capacitor and one transistor.

Characteristics of Dynamic RAM

- Short data lifetime
- Needs to be refreshed continuously
- Slower as compared to SRAM
- Used as RAM
- Smaller in size
- Less expensive
- Less power consumption

ROM(Read Only Memory):- ROM stands for Read Only Memory. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM stores such instructions that are required to start a computer. This operation is referred to as bootstrap. ROM chips are not only used in the computer but also in other electronic items like washing machine and microwave oven.

Let us now discuss the various types of ROMs and their characteristics.

PROM (Programmable Read Only Memory):-

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM program. Inside the PROM chip, there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

EPROM (Erasable and Programmable Read Only Memory):-

EPROM can be erased by exposing it to ultra-violet light for a duration of up to 40 minutes. Usually, an EPROM eraser achieves this function. During programming, an electrical charge is trapped in an insulated gate region. The charge is retained for more than 10 years because the charge has no leakage path. For erasing this charge, ultra-violet light is passed through a quartz crystal window (lid). This exposure to ultra-violet light dissipates the charge. During normal use, the quartz lid is sealed with a sticker.

EEPROM (Electrically Erasable and Programmable Read Only Memory):-

EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of reprogramming is flexible but slow.

Advantages of ROM

- Non-volatile in nature
- Cannot be accidentally changed
- Cheaper than RAMs
- Easy to test
- More reliable than RAMs
- Static and do not require refreshing
- Contents are always known and can be verified

Secondary Memory:- This type of memory is also known as external memory or non-volatile or Auxiliary memory. It is slower than the main memory. These are used for storing data/information permanently. CPU directly does not access these memories, instead they are accessed via input-output routines. The contents of secondary memories are first transferred to the main memory, and then the CPU can access it. For example, disk, CD-ROM, DVD, etc.

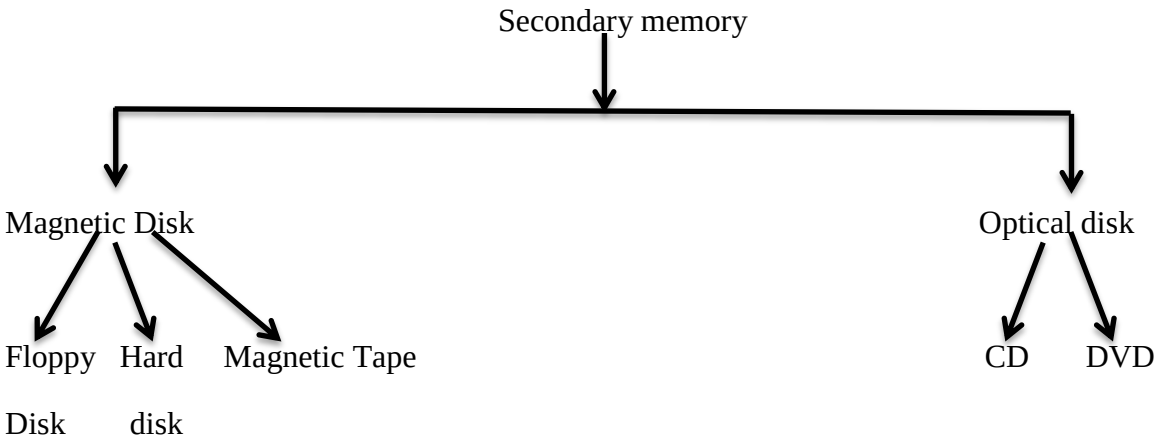
Functions/Features of Secondary Memory

- ❖ Information is stored on both sides of the disk surface.
- ❖ The surface is divided into a number of invisible concentric circles tracks.
- ❖ Secondary memory are non-volatile in nature.
- ❖ Capacity is large ie it can store large amount of data.
- ❖ It can easily ported from one computer to another.

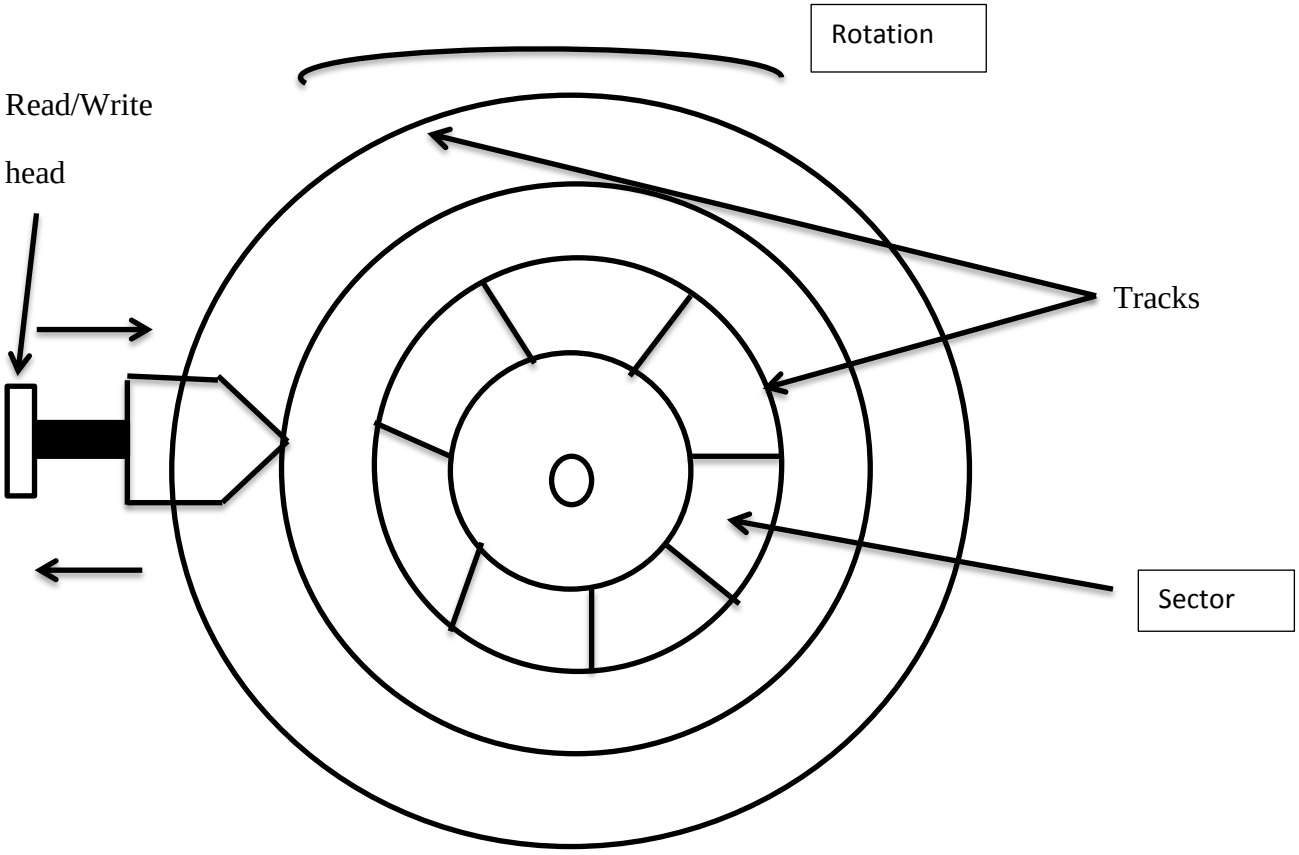
Characteristics of Secondary Memory

- These are magnetic and optical memories.
- It is known as the backup memory.
- It is a non-volatile memory.
- Data is permanently stored even if power is switched off.
- It is used for storage of data in a computer.
- Computer may run without the secondary memory.
- Slower than primary memories.

