Objective of this Chapter:

INTRODUCTION

We have studied about working with standalone computer. Only single user can do work on standalone computer at a time. To perform complex tasks, that may require a team work to perform different activities to complete the task, we need to connect our computer with other computers. Such an interconnection between computers forms a Computer Network. These networks help us to communicate and share files among a group of users connected to the Network. In this chapter, we are going to study various concepts of networking in detail.

1.1 NETWORK :

A network is the group of two or more computers that are linked in order to share resources such as printers, files and other resources. It also allows communication among different users within a network. The computers in a network may be linked through any communication media, such as: cables, telephone lines, radio waves, satellites or infrared light beams. Network is capable of sharing Software and Hardware resources among users within a network.
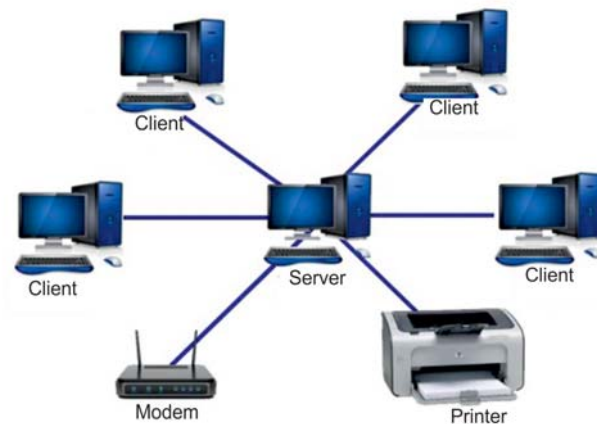
Fig 1.2 Computer networking

In general, network connections between computers are created using cables (wires). However,

connections can be created using radio signals (wireless / wi-fi), telephone lines (and modems) or even for very long distances, via satellite links.

Note: A computer that is not connected to a network is known as a standalone computer.

1.2 NEED FOR NETWORKING: The ability to exchange data and communicate efficiently is the main purpose of networking. Some of other common usesof Networking are given below:
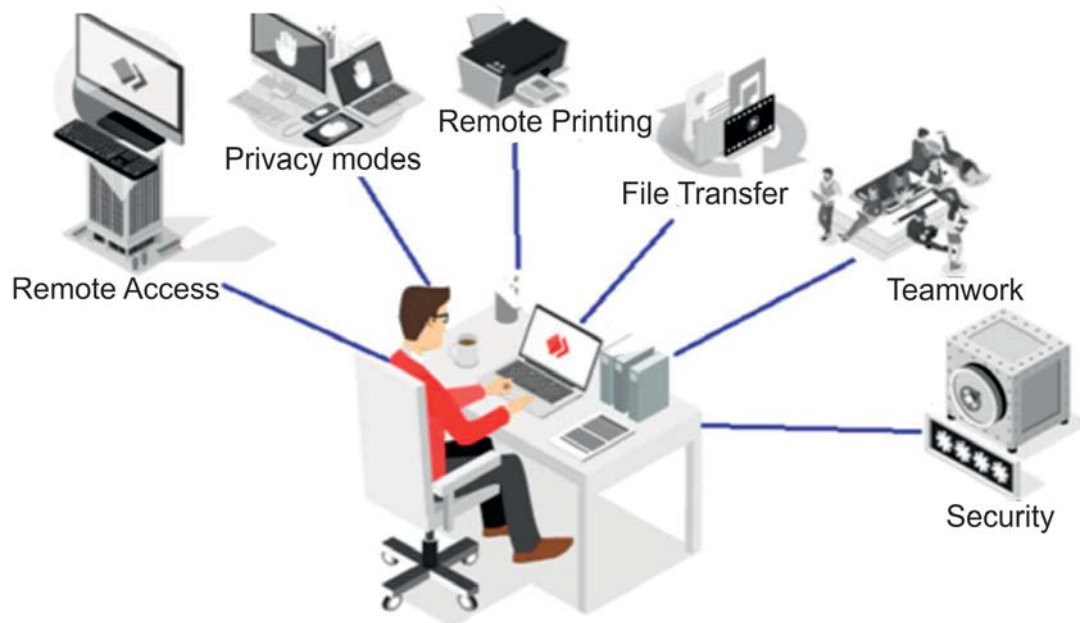

