GOVT. POLYTECHNIC, KANDHAMAL

**FOR DIPLOMA STUDENTS
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LECTURE NOTES

ON

COMPUTER APPLICATION

Session – 2023-24

Syllabus of
COMPUTER APPLICATION (BET104)
(First / Second Semester Diploma in Engg.(All Branches))

Topic wise distribution of periods:

Sl. No	Topic Name	No Of Periods
1.	Computer Organisation	**05**
2.	Computer Software	**07**
3.	Computer Network and Internet	**08**
4.	File Management and Data Processing	**05**
5.	Problem Solving Methodology	**05**
6.	Overview of C Programming language	**15**
7.	Advanced features of C	**15**
Total :		**60**

1. COMPUTER ORGANISATION

1.1 Introduction to Computer
1.2 Evolution of Computers
1.3 Generation of Computers
1.4 Classification of Computers
1.5 Basic Organisation of Computer (Functional Block diagram)
1.6 Input Devices, CPU & Output Devices.
1.7 Computer Memory and Classification of Memory

2. COMPUTER SOFTWARE

Software concept
System software
Application software
Overview of Operating System
Objectives and Functions of O.S
Types of Operating System
Batch Processing, Multiprogramming, Time Sharing OS
Features of DOS, Windows and UNIX
Programming Languages
Compiler, Interpreter
Computer Virus
Different Types of computer virus
Detection and prevention of Virus
Application of computers in different Domain

3. COMPUTER NETWORK AND INTERNET

Networking concept, Protocol, Connecting Media,
Date Transmission mode
Network Topologies,
Types of Network
Networking Devices like Hub, Repeater, Switch, Bridge, Router, Gateway& NIC
Internet Services like E-Mail, WWW, FTP, Chatting, Internet Conferencing, Electronic
Newspaper & Online Shopping
Different types of Internet connectivity and ISP

4. FILE MANAGEMENT AND DATA PROCESSING

Concept of File and Folder
File Access and Storage methods.
Sequential, Direct, ISAM
Data Capture, Data storage
Data Processing and Retrieval

5. PROBLEM SOLVING METHODOLOGY

Algorithm, Pseudo code and Flowchart
Generation of Programming Languages
Structured Programming Language
Examples of Problem solving through Flowchart

6. OVERVIEW OF C PROGRAMMING LANGUAGE

Constants, Variables and Data types in C
Managing Input and Output operations.
Operators, Expressions, Type conversion & Typecasting
Decision Control and Looping Statements (If, If-else, If-else-if, Switch, While, Do-while, For, Break, Continue &Goto)
Programming Assignments using the above features.

7. ADVANCED FEATURES OF C

Functions and Passing Parameters to the Function (Call by Value and Call by Reference)
Scope of Variables and Storage Classes
Recursion Function and Types of Recursion
One Dimensional Array and Multidimensional Array
String Operations and Pointers
Pointer Expression and Pointer Arithmetic
Programming Assignments using the above features.
Structure and Union (Only concepts, No Programming)

Chapter-1

(COMPUTER ORGANISATION)

1.1 Introduction : A computer is an electronics device which accepts users data as input, process the data as per the users instruction and produces the output in the user required format.

1.2 Evolution of computer:

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

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

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

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

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

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

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

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

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

1.3 Generation of Computer:

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

a). First Generation (1940-55):
- The main component used is vacuum tubes and it use's Magnetic Drum for memory
- The Operating System is very slow.
- It's size is very large and more heat generated from it.
- It uses machine level languages for its operation.
- Ex. UNIVAC, EDSAC etc.

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

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

d). Fourth Generation (1971-89):
- The main component used are LSI, VLSI etc.

- ➢ Computers are smaller and powerful.
- ➢ Microprocessors are used.
- ➢ Magnetic disk, Optical disk Floppy disks are used for storage.
- ➢ High level languages like C, C++ etc are used.
- ➢ Mouse and other devices used.

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

1.4 Classification of Computers:

Modern computers are broadly classified into following 4 types-
(a) Analog Computers (b) Digital Computers (c) Hybrid Computers (d) Super Computers

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

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

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

(d) Super Computers:
- ➢ These computers are most powerful computers in the world.
- ➢ These are specially designed to maximize the processing of floating point instructions.
- ➢ These computers are working in parallel processing technique by implementing multiple processors to work in parallel manner.
- ➢ The speed of such computers is extremely high and measured in GFLOPS (Giga Floating Point Operations per Second).
- ➢ These computers have their own Operating system and programming languages.
- ➢ These computers are used for special operations like weather forecasting, scientific research, satellite operations etc.
- ➢ Ex. Param, Cray, Anupam, PARAM Yuva, EKA, Cray Jaguar, Tianhe-IA, PRITHVI etc.

Digital Computers are again classified in to following 3 types-
(i) Mainframe Computers (ii) Mini Computers (iii) Micro Computers

(i) Mainframe Computers:

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

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

(ii) Mini Computers:

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

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

(iii) Micro Computers (personal Computers):
These are the smallest and least expensive computers. These are also called as personal computers. These are most widely used in different areas.
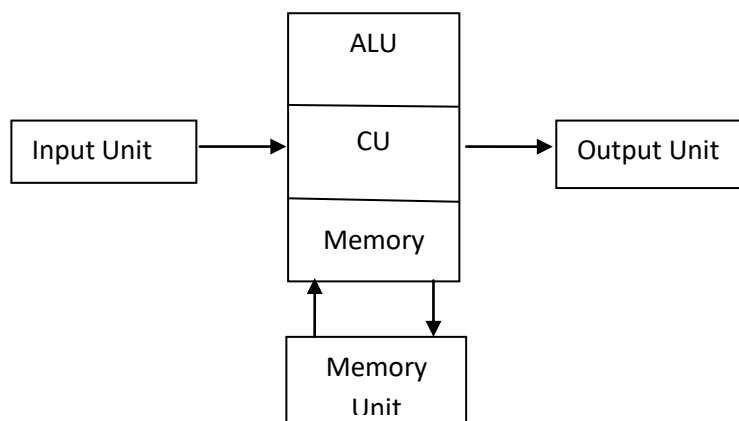
Features:
- Portable.
- Required minimum power.
- Wide verity of memory size.
- Appropriate processing speed which can handle most of the tasks.
- Affordable price.
- Ex: Desktop, Laptop, Notebook, Tablet, Smart phone etc.

1.5 Basic Organization of Computer/ Functional Block Diagram/ Von-Numan Architecture:

It describes the architecture of a general digital computer and it consists of following units
(a) Input Unit
(b) CPU (Central Processing Unit)
(c) Output Unit
(d) Memory Unit

(Functional Block Diagram)

(a) Input Unit:
- It is used to accept data & instructions from user.
- It converts the data & instructions into computer understandable format.
- Supply the converted data to the CPU for processing.
- Examples of different types of Input devices:
  Key board, Mouse, Image Scanner, Camera (web Cam), Microphone, Joy Stick, Optical Pen, Bar code Reader, and Optical mark Reader etc.

(b) CPU Unit (Central ProcessingUnit):
- It is the main part of the computer and also called as the brain of the computer.
- It controls the overall activities of the computer and performs different types of operations.
- It mainly consists of 3 units
  (i) ALU (ii) CU (iii) Memory
  (i) ALU (Arithmetic Logic Unit): This unit performs all the arithmetic and logical operations/ calculations inside the computer like Addition, Subtraction, Multiplication, Division, Logical AND, OR etc.

(ii) CU (ControlUnit):

It is used for controlling the overall operations of a computer.