Classification/Types of Secondary Memory



Magnetic Disk:- A magnetic disk is a circular plate made up of metal or plastic, coated with magnetized material. Often both sides of the disk are used to store information. Disks are having concentric circles called tracks, which are further divided into section are called sector. The minimum amount of information that can be read or written is a sector.



Usually several such disks may be mount on one spindle with read/write heads available on each surface. Here all disks rotate together at high speed. To read or write information to a sector it requires specifying the disk number, which surface, the sector number and the tracks within a sector.

They are three types of Magnetic Disk

- **Floppy Disk**:- These are small removable disks that are plastic coated with magnetic recording material. Floppy disks are typically 3.5″ in size (diameter) and can hold 1.44 MB of data. This portable storage device is a rewritable media and can be reused a number of times. Floppy disks are commonly used to move files between different computers. The main disadvantage of floppy disks is that they can be damaged easily and, therefore, are not very reliable.
  - A soft magnetic disk.
  - Floppy disks are portable.
  - Floppy disks are slower to access than hard disks and have less storage capacity ,but they are much less expensive.
  - Can store data upto1.44MB.
  - Two common sizes:5¼”and3½”.
  - It is also known as Diskette.

- **Hard Disk:**- Another form of auxiliary storage is a hard disk. A hard disk consists of one or more rigid metal plates coated with a metal oxide material that allows data to be magnetically recorded on the surface of the platters. The hard disk platters spin at 5 a high rate of speed, typically 5400 to 7200 revolutions per minute (RPM).Storage capacities of hard disks for personal computers range from 10 GB to 120 GB (one billion bytes are called a gigabyte). The surface of each plate is organised as a number of concentric tracks. Each track is divided into sectors. Set of matched tracks are called cylinders.
  - The hard disk drive is the main, and usually largest, data storage device in a computer.
  - It can store any where from160 gigabytes to 2 tera bytes.
  - Hard disk speed is the speed at which content can be read and written on a hard disk
  - A hard disk unit comes with a set rotation speed varying from 4500 to 7200 rpm.
  - Disk access time is measured in milliseconds.

- **Magnetic Tape:**- The Magnetic Tapes is the Type of Secondary Storage Device and this Device is used for taking back up of data and this Tape contains some magnetic fields and the Magnetic Tapes are used Accessing the data into the Sequential Form and the Tape Also Contains a Ribbon which is coated on the Single Side of the Tape and also contains a head which reads the data which is Recorded on to the Tape. And when we are reading the information from the disk then we can also read backward information means we can also back the Tape for Reading the Previous information. And For inserting the Tape into the System we also Requires Some Tape Drives Which Contains Tape and which is Responsible for Reading the contents from the Tapes.

  They can Store huge Amount of data into the Tape Drive , But the Main Limitation of the Tape Drive is that we cant Access the Data from the Disks directly means if we wants to 100th Record from the Tape then we must have to move all the Previous i.e. 99th Records first. And the Tapes are also easily damaged due to the Human Errors.
  - A magnetically coated strip of plastic on which data can been coded.
  - Tapes for computers are similar to tapes used to store music.
  - Tape is much less expensive than other storage mediums but commonly a much slower solution that is commonly used for back up.

Optical Disks:- It laser light used to store information. It depending 0 or 1 is stored. Optical Mass Storage Devices Store bit values as variations in light reflection. They have higher area density & longer data life than magnetic storage. They are also Standardized and relatively inexpensive. Their Uses: read-only storage with low performance requirements, applications

with high capacity requirements & where portability in a standardized format is needed.

Types of Optical Disk

1. CD-ROM (read only)
2. CD-R: (record) to a CD
3. CD-RW: can write and erase CD to reuse it (re-writable)
4. DVD(Digital Video Disk)

CD(Compact Disk):- It is used to data or information. CD-ROM means compact disk read only memory. This means we can read from the disk, not write or store data onto it. They are also known as optical disks because the data is read by a laser beam reflecting or not reflecting from the disk surface.

Uses:- Most software programs are sold on CD-ROM.

DVD(Digital Video Disk or Digital Versatile Disk):- It is a optical disk storage media format, and was invented and developed by Philips, Sony, Toshiba and Time Warner in 1995. It main uses are video & data storage. DVD are the same dimension as CDs but store more than six times as much data.

DVD-RAM can all record and erase data multiple times. The wavelength used by standard DVD laser is 650nm thus the light has a red colour.

Flash Memory:- It is a form of Non-volatile memory. The contents can be erased and modified in blocks in one bulk operation instead of one byte at a time and hence the name flash memory. It is used in Digital camera, Mobile phone, Portable mp3 player etc.

USB Drives:- A small, portable flash memory card that plugs into a computer's USB port and functions as a portable hard drive.

Flash drives are available.

In sizes such as 256MB, 512MB,1GB, 5GB,and16GB and are an easy way to transfer and store information.

Difference between Primary Memory and Secondary Memory

Primary Memory	Secondary Memory
Primary memory is directly accessible by Processor/CPU.	Secondary memory is not directly accessible by CPU
Main memory.	Auxiliary memory.
Instructions or data to be currently executed are copied to main memory.	Data to be permanently stored is kept in secondary memory
Primary memory is usually volatile	Secondary memory is non-volatile
Primary memories are made of semiconductors.	Secondary memories are made of magnetic and optical material.
Accessing data from primary memory is faster.	Accessing data from secondary memory is slower.
Primary memory is accessed by the data bus.	Secondary memory is accessed by input-output channels.
The computer has a small primary memory.	The computer has a larger secondary memory.
Primary memory is costlier than secondary	Secondary memory is cheaper than primary

memory.	memory
Primary memory is an internal memory.	Secondary memory is an external memory.

Difference between RAM and ROM

RAM	ROM
It is a read-write memory.	It is read only memory.
Used to store the data that has to be currently processed by CPU temporarily.	It stores the instructions required during bootstrap of the computer.
It is a volatile memory.	It is a non-volatile memory.
Random Access Memory.	Read Only Memory.
Data in ROM can be modified.	Data in ROM can not be modified.
RAM sizes from 64 MB to 4GB.	ROM is comparatively smaller than RAM.
RAM is a costlier memory.	ROM is comparatively cheaper than RAM.
Types of RAM are static RAM and dynamic RAM.	Types of ROM are PROM, EPROM, EEPROM.

UNIT -3

Computer Software:- Software is the set of program inside given to the computer to carryout certain task without software computer will not work.

Software is classified as

1. Application software.
2. System software.

Application software:- These are the programs employed by the user to perform specific function. The term application software describe programs that help the user to accomplished specific task. It is written for user.

Different types of application software are

- General application software.
- Customized software.
- Utility software.