Fig. 1.2 Need for Networking

1. Remote Access to computer or other terminals.

2. Ensured privacy among all the users of network.

3. Sharing hardware devices like printer, scanner, modem etc.

4. File sharing across the network.

5. Sharing of software or operating programs on remote systems.

6. Make information easier to access and maintain among network users.

7. Multiple users can play games from different locations.

8. Multiple users can share the Internet connection.

9. Communication via email, video conferencing, instant messaging, etc.

10. Secured centrally access and backup of data among network users.

1.3 ADVANTAGES AND DISADVANTAGES OF NETWORKS

Advantages of Networks:

- **Sharing files,data and information**:You can share data, programs and different resources with it. It is only possible because all the files are stored on server (Central computer, Server allows sharing of these files)

- **Sharing Hardware and software**: you can share hardware and software within network easily.For example, a printer can be shared among the users in a network so that there's no need to have individual printers for each and every computer in the organization.

- **Fast Communication :** Network provides a very fast communication media e.g. E-mail is used as a fastest way of communication in different offices.

- **File Integrity**: File integrity remains continuous due to network. It saves much time. Network helps in fast saving and sharing of files.

- **Cost effective**: We can share costly input and output devices like printer with network. Thus, it reduces the cost of system.

- **Reliability**: Network ensures use of many resources to us e.g. when hardware fails, information can be recovered from other computer with the help of network.

- **Flexibility**: It provides more flexibility because there is a possibility of connecting devices of different organizations in it.

- **Backup**: It is difficult to get back up of a file from different computers. But it is easy to take backup from server if we are linked with network.

- **Security**: Network provides security to us. Network user can be restricted to access files or applications.

- **Speed**:Sharing and transferring files within networks is very fast which saves time and money.

Disadvantages of Networks:

- **Network Failure**: All the central facilities may fail due to network failure.

- **Management**: For managing entire network, technical experts are required.

- **Security**: There are security threats in a network. Data can be misused in network.

- **Expensive to Build**: Building a network is costly, especially for Large scale organizations. Cost of cables and other hardware equipment is very high.

1.4 COMPONENTS OF COMPUTER NETWORKS:

A computer network consists of several components. Each of these components is very important for the proper functioning of a network. **Computer network components** include the major

parts that are required to install a network both at the office and home level. Before exploring the networking process, we should be familiar with its parts so that we could choose and buy the right component that fits with our network system.

a. Computer: The purpose of a network is to interconnect computers. The first step for setting up a network is to identify computers and users who want to participate in the network.There are two types of computers which are used for creating a network:

- **Client**: Client is a normal computer system. These computers are connected to a network for sharing various types of resources.

- **Server**: Server is a powerful computer system. It helps in sharing of resources or information in the network. It controls all other nodes within a network.
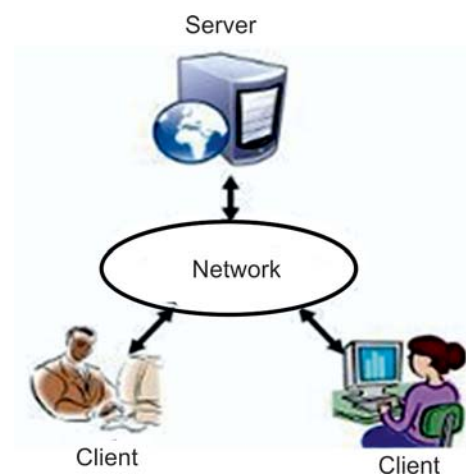

Fig 1.3 Client/Server

Note: A Node can be a Computer, Printer, Switch, Scanner or any other device connected to the network for sharing purpose.

b. Network Interface Card: A Network Interface Card(NIC) is a Printed Circuit Board (PCB). It is installed on the motherboard inside a system-unit so that a computer can be connected to a network. It should be fitted in each client and server computer.