It generates different signals for different activities like Read, Write operations.

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

(c) Output Unit:
- ➤ The output unit is used to produce or display results of processed data in used requirement format.
- ➤ The output result may be a soft copy or hard copy.
- ➤ Soft copy outputs are only visible and have no physical existence.
- ➤ Hard copy outputs have physical existence.
- ➤ Examples of different output devices:
  Monitor, Printer, Plotter, Speaker, Projector etc.

(d) Memory Unit:
It is used to store data, instructions and results. The memory of computer is divided into 2 types.

(i) Primary Memory:
- o This is the memory where program is stored for its execution by CPU.
- o Execution of program is not possible until the program and data are loaded in this memory.
- o During the execution the result is also stored in main memory and after that it goes to the secondary memory for permanent storage.
- o Main memory is volatile in nature i.e the contents of this memory are goes out when power goes off.
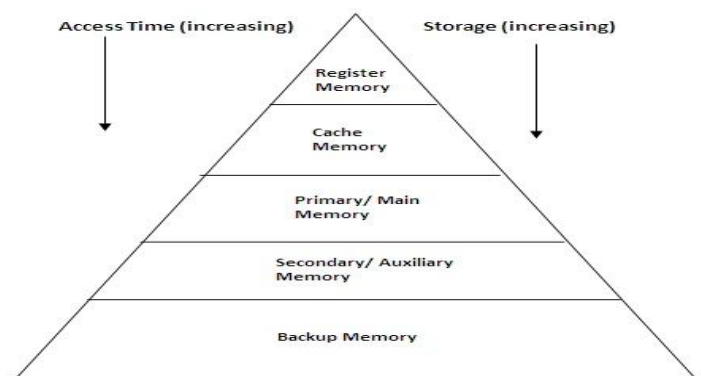
(ii) Secondary Memory:
- o As main memory is volatile in nature and limited capacity so in order to store large amount data permanently secondary/ auxiliary memory is used.
- o It consists of magnetic or optical materials and used to store data permanently even power is off.
- o Both read and write operation is possible here and data & programs need to load in main memory for their execution.

1.7 Classification of Memory:

Memory is an essential component of a digital computer. It is needed to store programs, data and results. The memory of computer is divided into following 5 types.

(1) Register Memory
(2) Cache Memory
(3) Primary/ Main Memory
(4) Secondary/ Auxiliary Memory
(5) Backup Memory

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

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

- ➢ Cache is used to store frequently used programs and data.

(3) Primary/ Main Memory:
- ➢ This is the memory where program is stored for its execution by CPU.
- ➢ Execution of program is not possible until the program and data are loaded in this memory.
- ➢ After the execution the result is also stored in main memory and after that it goes to the secondary memory for permanent storage.
- ➢ Main memory is volatile in nature i.e the contents of this memory are goes out when power goes off.
- ➢ These are semi-conductor memory and divided in to 2 types-(i) RAM   (ii) ROM

    (i) RAM :
    - o RAM stands for Random Access Memory because here any memory location can be accessed directly and   the time take to access any memory location is same.
    - o This is volatile in nature i.e its content will be lost when power goes off.
    - o Both read and write operation is possible here.
    - o There are 2 types of RAM (a) Static RAM (b) Dynamic RAM

    (ii) ROM:
    - o ROM stands for Read only memory because in this memory only read operation is possible.
    - o The user is not allowed to write anything here, it was written by the manufacturer.
    - o It is non-volatile in nature i.e its content will not be lost when power goes off.
    - o ROM is also divided in to several types
        (a) PROM : Programmable ROM- here user is allowed to reprogram but only once.
        (b) EPROM : Erasable Programmable ROM : here contents of ROM can be erased and reprogrammed multiple times. Here the contents can be deleted using Ultraviolet light but the entire content can be erased at a time.
        (c) EEPROM : Electrically Erasable Programmable ROM : here contents of ROM can be erased by electrical signals. Here the advantage is user can erase the selected contents as per the requirement.

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

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

Chapter-2

Instruction : Instruction is a command given to the computer by the user to perform a particular task.

Program : Program is a group of Instructions written using some set of rules to perform a particular task.

Software : Software is a set of programs combined together by some meaningful way for a particular task.

Types of Software:

There are 2 types of software (a) System Software (b) Application Software

(a) System Software : A set of program which are designed to control the operation of computer Hardware.

Example: Operating system, Compiler, Interpreter, Assembler, Driver Programs etc.

(b) Application Software : A set of programs which are used to solve different users application.

Example: Railway Reservation system, Microsoft Word, Excel, PowerPoint, Notepad, video player etc.

Operating System : Operating system is a system software, which is installed in a computer to acts as an interface between computer and user.

Operating system is used to manage all the computer hardwareand all the other programs in a computer.

It provides the Graphical User Interface, so that user interacts with computer easily.
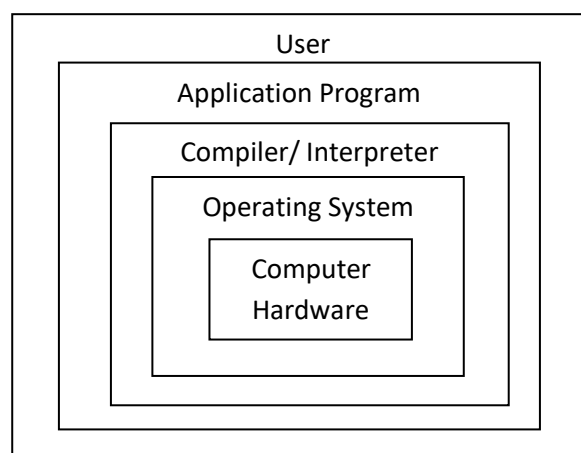
The Operating System does the following works-

(a) Resource Management

(b) Process Management

(c) Memory Management

(d) Device Management

(e) Information Management

Objectives of Operating system:

(a) It hides the hardware and their complexity so that the user interacts with operating system not hardware.

(b) it does the effective allocation of resources among different processes.

(c)A user can interact with system through good and easy user interface.

(d) To make a computer system convenient to use in an effective manner.

(e) To keep track of details of all activities.

Functions of Operating system: Operating system performs the following functions-

(a) Process Management

(b) Memory Management

(c) Device Management

(d) File System Management

(e) Security

(f) Job accounting

(a) Process Management: In a multi programming environment, the OS decides the order in which processes have access to the processor and how much processing time each process has.it also keeps track of status of processes and according to that it allocate and de-allocate processor to them**.**

(b) Memory Management: The OS manages all the devices connected to it. It keeps track of all and decides which process gets access to a certain device and for how much time and accordingly allocate them in a effective way and de-allocate them when they are no longer required.

(c) Device Management: In a multi programming environment, the OS decides the order in which processes have access to the processor and how much processing time each process has.it also keeps track of status of processes and according to that it allocate and de-allocate processor to them.

(d) File System Management: A file system is organized into directories for efficient and easy navigation and uses. These directories may contain other directories and files. An OS manages all the operations carried out with in the file system like Read, Write, Modify, Delete etc.

(e) Security : The operating system uses password protection to protect user data and similar other techniques are also used to prevent unauthorized access to program and user data.

(f) Job accounting : The OS keeps track of time and resources used by various tasks users and assign resources accordingly to different processes.

Types of Operating System:

(a) Single User Operating System: The single user operating system are designed to manage the computer so that one user can effectively do one thing at a time.

Example: Microsoft DOS. (Desk Operating System)

(b) Multiuser Operating System: The multiuser operating system is designed to manage a no. of users to the computer to take advantages of different computer resources at a time.