General application software:- This type of software help the user performing day to day general task. It is developed to fulfil the needs of general computer users.

Important general application software are

- Word processor:- It is software to prepared the documents such as letters, report etc.
- Electronic spread sheet:- Spread sheet is the simple worksheet comprises of row and columns. It is used to enter numerical data and formula.
- Graphics, Multimedia, Presentation software:- It is used presentation, animation etc.
- Database Software:- It is used to store simple data in desired order.

Customized software:- Customized software is developed for specific user-customers, large organization, life insurance company, banks, university and hospitals developed and use customized software as per their requirement.

Customized software develop for one organization cannot be used for other organization but it can be modified for other users.

Utility software:- Utility software are those that provide additional services to the user. Some of the utility software are

- Antivirus utility:- Ex Norton antivirus, MacAfee antivirus etc
- Backup software
- Field defragmentation
- Screen savers

System software:- System software consist of program designed for working on computer system. It helps in the effective use of computer system by the user.

The software performs standard task such as translating programs written in various languages, memory management, loading software etc.

Different types of system software

Operating system:- An operating system is a system software which acts on interface between the users and the computer hardware. The operating is to control and co-ordinate the various function in a effective manner.

Main functions of operating system. They are

- Loads application programs.
- Input and Output operations.
- Controlling of file storage.
- Communication error message of operator.
- Perform function to check the availability of peripherals, memory etc.

Objectives:- An operating system is an essential part of almost every computer system. The main objectives of an operating system are:

1. To manage the computer hardware:- The operating system must manage efficiently, the resources of the computer such as memory, processor, file systems, input/output devices and other external devices such as hard disk, floppy disk etc.
2. To provide a user interface:- Users must be able to interact with the computer through the operating system to complete the task on hand(using commands like Dir, Copy, Del etc in DOS).
3. To make the computer system convenient to use in an efficient manner.
4. To hide the details of the hardware resources from the users.
5. To provide users a convenient interface to use the computer system.
6. To act as an intermediary between the hardware and its users, making it easier for the users to access and use other resources.
7. To manage the resources of a computer system.
8. To keep track of who is using which resource, granting resource requests, and mediating conflicting requests from different programs and users.
9. To provide efficient and fair sharing of resources among users and programs.

Functions of Operating System/Features/Characteristics:-

Generally a computer system can be divided into four components as in figure. They are

- Computer hardware
- Operating system
- System programs
- Application programs

- Users

The computer hardware consisting of the central processing unit(CPU), the memory and the input/output(I/O)devices, provides the basic computing resources, word processors, spread sheets, compilers, web browsers are some of the application program used to solve the problems of the user. Therefore, it is the OS that directly controls and co-ordinated the computer hardware resources for the various users.

In order to manage the computer hardware the operating system performs the following functions.

1. **Process Management**:- A process is simply a program in execution. A process must be executed sequentially. Therefore the CPU executes the instructions one after the other until the process is completed.
   The operating system is responsible for
- Creation and deletion of a process.
- Suspending and resuming a process.
- Providing mechanism for processing synchronisation and communication.
- Providing technique for deadlock handling.

2. **Memory Management**:- To execute a program on a disk, first it must be loaded into memory. When the program is executing, it accesses program instruction and data from memory. Eventually, when the program terminates, its memory space become available for the processes, which are next loaded into memory for execution. Therefore the OS is responsible for
- Keeping track of current memory usage.
- Selecting process to be loaded into memory when memory space is available.
- Allocating and reclaiming memory space on completion of the process.

3. **File Management**:- The activities of the OS with respect to file management are
- Creation, deletion and manipulation of files and directories.
- Mapping of files onto secondary storage.
- Backup and recovery of files

4. **Device Management**:- The responsibilities of the device manager which is part of the OS is
- To manage the input/output operations with devices such as keyboard, mouse, printer etc.
- To manage the device drivers.
- To manage the memory component that controls buffering, caching and spooling.

5. **Security Management**:- Security manager, which is part of the OS , is responsible for
- Controlling access of programs, process or users to the resources.
- Improving reliability by early detecting of errors.
- Providing a means of differentiating between authorized and unauthorized users.

6. **Disk Management**:- Proper management of secondary storage is required, since most of the programs use the disk storage for both source and destination of their processing.
   The responsibilities therefore of the disk manager are
- Storage allocation.
- Scheduling of disk.
- Management and allocation of free space.

7. **User Interface**:- The OS allows the user interface with the computer so that the user can use the system resources effectively. This interface is known as the User Interface.
   Programming Languages:-It is well known fact that communication language is important similarly even computer s need a language to communicate with others. Such a language as a programming language.
   All computer Language can be classified in following categories.

1. Low level language.

i. Machine level language

ii. Assembly language

2. High level language.

i. Specific purpose language

ii. General purpose language

Machine level language:- Machine level language is the only language that the computer can understand and follow. It is made up od sequence of 0's and 1's and is hence quite difficult for us to understand and follow.

The instruction provides in machine level language are immediately understood and converted into electrical signals to run computer. An instruction given in the machine language has two parts.

a) OPCODE(Operation Code):- The operation Code denotes the operation, which is to be formed such as addition, multiply, divide etc.
b) OPERAND(Address/Location):- The Operand part of the instruction code gives the specific location or address of the data to which the operation code is to be applied.

Advantages:-

- Machine languages make efficient use of storage.
- Instruction of a machine language program are immediately executed.
- Machine language instructions can be used to manipulate the individual bits in a byte of computer storage.

Disadvantage:-

- Machine language are machine dependent.
- Machine language is difficult to program.
- It is difficult to correct or modify machine language programs.

Assembly Language:- The complexities of machine language led to the search of another language and assembly language was developed. It was developed in the early 1950's and its main developer was IBM.

This language assign mnemonics code to each machine language instruction to make it easier to remember or write.

Every instruction of assembly language contains-

a) Symbolic operation code(MNEMONICS CODE).
b) Symbolic address.

Example 1:-

MNEMONICS CODE	Meaning
ADD	Code for Addition
SUB	Code for Subtraction
LOAD	Code for Load
STORE	Code for Storing

Advantages:-

- Easy to understand and use.
- Less error prone.
- Less time is required in writing a program than language.
- Language is simple when compared with machine language.
- Program correction/modification is relatively easier when compared with machine language programs.

Disadvantage:-

- It is machine dependent.
- It is less efficient.
- Slow development time.

High Level Language:- High Level Language were developed in the early 1960's and these are third generation programming language(3GL).

The instruction in high level languages are written by using symbols and words just like English language which is great improvement over the mnemonics. For example, COBOL, FORTRAN, BASIC, C, C+, Python, etc. The program written in such a language can usually run on computers of different types, size and manufactures. The high level language programs are very easy to write, modify and maintain.

Advantage:-

- It is Readability.
- It is a machine independent.
- Easy Debugging.
- Easier to maintain.
- Low development cost.
- Easy documentation.

Disadvantage:-

- Less Efficient.
- Poor control on hardware.

Language Translator:- Language translator are system software which perform translate high level language or assembly level language to machine level language. In addition to check the errors that may present in the program be translated.