There are two types of network cards:

- **Ethernet Card:** The Ethernet NIC uses Ethernet cables and connectors as a medium to transfer data

- **Wireless Card**: In wireless card, the connection is made using such an antenna that employs radio wave technology.
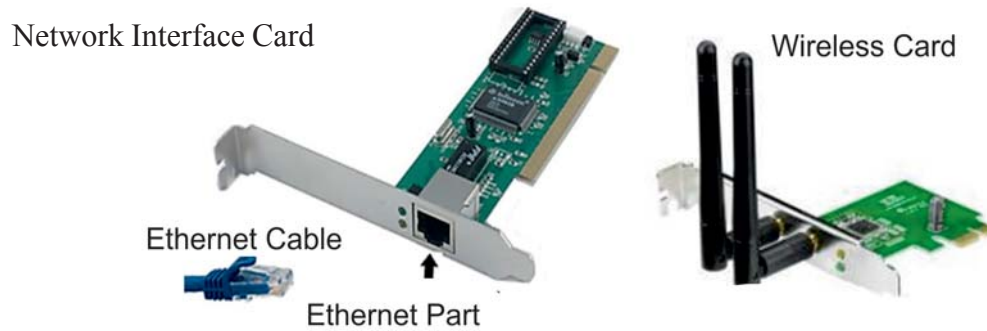
Network Interface Card

Wireless Card

Ethernet Cable

Ethernet Part

Fig: 1.4 Network Interface Cards

c.HUB / Switch:A networking Hub/Switch is a device that allows us to connect multiple computers to a single network. In simplest form, a hub works by duplicating the data packets received at one port and making it available to all other ports, therefore allowing data sharing between all the devices connected to the hub/switch.

Printer

Network switch

File server

Jett

Network using   Network using   Network using

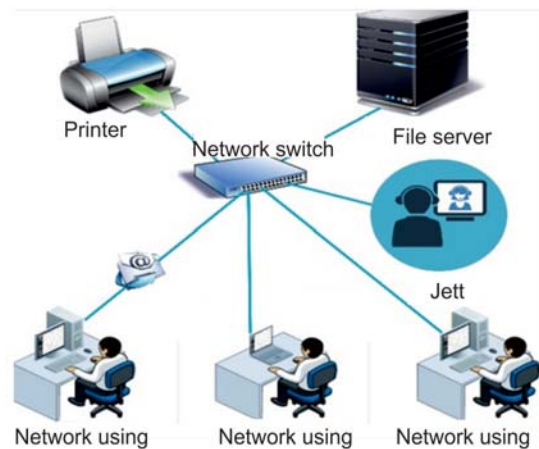Fig 1.5 Hub/Switch   Fig 1.6 Network using Hub/Switch

d. Router: A *router* is a hardware device designed to receive, analyze and forward incoming data within a network or to another network. It decides the forwarding-route for each incoming data-packet of the network.

Fig 1.7 Router

e. Transmission Media: Transmission media is a communication channel that carries the information from the sender to the receiver. They are of two types:

- **Guided Media:** It is a wired media, such as Twisted Pair Cables, Coaxial Cables, and Optical Fiber etc.

- **Unguided Media:** It is a wireless media, such as Microwave signals, Satellites etc.

1.5 TYPES OF NETWORKS:

There are several different types of computer networks. Computer networks can be characterized by their size as well as their purpose. The size of a network can be expressed by their geographical area and the number of computers that are connected to a network. Networks can cover anything from a handful of devices within a single room to millions of devices spread across the entire globe.