Example: Windows, UNIX etc.

1. Batch Processing O.S:

➢ Batch is a group of processes of similar types.
➢ it supports the processing of jobs in a batch but one at time.
➢ The task of this operating system is to select the job in a queue and assign the system resources one by one.
➢ Here there is a very less interaction between user and computer system.
➢ Printing is an example of this type.
➢ The main problem in this operating system is to prepare a batch and more time wasted for this.
➢ VII. The speed of this operating system depends upon the type of batch and jobs.

2. Multiprogramming O.S:

➢ In order to avoid the delay that occurs in batch processing system and to provide maximum CPU utilization multiprogramming technique is used.
➢ In this technique, multiple processes are loaded in the memory simultaneously and execution begins from the first process.
➢ If the first process waits for any recourse, then it waits and execution of second process starts till the first process gets the resources and so on until all programs finished running.
➢ It increases CPU efficiency but requires proper memory management since processes are interchanged from ready state to wait state & wait state to ready state.

3. Time sharing / Multi taskingO.S:

➢ It allows multiple users to work in multiple terminals simultaneously by making time slice of CPU time and distributed among different terminals.
➢ Here each process is allocated with resources for a particular time slot.
➢ The switching between terminals is done so frequently that each user/ terminal thinks that he is getting the system resources continuously.

4. Real time O.S:

➢ It is a multitasking Operating system intended for real time applications in which the total correctness of an operation depends not only logical correctness but also upon the time in which it performed.

- Such operating systems are used for industrial control, scientific research, spacecraft etc.
- This type of operating system also supports multiprogramming/ multiuser environment.

5. Multiprocessing O.S:

- In multiprocessing operating system, it works with two or more processing units within a single computer. This operating system has the ability to allocate tasks between them.
- This operating system enables several programs to run continuously.
- UNIX is an example of multiprocessing operating system.

6. Network O.S:

- Network Operating system is a software that includes special functions for connecting computers and devices in to a LAN. It controls a network and its traffic and control access of resources by multiple users in a network such as File, Storage devices etc.
  Example: Windows NT, UNIX, Mac O.S etc.

DOS (Desk Operating System)

- DOC was developed by Microsoft so it is called MS Dos.
- It is the first widely installed operating system used for personal computers.
- DOS is a medium through which user & external devices attached to the system are communicated with the system.
- The main function of DOS is to manage Disk files and allocate system resources according to the requirement.

Features of DOS:
- ❖ It is a single user Operating system.
- ❖ It provides a hierarchical file structure.
- ❖ It is a command based operating system i.e used has to enter commands to perform a task.
- ❖ Here commands are two types Internal & external Commands.
- ❖ DOS Required relative small amount of memory for installation and running.

UNIX:

- Unix is widely used in both server & client.
- It provides an environment that is so powerful and flexible that is found in business, science, university industry etc.
- The Unix system is functionally organized at 3 levels
  (a) The Kernel (b) Shell (c) Tool & Applications.
  - The Kernel : It is used to managing task and storage. It is the heart of the Operating System and controls the Hardwares of the system as per the users command.
  - Shell : It connects and interprets users commands, Call programs from memory and execute them. It also acts as an Interpreter between user and computer.
  - Tools &Applications : It provides additional functionality to the operating system.

Features :
- ❖ Unix is one of the most popular, stable, multiuser, multitasking operating system for servers and work stations.
- ❖ It is portable that means move from one brand to another brand computer with minimal code change.
- ❖ It is machine independent that means it hide the machine architecture to the user.
- ❖ It supports multiuser to work at a time.
- ❖ It uses Hierarchical File structure.

❖ It provides security mechanism and does not allow any user to enter in to the core part.

WINDOWS :
Microsoft window is a series of operating systems and graphical user interfaces made by Microsoft.

It is most widely used operating system for personal computer.

It has different versions like Windows-1.0, 2.0, 3.0, 3.1, 95, 98, 2000, XP, 7, 10 etc.

Features :
Windows provides Graphical User Interface (GUI) to the users for interact with computer.

It provides various commands in the form of menu and icons.

It allows use of Mouse.

It is easy to use and learn, because commands do not need to be memorized.

Difference between DOS, Window &Unix.

Different Between Windows & DOS.

Window	DOS
• It provides Graphical User Interface	• It provides Character User Interface
• It is a powerful and fast O.S	• It is a less powerful and slow O.S
• It provides inbuilt commands in various applications which can be used by mouse click.	• All types of commands are to be typed in DOS Prompt.
• All commands available in DOS are available in Windows.	• All commands available in Window are not available in DOS.
• It is a Multiuser & Multitasking O.S.	• It is a Single user O.S.
• It supports Graphics	• It does not supports Graphics
• It is costly.	• It is cheaper.

Different Between UNIX & DOS.

UNIX	DOS
• It is a powerful and fast O.S	• It is a less powerful and slow O.S
• It is a Multiuser & Multitasking O.S.	• It is a Single user O.S.
• It supports Visual Display &Graphics.	• It does not supports Graphics
• It supports Networking of Computers.	• It does not supports Networking of Computers.
• Its Security Level is High.	• Its Security Level is very less.
• It supports the Kernel & Shell Concept.	• It don't have the Kernel & Shell Concept.
• It is costly.	• It is cheaper.

Compiler:

A compiler is system software that translates a High level language program in to machine level language program. It checks all types of errors, limits, ranges etc.

Interpreter:

It is also system software that converts High level language programs in to machine level language programs but line by line. It takes one statement of high level language program and converts in to machine level language at a time.

Difference between Compiler & Interpreter

Compiler

• It converts the total program written in High level language in to machine level language at a time.	• It converts the program from High level language to machine level language line by line.
• It compiles the entire program and check for any error.	• It compiles the program line by line and if error in any line then does not go to next line.
• It takes more memory space.	• It takes less memory space.
• It is faster.	• It is slower.
• It is suitable for large programs.	• It is suitable for smaller programs.

Interpreter

Computer Virus:

A computer virus is a software program that has been intentionally created to make harm to a computer system.

A computer virus can corrupt data, delete data, copy & destroy data on an individual computer.

It has the ability to replicate (making its duplicate copy automatically) itself.

It can spared from one computer to another through internet, network, storage devices and affects all the programs, memory of computer.

It may results system failure, wasting computer resources, corrupting data, increasing maintenance cost etc.

Computer virus also has some common forms such as worms, Trojan horses, keyloggers, spywares, rootkit, logic booms etc.

Types of Virus:

1. **Resident Virus:** these are permanent virus which are normally present in RAM and interrupts all the programs executed by the system. It corrupts the program & file while open, close, copy or rename etc.

   Ex. Randex, CMJ, Meve etc.

2. **Boot Virus:** Boot Virus affects the boot sector of a hard disk. It deletes the boot records/ programs which are responsible for loading the operating system in memory. This virus loaded in to the memory when the computer boots.
   Ex. From, Disk Killer, Store Virus, Stones etc.

3. **Program Virus:**This virus affects executable files having extension like .exe, .com, .bin, .sys etc. These are loaded in to memory during the execution of programs along with them and remain present in memory. They make copy of itself and making the memory full.
   Ex. Sunday, Cascade etc.

4. **Macro Virus:** These viruses infect files that are created by programs that contains macros. These virus propagates from one computers to another through the Infected files and affects the normal templates.
   Ex. Relax, Melissa, Nuclear etc.

5. **MultipartileVirus:** These are the mixture of Program virus & boot virus. They first infects the program files and hide in memory and gradually infects the boot sector of Hard disk.