There are 3 types of language translator

1. **Assembler**:- Assembler is a system software which translate an assembly language program into its machine language equivalent. An assembler translate complete source program into an object program. Identify any other along the way. If there are any errors the assembler display their errors for debugging. If the program is error free execute the program immediately. The object program created by assembler can be run many times without translating again.
2. **Compiler:-** Compiler is a standard program written supplied by the computer manufactured. It is the system software the translate source code(machine level language program) of high level program. The process of translation called compilation.
3. **Interpreter**:- Interpreter is the language translator that translate a statement of high level and immediately execute set before translating the next source code statement.

Disk Operating System

MS-DOS is one of the oldest and widely used operating system. DOS is a set of computer programs, the major functions of which are file management, allocation of system resources, providing essential features to control hardware devices.

DOS commands can be typed in either upper case or lower case.

Features of DOS

Following are the significant features of DOS −

- It is a single user system.
- It controls program.
- It is machine independence.
- It manages (computer) files.
- It manages input and output system.
- It manages (computer) memory.
- It provides command processing facilities.
- It operates with Assembler.

Types of DOS Commands

Following are the major types of DOS Command −

- **Internal Commands** − Commands such as DEL, COPY, TYPE, etc. are the internal commands that remain stored in computer memory.
- **External Commands** − Commands like FORMAT, DISKCOPY, etc. are the external commands and remain stored on the disk.

Windows Operating System

The operating system window is the extension of the disk operating system.

It is the most popular and simplest operating system; it can be used by any person who can read and understand basic English, as it does not require any special training.

However, the Windows Operating System requires DOS to run the various application programs initially. Because of this reason, DOS should be installed into the memory and then window can be executed.

Elements of Windows OS

Following are the significant element of **W**indows **O**perating **S**ystem (WOS) −

- Graphical User Interface
- Icons (pictures, documents, application, program icons, etc.)
- Taskbar
- Start button
- Windows explorer
- Mouse button
- Hardware compatibility
- Software compatibility
- Help, etc.

Versions of Windows Operating System

Following are the different versions of Windows Operating System −

Version	Year	Version	Year
Window 1.01	1985	Windows XP Professional x64	2005
Windows NT 3.1	1993	Windows Vista	2007
Windows 95	1995	Windows 7	2009
Windows 98	1998	Windows 8	2012
Windows 2000	2000	Windows 10	2015
Windows ME	2000	Windows Server 2016	2016
Windows XP	2001		

Linux Operating System:-

- It is also one type of operating system.

- Which is very secure and uses in top level organizations, companies to secure their data and information.
- When we start up the computer it will ask for user name and password.
- It is compulsory to give username and password in linux operating system.
- This operating system is not user friendly when compared to windows operating system.
- It is very difficult to operate on linux operating system for a beginner.

Computer Virus:- Computer virus is a program that causes a computer system to behave in unexpected and undesirable ways. A computer virus is a computer program written to alter the way a computer operates, without the permission or knowledge of the user. It hides other program files. The effects of a computer virus can be

- Unexplainable loss of free memory.
- Unusually long times for program loading or execution.
- Changes in file or program size.
- Print routines that stop working.
- Computer freezing up.
- Strange beeps or message.
- Computer reboots in the middle of a process.
- Corrupted files.

Types of Viruses

The basic types of viruses are

- **File Viruses(parasitic viruses)**:- File viruses are pieces of code that attach themselves to executable files, driver files or compressed files, and are activated when the host program is run. Most file viruses spread by loading themselves in system memory and looking for any other programs located on the drive.
- **Boot Sector Viruses**:- A boot sector virus affects the boot sector of a hard disk. The boot sector is where all information about the drive is stored, along with a program that makes it possible for the operating system to boot up.
- **Macro viruses:**- Macro viruses infect files that are created using certain applications or programs that contain macros.
- **Network Viruses**:- This kind of virus can quickly spread across a Local Area Network(LAN) or even over the Internet. Usually, it propagates through shared resources, such as shared drives and folders.
- **E-mail Viruses**:- An E-mail virus could be a form of a macros virus that spreads itself to all the contacts located in the host's email address book.

Worms:- This is a computer program that replicates itself at a swift pace. Unlike a computer virus, it is self-contained and hence does not need to be part of another program to propagate 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.

Bombs:-It is similar to Trojan Horse, but Logic bombs have some specialty; these include a timing device and hence it will go off only at a particular date and time.

Virus Affect?

Let us discuss in what ways a virus can affect your computer system. The ways are mentioned below

- By downloading files from the Internet.
- During the removable of media or drives.
- Through pen drive.
- Through e-mail attachments.

- Through unpatched software & services.
- Through unprotected or poor administrator passwords.

Impact of Virus

Let us now see the impact of virus on your computer system −

- Disrupts the normal functionality of respective computer system.
- Disrupts system network use.
- Modifies configuration setting of the system.
- Destructs data.
- Disrupts computer network resources.
- Destructs of confidential data.

Virus Detection

The most fundamental method of detection of virus is to check the functionality of your computer system; a virus affected computer does not take command properly.

However, if there is antivirus software in your computer system, then it can easily check programs and files on a system for virus signatures.

Virus Preventive Measures

Let us now see the different virus preventive measures. A computer system can be protected from virus through the following −

- Installation of an effective antivirus software.
- Patching up the operating system.
- Patching up the client software.
- Putting highly secured Passwords.
- Use of Firewalls:- A firewall is set up to protect a computer. It blocks unauthorized and unwanted users from accessing files and system.
- Run a more secure operating system like Unix on the system as the security features of the operating system.
- Programs from unknown sources like the Internet, should be avoided.
- Use of password protection.
- Use of privacy.
- Use of Integrity:- Integrity means information is protected against unauthorized changes in that are not detectable by authorized users

Most Effective Antivirus

Following are the most popular and effective antivirus from which you can choose one for your personal computer

- McAfee Antivirus Plus
- Symantec Norton Antivirus
- Avast Pro Antivirus
- Bitdefender Antivirus Plus
- Kaspersky Anti-Virus

- Avira Antivirus
- Webroot Secure Anywhere Antivirus
- Emsisoft Anti-Malware
- Quick Heal Antivirus
- ESET NOD32 Antivirus

UNIT -4

Computer Network:- A Computer Network is an interconnected collection of a group of two or more single computers that are linked to share information and resources.

Computer Network can be classified into 3 types based on the size of the Network.

1. Local Area Network(LAN).
2. Wide Area Network(WAN).
3. Metropolitan Area Network(MAN).

LAN:-

- LAN is a Computer Network that connects that the group of computers within a single building or small organization.
- Communication medias used in LAN are Co-axial cable and optical fiber.
- When two or more computers are connected in a small area such a network in known as LAN.
- Ex- LAN,s are used in Schools, Colleges, Offices, Banks, Hospitals etc.
- LAN size is limited to a few km(2km).
- LAN has data speed of 100 or 1000mps.
- Wireless LAN's are the latest evolution of LAN Technology.

WAN:-

- A WAN is a Computer Network that connects a Large Geographical Area.
- It connects the computer from several miles to several miles to hundred miles.
- It uses wireless communication media to communicate.
- It operates nation wide or world wide. Ex: Internet
- WAN's consists of 2 or more LAN's.