Networks may be small or large based on its size, complexity and Distribution area. On the basis of their size, Networks can be categorized as follows:

1. PAN(Personal Area Network)
2. LAN (Local Area Network)
3. MAN (Metropolitan Area Network)
4. WAN (Wide Area network)

1.5.1 Personal Area Network

A Personal Area Network or PAN, is a computer network organized around an individual person within a single building. This could be inside a small office or residence. Personal area networks can be constructed with cables or it can be wireless. It refers to the interconnection of information technology devices or gadgets (include laptop computers, PDAs, cell phones, printers) within the environment of an individual user (typically within 10 meters).
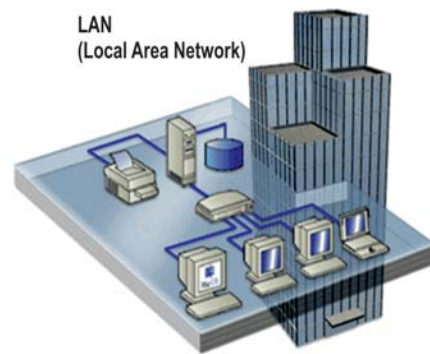

Fig. 1.8 PAN

1.5.2 Local Area Network (LAN):

A LAN is a network that is used for communication among computer devices, usually within an office building or home. LAN's enable sharing of resources such as files or hardware devices that may be needed by multiple users. It is limited in size, typically spanning a few hundred meters, and no more than a mile. It is fast, with speeds from 10 Mbps to 10 Gbps. It Requires little wiring, typically a single cable connecting to

Fig 1.9 LAN

each device. It has lower cost compared to MAN's or WAN's. LAN's can be either wired or wireless. Twisted pair, coaxial or fiber optic cable can be used in wired LAN's. It is suitable to
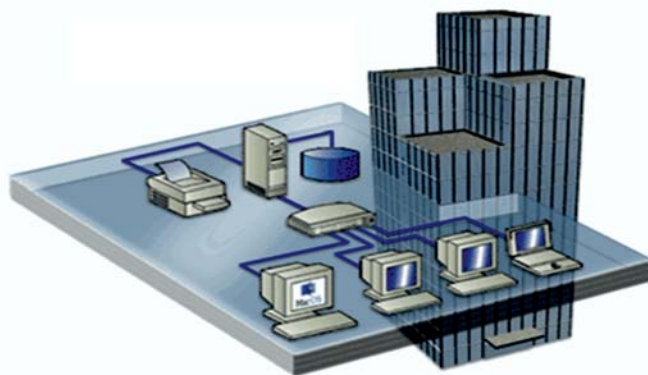
bus, ring or star topologies. Generally Coaxial Cable on Twisted Pair transmission media is used in these networks.

1.5.3 Metropolitan Area Network (MAN):

This type of network is distributed in a city, college campus or large area just like a Cable TV network.A MAN is optimized for a larger geographical area than a LAN, ranging from several blocks of buildings to entire cities. A MAN might be owned and operated by a single organization, but it usually will be used by many individuals and organizations. Many LANs may be inter-connected in this type of network. A MAN often acts as a high-speed network to allow sharing of regional resources. A MAN typically covers an area of range between 5 to 50 km diameter. Examples of MAN: Telephone company network that provides a high-speed DSL to customers and cable TV network.