Ex. Flip, Tequila etc.

6. **Polymorphic Virus:** These virus encrypts or encode themselves in a different way using different algorithm/ Technique every time while infects a system so it is very difficult for a antivirus to detect this types of virus. They are creating a large no. of copies of themselves.
Ex. Cascade, evil, Proud, virus etc.

7. **Directory Virus:** These virus changes the paths that indicates the location of a file. You are unknowingly running the virus while original file is previously moved by the virus. It once infect, it becomes impossible to locate the original file.

8. **Network Virus:** These virus rapidly spread through LAN & internet. When these viruses affect a computer it first infects the computer fully and moves to the next computer through network and continue.

9. **Worms:** A worm is technically not a virus but a program very similar to a virus. It has the ability to self-replicate causes harm to a system. It can be executed without the help of any other program.

10. **Trojan Horse:** These are some special types of malicious codes which are not similar to virus or worms. It spared by internet automatically even you don't touch it.

11. **Logic Bombs:** These are some special types of malicious codes not exactly virus used to destroy data on a computer when certain conditions occur.
Some commonly used virus is Brain, Friday13, Happy Birthday, April 1st, black Monday, I Love U, Monkey etc.

The presence of virus can be detected by anti-virus software through experts and by the symptoms.

Preventions:
- ➤ Don't allow outside CD & pen drive without scanning.
- ➤ Always install suitable antivirus software.
- ➤ Don't visit website which are not reputed.
- ➤ Don't open unknown mail.

Antivirus:
Ex. Norton, Macfee, e-trust, PC-clean, Microsoft security essential, Quick hill etc.
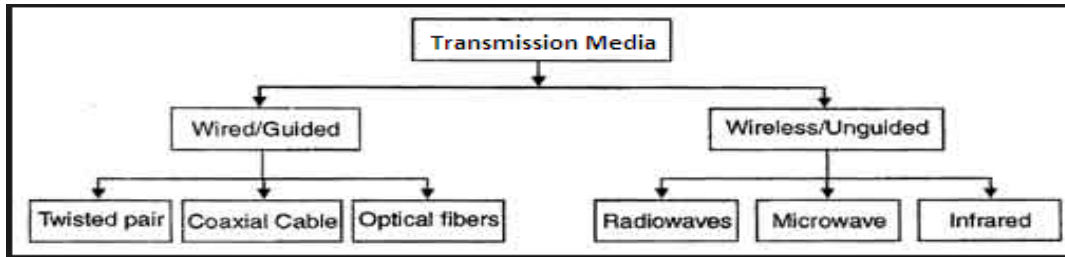So always choose relative antivirus software and update regularly.

Application of Computer in different domain:

Now a day Computer is used in every field like Education, Research, Business, Medical, Entertainment, University, Transportation, Agriculture, Government, Advertisement, Industry, Communicationand Training& Placement etc.
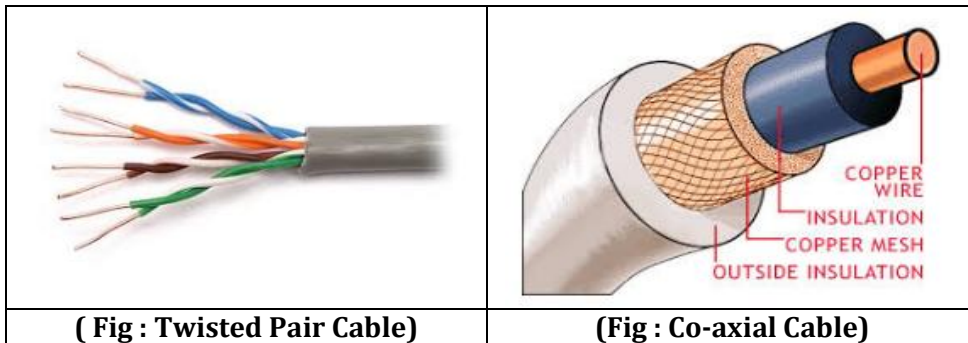
Chapter-3

Transmission Media:

A transmission medium can be defined as anything that can carry information from a source to a destination. It is divided into following types-

a. Twisted pair Cable:

➢ A Twisted Pair Cable consists of two conductors each own with its plastic insulation twisted into pairs.

➢ It is most widely used for Tele-communication.

➢ Here one of the wires is used to carry signal to the receiver and the other is used for ground reference.

➢ Ordinary telephone line consists of two pairs of twisted pair cables where as computer network cable consists of four set of twisted pair cables.

➢ The twisted pair cable helps to reduce crosstalk and electromagnetic induction.

➢ Its transmission speed varies from 2 mbps to 100 mbps.

➢ It is cheap, easy to install & use.

(Fig : Twisted Pair Cable)	(Fig : Co-axial Cable)

b. Coaxial Cable:

➢ Coaxial cable carries signals of higher frequency ranges than twisted pair cables.

➢ These are mostly used for cable TV system and for connecting the computers with in an office building or a short distance to form anetwork.

➢ The Coaxial cable consists of a single copper conductor at its center which is encapsulated inside a plastic layer that provides insulation the conductor and metal shield.

➢ The metal shield works as second conductor and also protects the signal from outside noise and this is also enclosed with a plastic cover.

➢ The coaxial cable is highly registrant to signal interference and can support greater cable length between devices.

➢ Its speed varies from 200 mbps to 500 mbps.

➢ It is difficult to install.

c. Fiber Optics Cable:

➢ The Fiber optics cable is constructed in several layers. The core is the actual glass or fiber conductor which is covered with a refractive coating called cladding. The next layer is a protective covering made of PVC to protect the core and cladding.

➢ It transmits signal in the form of light.

(Fig : Fiber Optics Cable)

Advantages of Fiber Optics cable:
- ✓ **High Speed:**Fiber optics cable transmits data hundred times faster than coaxial cable and thousand times faster than twisted pair cable.
- ✓ **Less signal attenuation:** Here a signal can run 50km without requiring regeneration, where as we need a repeater in every 5km for co-axial or twisted pair cables.
- ✓ **Less electromagnetic interface:** Electromagnetic noise can not affect fiber optics cable.
- ✓ **Resistance to corrosive material:** Glass is more resistance to corrosive materials than copper.
- ✓ **Greater immunity to tapping:** Fiber optic cables are more immune to tapping than copper wires.

Disadvantages:
- ✓ **Installation & maintenance:** Since it is a new technology, so installation & maintenance is little bit difficult than others.
- ✓ **Unidirectional:** Fiber optic cable is unidirectional in nature, so for two way communication two fiber optic cables are required.
- ✓ **Cost:** These cables are relatively more expensive than other cables.

d. Radio wave: (one to many)
- ➢ Radio wave normally ranges frequencies from 3KHz to 1 GHz.
- ➢ Radio wave transmissions are done through omni-directional antenna, which transmits radio waves in all directions.
- ➢ Here sender antenna sends signal in all direction and receiver antenna receives the signals which may not be in straight line with sending antenna. Radio wave is propagates through sky mode and travel long distance and this is suitable for long distance broadcasting.
- ➢ Example AM & FM Radio, TV, Cordless Phone etc.

e. Micro wave: (one to one)
- ➢ Electromagnetic signals having frequencies between 1GHz to 300GHz are called micro waves.
- ➢ Micro waves are unidirectional, so when sending antenna sends signal and receiving antenna for receiving signal must present face to face in a straight line.
- ➢ Micro waves propagate in line of sight mode.
- ➢ It uses Horn antenna for sending and Dish antenna for receiving signals.
- ➢ Example Cellular Phones, satellite networks, wireless LANs etc.