MAN:-

- MAN connects computer network with in city.
- It is a network which connects LAN's.
- Communicating media used in MAN connection in optical fiber.
- It covers the area inside a town or city.

Difference between LAN, WAN, MAN:-

LAN	MAN	WAN
LAN stands for Local Area Network.	MAN stands for Metropolitan Area Network	WAN stands for Wide Area Network
It connects in a single building.	It connects in a Town or City.	It connects different Countries
It can covers 0 to 2 km.	It can covers 10 to 100 km.	It can covers 100 to 1000 km.
Data Transmission is very fast.	Data Transmission is medium compare LAN	Data Transmission is slow.
Ex used in Schools, Small Organizations Colleges.	Used in City Cable Network.	As Internet in the best ex of WAN.

Network Topologies:- A network topology defines the physical layout of the cables, connecting the computers and other peripheral devices.

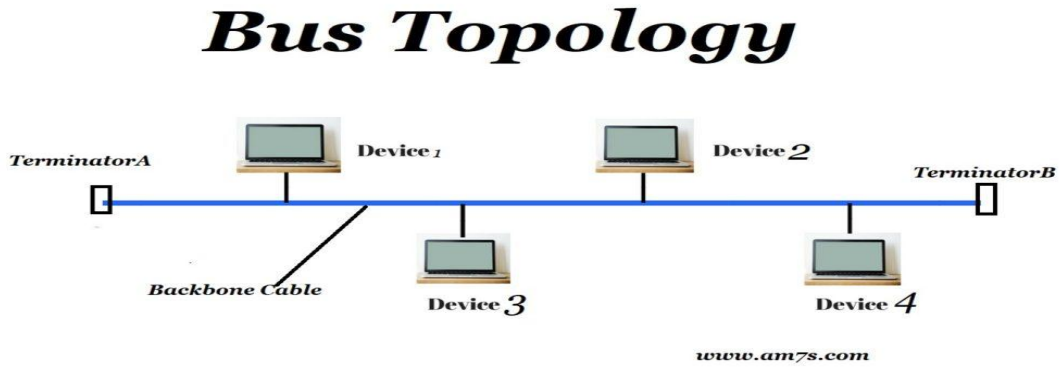
In a computer network, the computers, servers, workstations and other devices are known as Nodes. Data transfer takes place between nodes in the form of Packets.

Each packet consists of two parts. The first part carries the address of source computer and destination computer. The second part is the actual data or message to be sent to another computer or device.

Types of Topology

Bus Topology:-

- The Computers are connected in a row along a single cable segment called a bus.
- Only one computer at a time can send data.
- The signal is sent to the entire network and travels from one end of the cable to the other.
- When a computer uses the network, the information is sent to the controller, which then sends the information down the line of computers until it reaches the terminating computer.
- Failure of one computer does not disrupt the entire network.
- A main cable break or damaged will result in total network failure.



Advantages:-

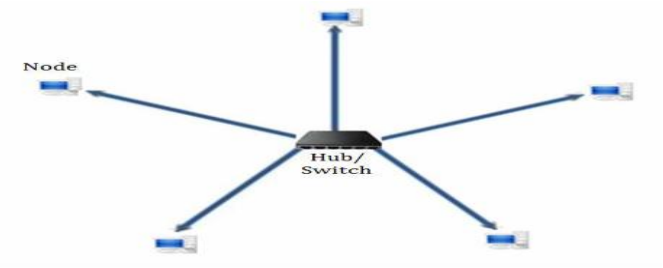
- High rate of data transfer.
- Easy to implement.
- Require less cabling.
- Failure of one computer does not affect other computers on the network.
- It is cost effective.

Disadvantage:-

- Limited cable length leads to limited number of nodes in the network.
- A main cable break or damaged in the network leads to total network failure.
- It is difficult to locate the problem node when there is a network failure.
- Terminators are required at ends of the main cable(backbone cable).

Star Topology:-

- All computers are connected by cable to a central hub.
- Hub is a central controller.
- Signals are sent by a computer to the hub, which directs the signals to the destination computer.
- If a computer goes down on the network, that computer can no longer send or receive message.
- If the hub fails, the whole network is down.



Advantages:-

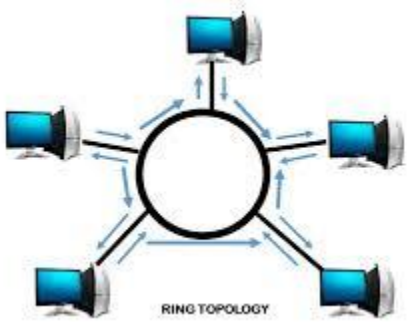
- Easy to install and cable.
- Failure of one node does not affect the entire network.
- Faults can be detected easily and corrected.
- Nodes cam be added or removed from network easily.

Disadvantage:-

- It requires larger cable lengths.
- Failure of hub results in the failure of the entire network.
- More expensive due to the cost of hubs and cables.

Ring Topology:-

- In a ring topology network computers are connected by a signal loop of cable.
- The data signals travels around the loop in one direction, passing through each computer.
- The token is a signal that passes around the ring until a computer has a message to send.
- Maximum number of nodes are limited by the system design.
- Message delay increases as more nodes are added to the ring.



Advantages:-

- Easy to install and cable.
- No chance of collision as only one token travel around the ring at a time.
- Every node on the network gets equal opportunity to transmit its data.
- Simple transmission since data travels in only one direction.

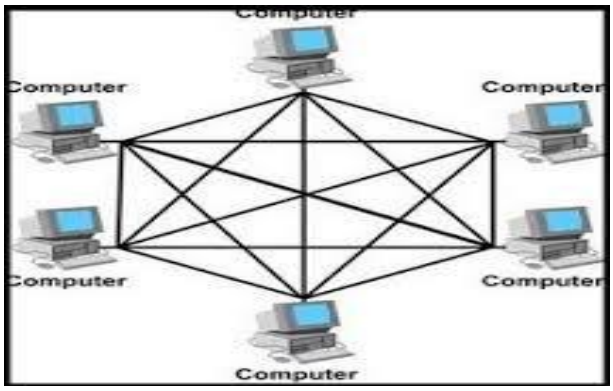
Disadvantage:-

- Failure of one node results in the failure of the entire network since the ring broken.
- When network fails, it is difficult to locate the problem node.
- Addition or deletion of a node from the network is difficult.
- Limited number of nodes.
- Slower data transmission.

Mesh Topology:-

- A mesh topology provides each device with a point to point connection to every other device in the network.
- These are most commonly used in WAN's which connect networks over telecommunication links.

- Since each devices has a point to point connection to every other device.
- Mesh topologies are the most expensive and difficult to maintain.