Network of Building-1

Network of Building-2

Fig 1.10 MAN

Network of Building-3
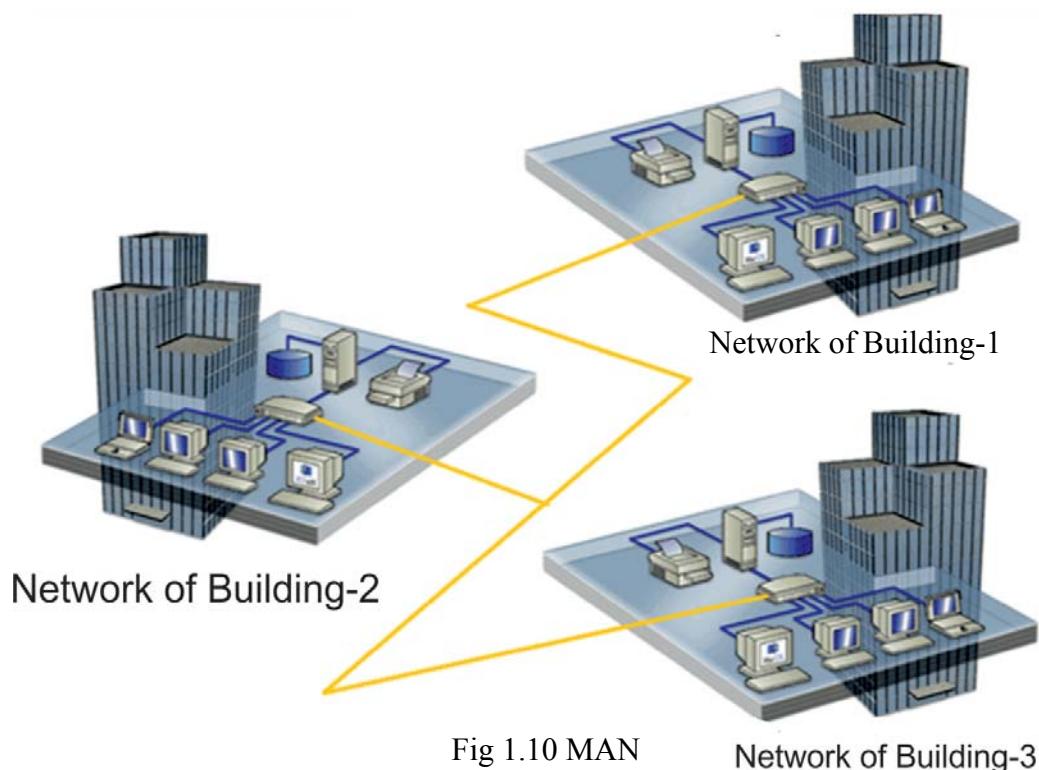
1.5.4 Wide Area Network (WAN):

WAN covers a large geographical area such as a country, continent or even the entire world. WAN can contain multiple smaller networks, such as LANs or MANs. In this network,various types of communication media such as - telephone lines, satellites, microwave signals etc. are used. These transmission media are linked with Router. Router is a device which determines the route of information from sender to receiver. The world's most popular Wide Area Network is the Internet.

Fig 1.11 WAN

1.6 NETWORK TOPOLOGIES:

Network topology is the arrangement of the elements such as links, nodes, etc.of a ComputerNetwork. The term Topology refers to the way in which the various nodes or computers of a network are linked together. It describes the actual layout of the computer network hardware. Topology determines the data paths that may be used between any pair of devices of the network.Two or more nodes connect to a link; and two or more links form a topology.
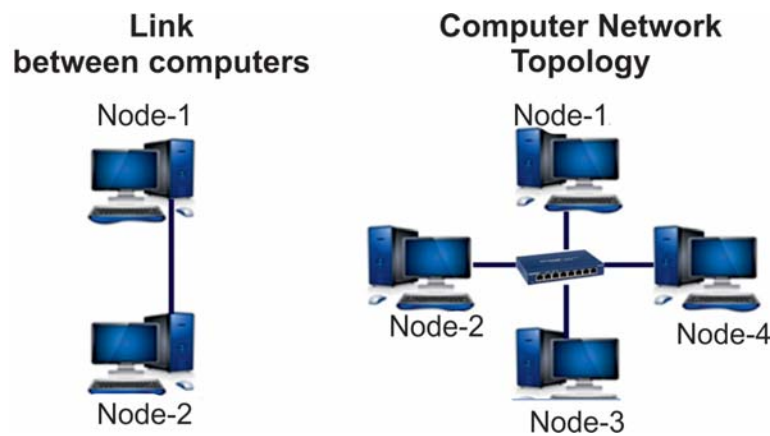

Fig 1.12 Link vs. Topology

The selection of a **Network Topology** depends on the choice of media and the access method used. The following factors are considered while selecting a topology:

1. Cost

2. Reliability

3. Scalability

4. Bandwidth capacity

5. Ease of installation

6. Ease of troubleshooting

1.6.1 Types of Network Topologies:

Following figure shows the different types of topologies:
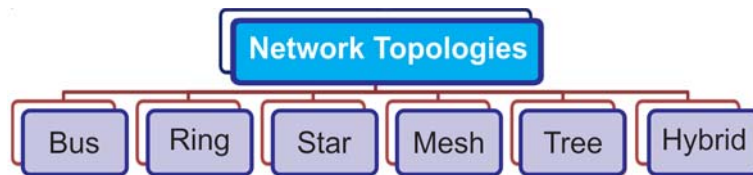
1.13 Networks Topologies

1.6.2.1 Bus Topology:

Bus Topology is the simplest type of network topology.In this type of topology, all the nodes (Clients, Servers and other Devices) are connected to the single cable with the help of T-connectors. This central cable is the backbone of the network and is known as **Bus**. Every workstation communicates with other devices through this Bus.Terminators are placed at both ends of the bus cable to prevent signal bouncing.

When a signal is broadcasted from the source, it is transmitted to all other nodes connected to the bus cable. Although the message is broadcasted, but only the intended recipient, whose MAC/IP address matches, accepts it. If the MAC /IP address of machine doesn't match with the intended address, machine discards the signal.

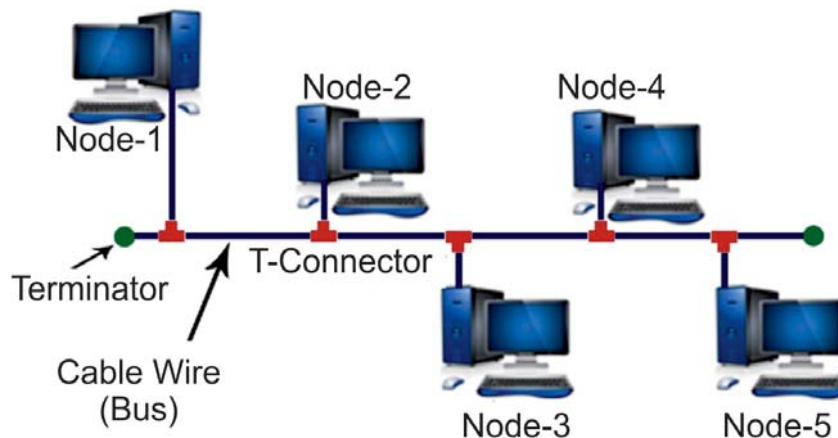Fig 1.14 Bus Topology

Advantages of Bus Topology:

- Any new computer can be attached easily.
- It is a cheaper topology.
- If one computer fails, others are not affected.
- Cable requirement are least as compared to other network topologies.

- Used in small networks.

- It is easy to understand the layout and connectivity.

Disadvantages of Bus Topology:

- If the main central bus fails, the entire network breaks down.

- The efficiency of network is reduced with the increase in number of computers.

- Cable length is limited.

- It is slower than some other topologies.

- Terminators are required at both ends of the backbone cable

- Difficult to identify the problem if the entire network breaks down

1.6.2.2 Ring Topology:

In Ring Topology, all the computers are logically linked in the form of a ring. In this type of topology, each node is connected with two adjacent (Neighboring) nodes. All traffic travels either clockwise or anticlockwise around the ring. At the time of accepting data, each node checks its address. If address matches with the node,

node will accept it. Otherwise, data will be rejected by the node. There are two kinds of ring topologies:

1. **Single Ring** - In single ring network, a single cable connects all the devices and data travels only in one direction. Each device waits for its turn and then transmits data. When the data reaches at its destination, another device can transmit data.