f. Infrared:
- ➢ Electromagnetic signals having frequencies 300GHz to 400THz.
- ➢ These signals have very high frequencies so can't penetrate walls.
- ➢ These are used for short range communication within a room.
- ➢ It uses line of sight propagation.
- ➢ Example TV Remote Control, devices between keyboard & CPU, cord less mice etc.
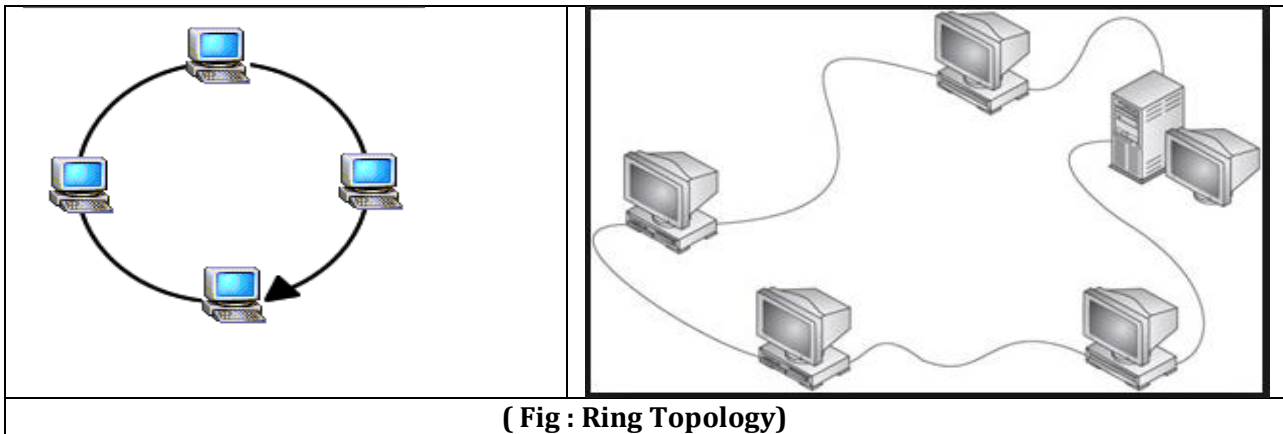
Network Topology:

Topology refers to arrangement of computers and network devices in a network.

There are different types of network topologies

(a) Ring Topology (b) Bus Topology (c) Star Topology

(d) Mesh Topology (e) Tree Topology (f) Hybrid Topology

(a) Ring Topology:

➢ In Ring Topology all the nodes are connected to each other in a closed loop. So every node is connected directly to two other nodes.

➢ Here message travels through the Ring in a circular fashion in the same direction.

➢ Here each node receives message from any of its two adjacent nodes, then checks its destination address. if the message is addressed to it then it accepts it otherwise it regenerates the signal and passes to the next node in the sequence.

(Fig : Ring Topology)

Advantage:
- Best suited for networks that do not have a Hub.
- Easy to Install
- Can span over large distance
- Every node has equal chance to transmit data.

Disadvantage:
- Unidirectional in nature.
- Difficult to add or remove nodes from the network.
- If one node fails, the entire network is shut down.
- Difficult to find errors
- Communication is slower.

(b) Bus Topology:

➢ In Bus Topology, each computer is connected to a single cable and nodes share the same communication channel.

➢ When a node wants to send a message to another node, it first checks whether the line is free or not. If the line is free then it transmits the signals else waits until the channel becomes free.
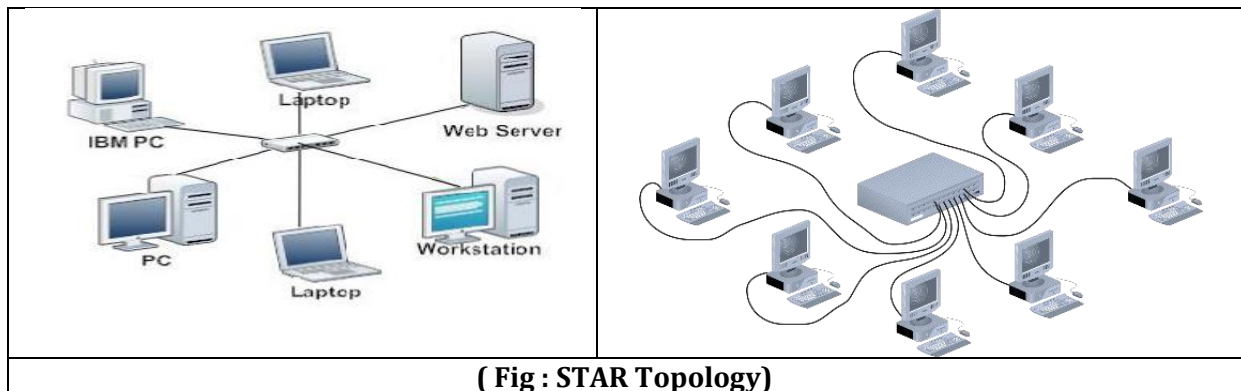
Advantage:
- Easy to install and control a new device to the network.
- Requires less cable hence less expensive
- Failure in one node doesn't affect the other nodes.

Disadvantage:
- Failure in the main cable results shutting down the entire network.
- As the no of nodes increases, the speed of the network slows down.

(c) Star Topology:
- In Star Topology every node is connected to a central hub within a point to point connection and all the data/ message passes from one node to another through the central hub.
- The Hub acts as a signal repeater. When a node has to send a message to another node it first sends the message to the Hub then the Hub regenerates the message and forward to the destination node.

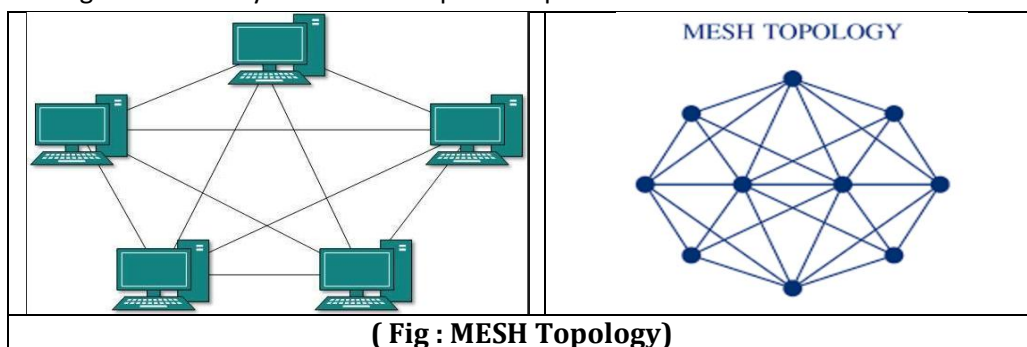**(Fig : STAR Topology)**

Advantages:
- Easy to install
- New nodes can easily connected
- Failure in one node does not affect the other nodes in the network.
- Easy to detect errors.

Disadvantages:
- Requires more cable than Bus topology.
- If the central Hub fails then the entire network fails.
- More expensive than Bus topology.

(d) Mesh Topology:
- Mesh Topology is also called completely connected network. Here every node is connected to every other nodes on the network using a separate physical link.
- Here a message can take any of the several possible paths from source to destination.