Advantages:-

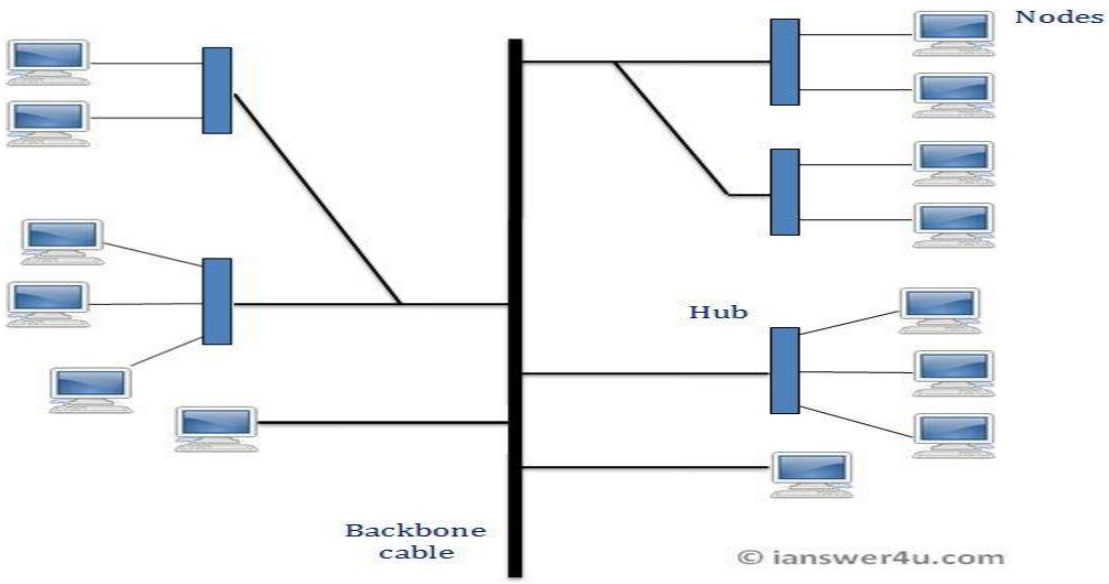
- Highly reliable data transmission due to the multiple communication links.
- High rate of data transfer.
- No network congestion due to the large number of links.

Disadvantage:-

- Very expensive due to the large cable requirement.
- Installation and cabling is difficult.
- Additional and removal of nodes is very difficult.

Tree Topology:-

- A tree topology combines both bus and star topologies.
- It consists of group of star nodes connected to a bus main cable.
- The tree network topology is ideal when the systems are located in the groups, with each group occupying a small region.
- An ex is a university campus in which each building has its own star network.
- It is easy to add or remove workstations from each star network. Entire star networks can be added to, or remove from the tree.



Advantages:-

- Supports easy expansion of tree network.
- Failure of one hub does not affect entire network.

- Supported by many vendors of both software and hardware.
- Supports point-to-point wiring for individual segments.

Disadvantage:-

- Failure of the backbone cable leads to the failure of the entire network.
- Difficult to setup and configure.
- Expensive.
- Overall length of each segment is limited by the type of cabling used.

Electronic Commerce:-

The advancement of computer technology and internet, domestic as well as international businesses are being fascinated towards these technologies. Today, most of the small or big businesses and domestic or international businesses offer their products and services through Internet.

The business organizations these days have attractive and interactive website through which they promote and market their business.

The facility of computer based technology and Internet collectively integrates the fragmented markets by offering them a common arena. Technology has further helped organizations in cost cutting and has also helped reduce the cost of products and services.

Technology facilitates customers in buying products or services of their requirement by sitting at home or any place.

What is Electronic Commerce?

Electronic commerce or simply ecommerce is normally a process that involves facilitating the availability of products and services online. The users can search, choose, sell, buy from a wide range of options through Internet.

The major activities of ecommerce are as follows −

- Selling products and services online (through internet)
- Buying products and services online
- Paying and accepting payment online
- Transaction of businesses and other services online

Features of E-Commerce

Following are the important features of ecommerce −

- It efficiently increases the business capability.
- It substantially reduces the cost.
- It perceptively increases the delivery services.
- It unbreakable solution of quick business transactions and office automation.
- It potentially increases the intra-business functionality.
- It competently increases the business communication.

Types of E-Commerce

Following are the major types of e-commerce businesses −

Business-to-Business (B2B):- This type of E-commerce includes the companies doing business with each other such as manufacture selling to distributors and wholesalers selling to retailer. Pricing is based on quantity of order and is often negotiable.

Business-to-Consumer (B2C):-This type of E-commerce includes businesses selling to the general public typically through catalogues utilizing shopping cart software.
It is conducted between the business firm and the consumer.

Consumer-to- Business (C2B):-A Consumer can posts his project with a set budget online and within few hours, company review the consumer's requirement and bid on the project. The consumer reviews the bids and selects the company which bids the best price and that will complete the project within a prescribed period of time.

Consumer-to-Consumer (C2C):-

Consumer-to-consumer business deals happen between two consumers; there are certain websites that facilitate a common platform to both the consumers - one who wants to buy and one who wants to sell.

Benefits of E-Commerce

Let us now discuss the benefits of e-commerce −

- It facilitates free market.
- It is available 24×7.
- Its presence is global (there is no constrain of political boundary as such).
- Set up cost is substantially low.
- It provides user-friendly technology.
- It offers multiple opportunity parallel and simultaneously.
- It provides frugal facilities to promote and market businesses.
- It has features to offer market research facility.
- It makes customer relations management easier.
- It facilitates the provision of 24×7 customer care services.
- It provides fund transfer facility domestically as well as internationally with simple steps.

Advantages of E-Commerce:-

- The greatest and most of the important advantage of E-commerce is that it enables a business concern or individual to reach the global market.
- With the help of E-Commerce, even small enterprises can access the global market for selling and purchasing product and services.
- There will be no time restrictions while conducting businesses, as E-commerce empowers one execute business transactions, 24 hours a day and even on holidays and weekends.
- E-commerce gives the customers the opportunity to look for cheaper and quality products.
- Shopping online is usually more convenient and time saving than conventional shopping.
- For business concerns, E-commerce significantly decrease the cost.
- It reduces the time period involved with business process re-engineering.
- It also enables efficient customer care services.

- It collects and manages the information related to customer behaviour, which in turns helps to develop and adopt and adopt an efficient an efficient marketing and promotional.

Disadvantages of E-Commerce:-

- A large number of people do not use the internet for any kind of financial transaction.
- Some people refuse to trust the authenticity of completely impersonal business transactions, as in the case of E-commerce.
- Many people have reservations regarding the requirement to disclose personal and private information for security concerns.
- Another limitations of E-commerce is that it is not suitable for commodities like food items, people prefer to shop in the conventional way than to use E-commerce.
- The time period required for delivering products can also be quite significant in the case of E-commerce. A lot of phone calls and E-mails may be required till you get your desired products.
- Returning the product and getting a refund is also more troublesome.
- Many people still enjoy the act of shopping and visiting shopping malls.
- Still we are not getting household product via internet.

Computer Security:- Computer Security is the process of detecting and preventing any unauthorized use of your laptop/computer. It involves the process of safeguarding against trespassers from using your personal or office based computer resources with malicious intent or for their own gains, or even for gaining any access to them accidentally.

- First of all, is to check the physical security by setting control systems like motion alarms, door accessing systems, humidity sensors, temperature sensors. All these components decrease the possibility of a computer to be stolen or damaged by humans and environment itself.
- People having access to computer systems should have their own user id with password protection.
- Monitors should be screen saver protected to hide the information from being displayed when the user is away or inactive.
- Secure your network especially wireless, passwords should be used.
- Internet equipment as routers to be protected with password.
- Data that you use to store information which can be financial, or non-financial by encryption.
- Information should be protected in all types of its representation in transmission by encrypting it.