(Fig : MESH Topology)

Advantages:

- Failure in any cable or node does not affect the network.
- Communication is faster since there is a dedicated link between every pair of nodes.
- Data transmission is very secure.
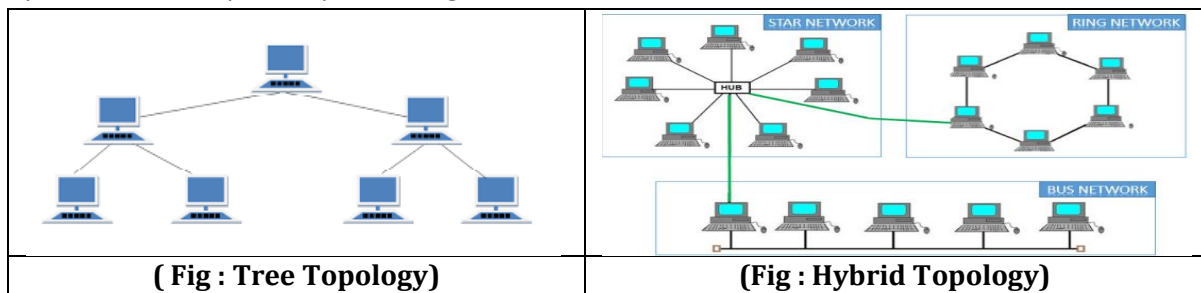- Easy to detect errors.

Disadvantages:
- Most expensive due to the use of huge no of cables.
- Difficult to Install.

(e) Tree Topology:
➢ Here each node is directly connected to its parent and child node only.
➢ Message can transmitted from one node to another node through the parent nodes.
➢ Here if one node is affected then only its subordinate nodes are affected and others are not affected.
➢ It is mostly used for cable TV network.

(f) Hybrid Topology:
➢ Since all the above topology have some advantages and disadvantages, so it is very useful to use combination of two or more topology while creating an network.
➢ Hence the combination of two or more topologies is called as Hybrid Topology.
➢ Two very commonly used Hybrid network topologies include Star-Ring and Star-Bus Topology.
➢ Hybrid network depends upon the organization structure.

(Fig : Tree Topology)	(Fig : Hybrid Topology)

Types of Networks:

There are normally 3 types of networks widely used
a. Local Area Network (LAN)
b. Metropolitan Area Network (MAN)
c. Wide Area Network (WAN)

a. Local Area Network (LAN)
➢ it is used to connect computers and devices in a limited geographical area such as office, school, college, university etc.
➢ LANs are typically owned, controlled and managed by a single person or organization.
➢ LAN can be one of the two types wired or wireless.
➢ A wired LAN may be used the Ethernet cable to physically connect all computers in a network.
➢ A wireless LAN may uses Radio waves for communication.
➢ LANs are preferred networks because they have higher data transfer rates and required small area.

b. Metropolitan Area Network (MAN)
➢ A MAN is a network that interconnects computers and other devices in a geographical that is larger than LAN but smaller than WAN.
➢ A MAN may interconnect networks in a city, a campus, or a community to form a singer larger network.
➢ It may formed by interconnecting several LANs by connecting them through fiber optics cable.
➢ A MAN is a high speed network that connects different offices or branches of a large organization or Govt. body located in different places of different geographical area.

c. Wide Area Network (WAN)

- WAN covers a large geographical area that covers a state, a country, or may be international distance through some communication channel that may be wired or wireless media.
- WAN is a combination of large no of small networks across world.
- In general LANs are private owned where are WAN are not owned by any individual or organizations.
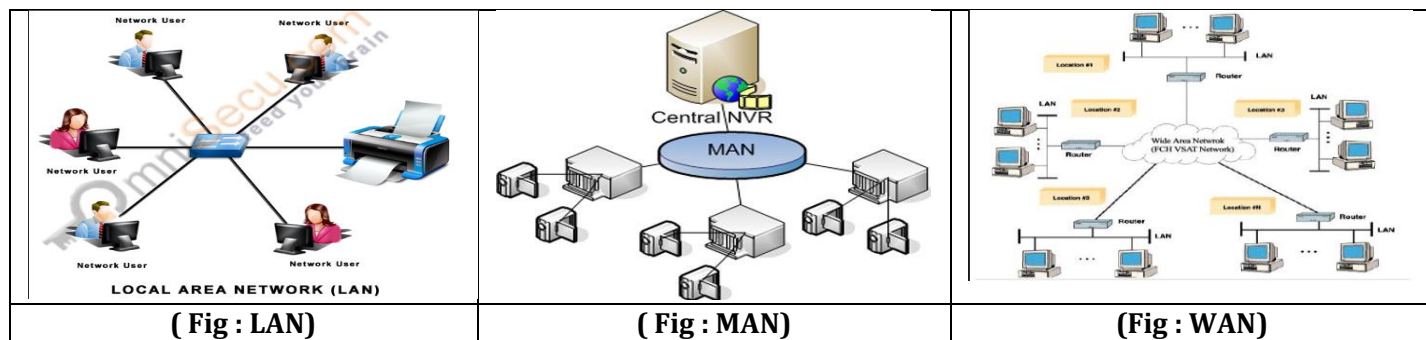- WAN uses much more expensive devices than LAN.

Difference between LAN & WAN:

LAN	WAN
❖ A LAN covers a small Geographical area.	❖ A WAN covers a verylarge Geographical area.
❖ The rate of data transmission is generally higher in case of LAN.	❖ The rate of data transmission is generally lower in case of WAN.
❖ A LAN can be formed by wired or wireless media.	❖ A WAN can be established by wireless media.
❖ The cost of communication is less.	❖ The cost of communication is higher.
❖ it was mainly privately owned by a person or organization.	❖ it was fully public.

(Fig : LAN)	(Fig : MAN)	(Fig : WAN)

Different Networking Devices:

Computer networking devices are communicating devices that help the user to create a network. Some commonly used networking devices are

a. Hub:
- A hub is a device to which different devices are connected so that they can communicate with each other. Every computer in a network can directly connect to the Hub.
- Hub is not an intelligent device, because it gets data packets it first amplifies that and broadcast it to all other computers.
- The computer whose address matches with the packet address can only able to receive that packet and all other computers discard them.

b. Switch:
- A Switch is a device that can be used in place of Hub. It is much better that Hub because it can switch the data packets by the help of switching table with in it.
- The switching table stores the address of all the computers connected to it. So when a message or a data packet reaches at a switch, then it checks the destination address and matches with the switch table and sends the packet to that particular computer instead of broadcasting.
- So switch is an intelligent device as it selects a computer out of a no of computers.

c. Repeater:
- A repeater is a device that operates only in the physical layer of the OSI Model.
- A repeater is used to regenerate the incoming signals before it became too weak and sends the fresh signal.
- It is used to regenerate the signal not amplify the signal.
- It is used to connect two segments of a LAN.

- For Regenerate the signal it takes a small amount of time, hence if we connect a no of repeater in a row then propagation delay increases.

d. Bridge:
- A bridge operates in both physical and datalink layers of the OSI Model.
- As a physical layer device it regenerates the signals it receives and as a datalink layer device it checks the physical address of the incoming messages then forward or drop the message depending its address.
- Bridge is used to connect two or more LANs with in a network.

e. Router:
- A router is an intelligent device that routes data from source computer to destination computer and works on the first 3 layers of OSI Model.
- It is used to connect two same or different types of LANs, two WANs, a LAN to a WAN etc.
- The router uses a special software known as routing table that stores the devices connected to the network.
- When data packets come to a router, then it checks its address information. If the address information. If the address of packet is in the same network then it forwards the packet to the destination computer but if the address is in some another network then it forwards the packet to another router.

f. Gateway:
- A Gateway is a complicated networking device that is basically used to connect two or more dissimilar networks that uses different protocols.
- A Gateway acts as a translator between two dissimilar networks.
- A gateway can be implemented in software or hardware.
- The main role of a Gateway is to provide security to the network.
- It monitors the network traffic by checking the incoming and outgoing data and checks for any malicious activity which creates harmful effects in a network.

g. Modem:
- Modem stands for Modulator & Demodulator.
- Modem is used to convert data from Analog form used on telephone line to digital form used in computer.
- ADLS Modems also called ADLS router which are used on many networks to provide the required connectivity to the internet.
- A Modem also has some intelligence and is capable of performing a no of advanced networking features including firewall services.
- ADSL Modems are used mostly to connect small to medium size organizational networks to internet using ISP.

h. Network Interface Card (NIC)
- A network interface card (NIC) is a computer hardware component that allows a computer to connect to a network.
- NIC may be used for both wired and wireless connection.
- NIC is a both Physical &Datalink layer device.
- It provides a low level addressing system through the use of MAC (Medium Access Control) address that uniquely assigned to a network interface in a network.
- A NIC provides the computer with a dedicated, full time connection to a network.

Difference between Hub & Switch

Hub	Switch
❖ It works on physical layer of OSI Model.	❖ It works on Datalink layer of OSI Model.
❖ It is a Passive Device (without Software)	❖ It is a Active Device (with Software)
❖ Performs broadcasting.	❖ Performs Unicast.
❖ Transmission mode is half duplex.	❖ Transmission mode is Full duplex.
❖ More chance of Collision.	❖ Less chance of Collision.

Different Types of Internet Connectivity:

1. Dial-up Connection:
- Dial-up connection uses telephone line to connect a PC to internet. It required a Modem to setup dial-up connection.
- The modem converts the computer digital signal into an analog signal that travels over a phone line.
- The computer which provides internet access is known as Host and the computer that receives the access is called Client/ Terminal.
- The common speeds were 14.4 kbps, 28.8 kbps & 33.6 kbps and currently the fastest speed is 56 kbps.
- It is available almost everywhere in the country.

2. DSL (Digital Subscriber Lines):
- It is one of the most commonly used internet connection, provided over ordinary telephone lines.
- Provides fast internet using phone line.
- Connection can be shared using wired or wireless.
- DSL service allows the user to access internet & talk on phone at the same time.
- DSL technique are divided into
  (a) ADSL (Asymmetric DSL): In ADSL, the data throughput in upstream direction is lower than downstream.
  (b) SDSL (Symmetric DSL): In SDSL, the data throughput in upstream and downstream direction is equal.
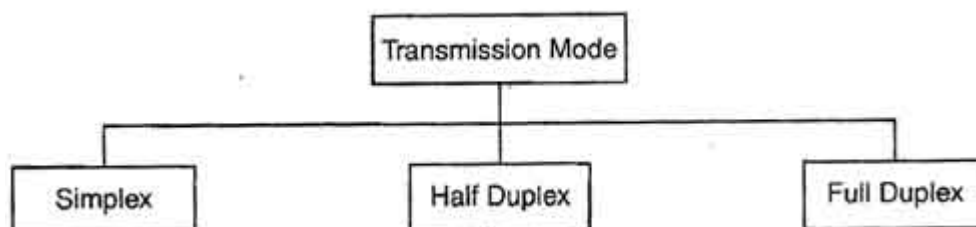
3. Leased Lines:
- A leased line is also called direct connection to internet.
- Leased lines are dedicated lines used primarily by ISPs, Business and other large organizations to connect LAN to internet using the existing infrastructure of public telephone network using wire, optical fiber, leased lines etc.
- T1 is a popular leased line option which consists of 24 individual channels.
- Speed is up to 1.544 Mbps.
- T3 is another leased line options consists of 672 individual channels and mainly used by internet service provider (ISP).

4. Satellite:
- This is the method by which internet content is downloaded to a satellite dish and then transmitted directly from dish to user PC.
- Satellite technology is not faced with the problem of pulling wire through desert and over mountain.
- Downward speed is about 600 kbps.
- The main problem in satellite connection is rain fade that may cause signal loss.

Data Transmission Mode:
According to the direction of data flow, data transmission is divided into following 3 types-

1. Simplex:
- In simplex mode, data can transmitted in **only one direction** and that is only from sender to receiver.
- It is useful in situation where flow of data required in one way, not in opposite direction.
- **Example**: Radio, TV broadcasting, Data transfer between keyboard and computer, computer to printer etc.
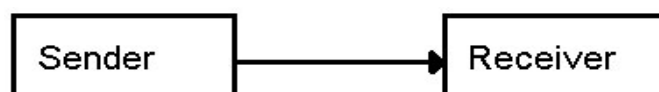

Fig: Simplex Mode.

2. Half Duplex:

- In Half Duplex mode, data can be transmitted **in both direction but one at a time**.
- Here there is only one Transmission channel between sender and receiver.
- When one device sending data, the other will receive data and while second device send data first will receive data.
- **Example**: Web Browsing, Walkie-talkies, citizen band radio etc.

Fig: Half Duplex Mode.

3. Full Duplex:

- In Full Duplex mode, data can be transmitted **in both the direction simultaneously**.
- Here both sender and receiver can send and receive data at a time.
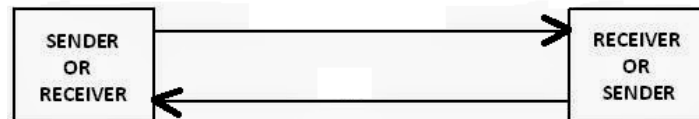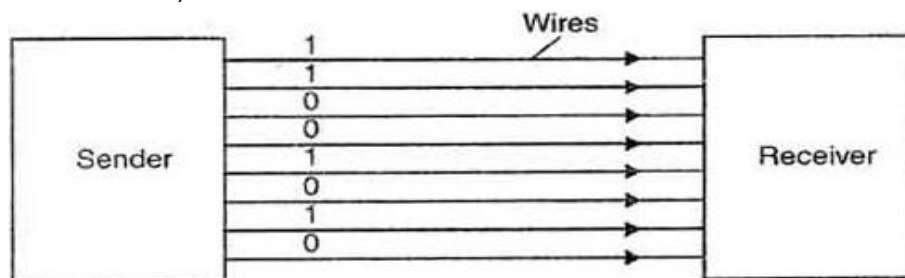- **Example**: Telephone & Mobile communication.

Fig: Full Duplex Mode.

Parallel/ Serial Transmission:

1. Parallel Transmission:

- In parallel data transmission n bits of data can be transmitted simultaneously.
- Here there are n parallel communication channels exist between sender and receiver and each channel transmits one bit at a time, so n channel transmits n bit data at a time.