Why Do We Computer Security?

Let us now see why do we need Computer security. It is required for the following major reasons −

- To prevent damage of the hardware.
- To prevent theft or damage of the installed software.
- To prevent theft or damage of stored data and information.
- To prevent the disruption of service.
- Likewise, security system keeps the computer system safe by protecting the installed software and the stored data (information).

Protection of Data and Information:-Following are the important steps to protect data .

- Make backup of all your important files.
- Keep your system virus by using anti-virus software.
- Keep updating your computer system.
- Run disk defragmenter and disk clean up on certain interval of time.
- Use a firewall.
- Use anti-spyware software.

Further, if you use internet, then you need to take greater precaution. Consider the following points to understand the precautions that need to be taken −

- Do not click on any link that you don't know (as it may be dangerous for your computer - virus attack).
- Do not open unauthorized an unlawful website (it may damage your computer system).
- Do not download unsolicited data from unknown website.

How to Secure Your Computer System from Threats?

Following are the significant tips through which you can protect your system from different types of threat −

- Install, use, and keep updated Anti-Virus in your system.
- Install, use, and keep updated a Firewall Program.
- Always take backups of your important Files and Folders.
- Use Strong and Typical Passwords.
- Take precaution especially when Downloading and Installing Programs.
- Install, use, and keep updated a File Encryption Program.
- Take precaution especially when Reading Email with Attachments.
- Keep your Children aware of Internet threats and safe browsing.

Types of Threat

Threats of Hardware:-Following are the most common types of computer threats −

- **Physical damage** − It includes fire, water, pollution, etc.
- **Natural events** − It includes climatic, earthquake, volcanic activity, etc.
- **Loss of services** − It includes electrical power, air conditioning, telecommunication, etc.

- **Technical failures** − It includes problems in equipment, software, capacity saturation, etc.
- **Deliberate type** − It includes spying, illegal processing of data, etc.

Some other threats include error in use, abuse of rights, denial of actions, eavesdropping, theft of media, retrieval of discarded materials, etc.

Sources of Threat

The possible sources of a computer threat may be −

- **Internal** − It includes employees, partners, contractors (and vendors).
- **External** − It includes cyber-criminals (professional hackers), spies, non-professional hackers, activists, malware (virus/worm/etc.), etc.

Human Threats/User Threats:-

Some of the intentional error are

- Cracking the password:- Trying to enter a system illegally by cracking passwords in order to access valuable data is a threat to computer security. Once the password is cracked, the person has full control of the system.
- Stealing the password.
- Reading email not intended for the user:- Reading emails not intended to the person or destroying important files.
- Modifying data.

Internet:- Internet is an interconnection between several computers connected all over the globe.

Uses of Internet:- The important current strategic uses of the internet areas follows.

- Accessing a wide range of information on several topics.
- Online communication.
- Software sharing.
- Exchange of views on topics of common interest.
- Position of information of general interest.
- Organization promoting their products.
- Feedback about the products.
- Customer support services.
- Online journals and magazines.
- Online shopping.
- Worldwide video conferencing.
- Entertainment.

Advantages of Internet:-

The Internet provides many facilities to the people. The main advantages of Internet are discusses below.

- Sharing Information:- You can share information with other people around the world.
- Collection of Information:- You can easily collect the information in different website on the internet.
- News:- You can get latest news of the world on the internet.
- Searching jobs:- You can search different types of job all over the world.
- Advertisement:- Today, most of the commercial organization advertise their product through internet.

- Communication:- You can communicate with other internet around the world. You can talk by watching to one another. Different services are provided on the internet such as
  - Chatting.
  - Video Conferencing.
  - E-mail.
  - Internet Telephony etc
    - Entertainment:- Internet also provides different types of entertainment to the people. You can play games with other people in any part of the world. You can see movies, listen music etc.
    - Online Education:- Internet provides the facility to get online education. Many website of different Universities provide lecturer and tutorials on different subjects or topics.
    - Online Result:- Today, the universities and education board provides result on the Internet.
    - Online Airlines and Railway Schedules:- Many Airlines companies and railway provides their schedules of flight and trains respectively on the internet.
    - Online Medical Advice:- Many website are also available on he Internet to get information about different diseases.

Disadvantages:-

- Viruses :- Internet is the most popular source of spreading viruses. Most of the viruses transfer from one computer to another through E-mail or when information downloaded on the internet.
- Security problem:- The valuable website can be damaged by hackers and your valuable data may be deleted.
- Immorality:- Some websites contains immoral materials in the form of text, pictures or movies etc. these website damage the character of new generation.
- Filtration of information:- When a keyboard is given to a search engine to search information of a specific topic, a large number of related links a displayed. In this case, it becomes difficult to filter out the required information.
- Accuracy of Information:- A lot of information about a particular topic is stored on the website. Some information may be incorrect or not authentic. So, it becomes difficult to select the correct information. Sometimes you may be confused.
- Wastage of times:- A lot of time is wasted to collect the information on the Internet.
- English language problems:- Most of the information on the internet is available in English language. So, some people cannot avail the facility of internet.

Intranet:- It is the generic term for a collection of private computer networks within an organization.

Internet utilize standard network hardware and software technologies like Ethernet, Wi-Fi, TCP/IP, web browsers and web servers.

Intranet is the system in which multiple PCs are connected to each other. PCs in intranet are not available to the world outside the intranet. Usually each organization has its own Intranet network and members/employees of that organization can access the computers in their intranet.

Each computer in Intranet is also identified by an IP Address which is unique among the computers in that Intranet.

Similarities between Internet and Intranet

- Intranet uses the internet protocols such as TCP/IP and FTP.
- Intranet sites are accessible via the web browser in a similar way as websites in the internet. However, only members of Intranet network can access intranet hosted sites.

- In Intranet, own instant messengers can be used as similar to yahoo messenger/gtalk over the internet.

Differences between Internet and Intranet

- Internet is general to PCs all over the world whereas Intranet is specific to few PCs.
- Internet provides a wider and better access to websites to a large population, whereas Intranet is restricted.
- Internet is not as safe as Intranet. Intranet can be safely privatized as per the need.

Cyber Law:- Cyber law is the part of the overall legal system that deals with the Internet, cyberspace, and their respective legal issues. Cyber law covers a fairly broad area, encompassing several subtopics including freedom of expression, access to and usage of the Internet, and online privacy. Generically, cyber law has been referred to as the Law of the Internet.

Why are cyber laws needed?

Just like any law, a cyber law is created to help protect people and organizations on the Internet from malicious people on the Internet and help maintain order. If someone breaks a cyber law or rule, it allows another person or organization to take action against that person or have them sentenced to a punishment.

Cyber security:- Cyber security is a potential activity by which information and other communication systems are protected from and/or defended against the unauthorized use or modification or exploitation or even theft.

Likewise, cyber security is a well-designed technique to protect computers, networks, different programs, personal data, etc., from unauthorized access.