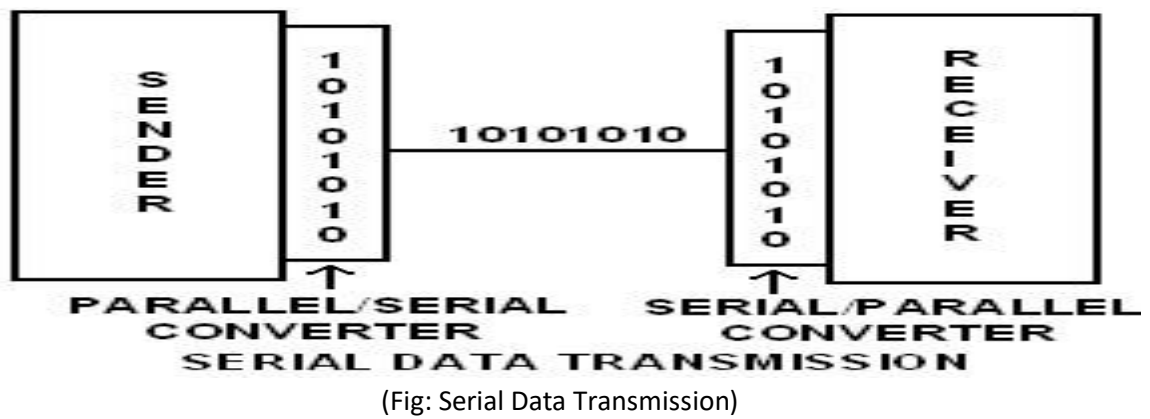(Fig: Parallel Data Transmission)

Advantages: Speed is n times faster than serial data transmission.

Disadvantages: Costly since n no. of transmission channels.

- It is suitable for short distance communication.
- Data transmission inside a computer is parallel transmission.

2. Serial Transmission:

- In serial data communication, there is only one communication channel between two devices and during data transmission one bit is followed by another bit.
- Since within a device communication is parallel, so it is required to set an interface at the sender and receiver that converts parallel data to serial data and serial data to parallel data.
- Serial data transmission is divided into 2 types

(Fig: Serial Data Transmission)

(a) Asynchronous Data Transmission:

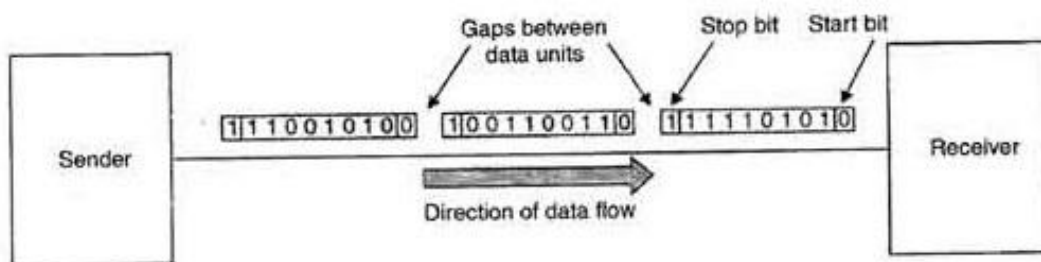In Asynchronous data transmission, Timing of signals is not important.

Here sender sends each group independently in the form of bytes (set of 8 bits).

Since timing of signals is not important, so in order to inform the receiver two extra bits are send along with the data bits. One is Zero as start bit at the beginning and other is one as stop bit at the end.

So in this case size of data bit becomes 10 bit instead of 8 bit, where 8 bit data and 2 bit as information bit.

This mechanism is asynchronous at byte level but synchronous at bit level.

Example: The connection of keyboard to computer is an example of asynchronous data transmission.

(Fig: Asynchronous Data Transmission)

Disadvantage: it is slower because each time 2 extra bits send and there exists time gap between each data byte.

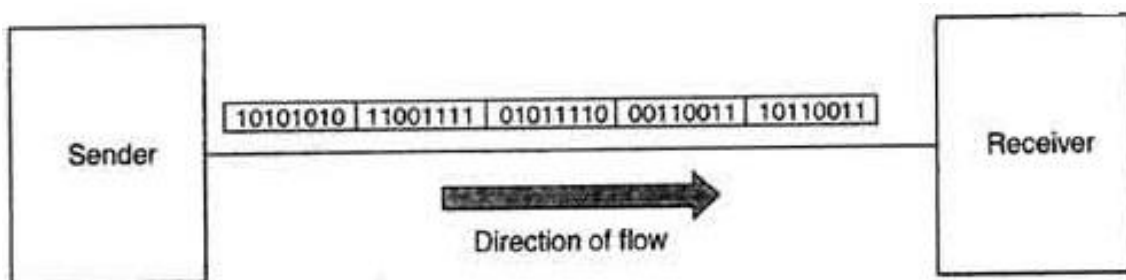**(b) Synchronous Data Transmission:**

In synchronous data transmission, the bit stream is combined into a longer frame with multiple bits without time gap.

The receiver separates the byte from the bit stream by counting.

Here data bits are send one after another without start bit, stop bit and gap.

Here timing between sender and receiver is very important.

It is much faster than Asynchronous data transmission because of time gap, start bit and stop bit.

(Fig: Synchronous Data Transmission)

Chapter-4

File Management:

File:
- ➢ A file is the most basic unit of data storage in a disk.
- ➢ File is a common storage unit for data storage.
- ➢ All the programs and data are stored in computer in the form of files and the read and write operation are done on files.
- ➢ All types of data like text, image, video and audio are stored in the form of files but in different formats.
- ➢ A file can be identified by some codes called extensions present at the end of file name.
- ➢ Example: Image file- abc.jpg, abc.gif, abc.png etc.

   Text file – abc.doc, excel files – anc.xlsx etc.

Folder:
- ➢ Folder is a collection of files and it may be empty.
- ➢ It is used to organized files in hierarchical structure.
- ➢ It is used for better file management.

Difference between File and Folder.

File	Folder
❖ Files are used to store data that may be text, image, audio, video etc.	❖ A folder is a collection of files and an empty folder does not take any memory space.
❖ Different types of data are stored in different file formats.	❖ Folders are used for file management and organize them.

File access method:

File access method specifies the technique used to read and write data from a file
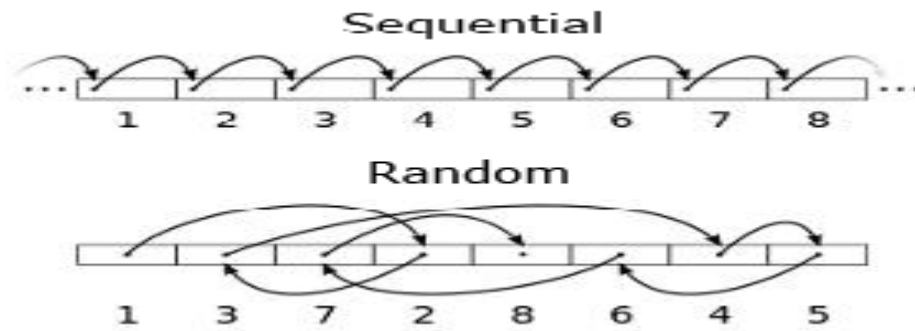
There are three types of file access method

(a) Random Access (b) Sequential access (c) Indexed SAM

(a) Random Access Method:
- ➢ In Random access method user can access any location of a file directly.
- ➢ Here the time taken to access any memory location of a file is same.
- ➢ Here file is made up of fixed length logical records that allow programmer to read and write records rapidly in no particular order.
- ➢ It is used to access large amount of information immediately.
- ➢ Disk access method is an example of Random access method because it takes equal amount of time to access any memory location.

(b) Sequential Access Method:
- ➢ In sequential access method user can access information from file in order i.e one record after another starting from the first memory location.
- ➢ Here time required to access different memory locations is different.
- ➢ Here memory access is started from the first memory location.
- ➢ It is the simplest access method.
- ➢ Accessing data from magnetic tape is an example of sequential access.

(c) Indexed Sequential Access Method (ISAM) :

➢ An indexed sequential access method is a static, hierarchical and disk based index structure.

➢ ISAM initially stored records sequentially and permits both sequential and random access method.

➢ Since it is static it does not change its structure, if records are added or deleted from the data file.

➢ Here each index defines a different ordering of records.