Cyber Crime:-The crime that involves and uses computer devices and Internet, is known as cybercrime.

Cybercrime can be committed against an individual or a group; it can also be committed against government and private organizations. It may be intended to harm someone's reputation, physical harm, or even mental harm.

Cybercrime can cause direct harm or indirect harm to whoever the victim is.

However, the largest threat of cybercrime is on the financial security of an individual as well as the government.

Types of Cybercrime

Let us now discuss the major types of cybercrime −

Hacking:- It is an illegal practice by which a hacker breaches the computer's security system of someone for personal interest.

Unwarranted mass-surveillance:- Mass surveillance means surveillance of a substantial fraction of a group of people by the authority especially for the security purpose, but if someone does it for personal interest, it is considered as cybercrime.

Child pornography:- It is one of the most heinous crimes that is brazenly practiced across the world. Children are sexually abused and videos are being made and uploaded on the Internet.

Child grooming:- It is the practice of establishing an emotional connection with a child especially for the purpose of child-trafficking and child prostitution.

Copyright infringement :-If someone infringes someone's protected copyright without permission and publishes that with his own name, is known as copyright infringement.

Money laundering:- Illegal possession of money by an individual or an organization is known as money laundering. It typically involves transfers of money through foreign banks and/or legitimate business. In other words, it is the practice of transforming illegitimately earned money into the legitimate financial system.

Cyber-extortion:- When a hacker hacks someone's email server, or computer system and demands money to reinstate the system, it is known as cyber-extortion.

Cyber-terrorism:- Normally, when someone hacks government's security system or intimidates government or such a big organization to advance his political or social objectives by invading the security system through computer networks, it is known as cyber-terrorism.

E-Payment:- E-commerce sites use electronic payment, where electronic payment refers to paperless monetary transactions. Electronic payment has revolutionized the business processing by reducing the paperwork, transaction costs, and labour cost. Being user friendly and less time-consuming than manual processing, it helps business organization to expand its market reach/expansion. Listed below are some of the modes of electronic payments −

- Credit Card
- Debit Card
- Smart Card
- E-Money
- Electronic Fund Transfer (EFT)

Credit Card:- Payment using credit card is one of most common mode of electronic payment. Credit card is small plastic card with a unique number attached with an account. It has also a magnetic strip embedded in it which is used to read credit card via card readers. When a customer purchases a product via credit card, credit card issuer bank pays on behalf of the customer and customer has a certain time period after which he/she can pay the credit card bill. It is usually credit card monthly payment cycle. Following are the actors in the credit card system.

- **The card holder** − Customer
- **The merchant** − seller of product who can accept credit card payments.
- **The card issuer bank** − card holder's bank
- **The acquirer bank** − the merchant's bank
- **The card brand** − for example , visa or Master card.

Debit Card:- Debit card, like credit card, is a small plastic card with a unique number mapped with the bank account number. It is required to have a bank account before getting a debit card from the bank. The major difference between a debit card and a credit card is that in case of payment through debit card, the amount gets deducted from the card's bank account immediately and there should be sufficient balance in the bank account for the transaction to get completed; whereas in case of a credit card transaction, there is no such compulsion.

Debit cards free the customer to carry cash and cheques. Even merchants accept a debit card readily. Having a restriction on the amount that can be withdrawn in a day using a debit card helps the customer to keep a check on his/her spending.

Smart Card:-Smart card is again similar to a credit card or a debit card in appearance, but it has a small microprocessor chip embedded in it. It has the capacity to store a customer's work-related and/or personal information. Smart cards are also used to store money and the amount gets deducted after every transaction. Smart cards can only be accessed using a PIN that every customer is assigned with. Smart cards are secure, as they store information in encrypted format and are less expensive/provides faster processing. Visa Cash cards are examples of smart cards.

E-Money:- E-Money transactions refer to situation where payment is done over the network and the amount gets transferred from one financial body to another financial body without any involvement of a middleman. E-money transactions are faster, convenient, and saves a lot of time.

Online payments done via credit cards, debit cards, or smart cards are examples of e-money transactions. Another popular example is e-cash. In case of e-cash, both customer and merchant have to sign up with the bank or company issuing e-cash.

Electronic Fund Transfer:-

- It is a very popular electronic payment method to transfer money from one bank account to another bank account. Accounts can be in the same bank or different banks. Fund transfer can be done using ATM (Automated Teller Machine) or using a computer.

- Nowadays, internet-based EFT is getting popular. In this case, a customer uses the website provided by the bank, logs in to the bank's website and registers another bank account. He/she then places a request to transfer certain amount to that account. Customer's bank transfers the amount to other account if it is in the same bank, otherwise the transfer request is forwarded to an ACH (Automated Clearing House) to transfer the amount to other account and the amount is deducted from the customer's account. Once the amount is transferred to other account, the customer is notified of the fund transfer by the bank.

Legal and Ethical issues in E-commerce:-

Web tracking

E-businesses draw information on how visitors use a site through log files. Analysis of log file means turning log data into application service or installing software that can pluck relevant information from files in-house. Companies track individual's movement through tracking software and cookie analysis. Programs such as cookies raise a batch of privacy concerns. The tracking history is stored on your PC's hard disk, and any time you revisit a website, the computer knows it. Many smart end users install programs such as Cookie cutters, Spam Butcher, etc which can provide users some control over the cookies.

Privacy

Most Electronic Payment Systems knows the identity of the buyer. So it is necessary to protect the identity of a buyer who uses Electronic Payment System.

A privacy issue related to the employees of company is tracking. Monitoring systems are installed in many companies to monitor e-mail and other web activities in order to identify employees who extensively use business hours for non-business activities. The e-commerce activities performed by a buyer can be tracked by organizations. For example, reserving railway tickets for their personal journey purpose can be tracked. Many employees don't want to be under the monitoring system even while at work.

Disintermediation and Reinter mediation

Intermediation is one of the most important and interesting e-commerce issue related to loss of jobs. The services provided by intermediaries are

(i) Matching and providing information.

(ii) Value added services such as consulting.

Legal Issues

Fraud on the Internet

E-commerce fraud popped out with the rapid increase in popularity of websites. It is a hot issue for both cyber and click-and-mortar merchants. The swindlers are active mainly in the area of stocks. The small investors are lured by the promise of false profits by the stock promoters. Auctions are also conductive to fraud, by both sellers and buyers. The availability of e-mails and pop up ads has paved the way for financial criminals to have access to many people. Other areas of potential fraud include phantom business opportunities and bogus investments.

Copyright

The copyright laws protect Intellectual property in its various forms, and cannot be used freely. It is very difficult to protect Intellectual property in E-Commerce. For example, if you buy software you have the

right to use it and not the right to distribute it. The distribution rights are with the copyright holder. Also, copying contents from the website also violates copy right laws.

Domain Names

The competition over domain names is another legal issue. Internet addresses are known as domain names and they appear in levels. A top level name is *qburst.com* or *microsoft.com*. A second level name will be *qburst.com/blog.* Top level domain names are assigned by a central non-profit organization which also checks for conflicts or possible infringement of trademarks. Problems arise when several companies having similar names competing over the same domain name. The problem of domain names was alleviated somewhat in 2001 after several upper level names were added to com.