2. **Dual Ring**: This topology uses two rings to send the data in both directions, i.e. clockwise and anti-clockwise. Thus, it allows more packets to be sent over the network.
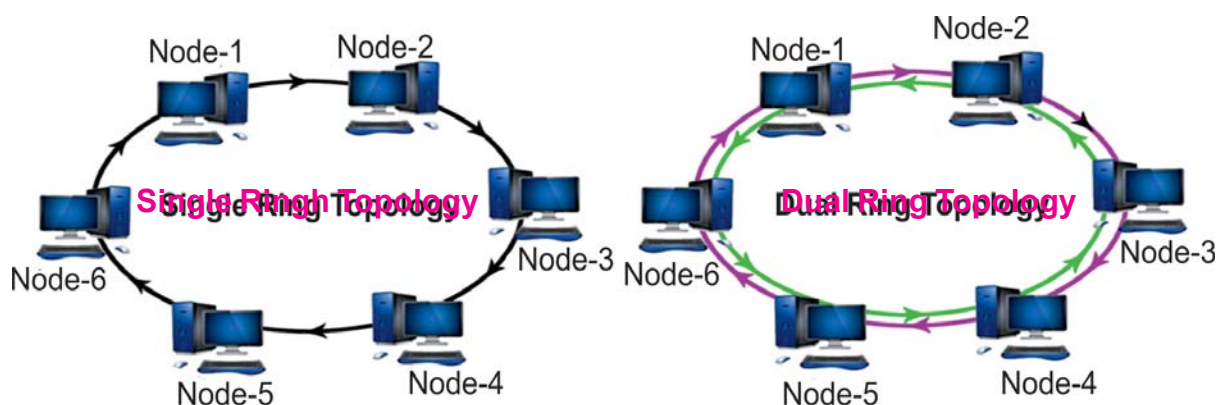

Fig 1.15 Ring Topology

Advantages of Ring Topology:

- Very systematic network where every device has access to the data and the opportunity to transmit data.

- Performs better than a bus topology under heavy network load.

- Does not require a central node to manage the connectivity between the computers.

- It is easier to locate the problems with device and cable *i.e.* fault isolation is simplified. If one device does not receive a signal within a specified time, it can issue an alarm.

Disadvantages of Ring Topology:

- Failure of one computer can affect the entire network.

- Difficult to troubleshoot.

- Adding or removing Computers disrupts the network

- A ring network requires more cable than a bus network.

1.6.2.3 Star Topology:

In Star Topology, all the nodes are connected to a central device. This central device can be a Hub, a Router or a Switch. This Hub/Switch is the central node of network and all other nodes are connected to this central node. Nodes in star topology cannot have a direct connection with each other. They have to be linked via hub.
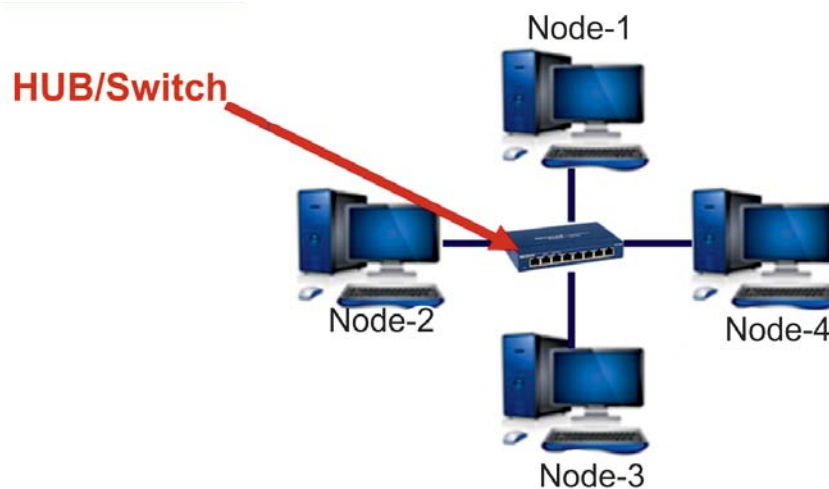

Fig 1.16 Star Topology

Advantages of Star Topology:

- It is easy to setup and connect.
- Failure of one computer does not affect the other.
- More nodes can be connected easily.

- It is easier to find faults in network.
- Easy to troubleshoot.
- Easy to modify.

Disadvantages of Star Topology:

- Failure of hub results in failure of entire network.
- Cost of installation is high.
- Performance depends on the capacity of central device.
- Cable requirements are more as compared to some other network topologies.

1.6.2.4 Mesh Topology:

In Mesh Topology, each node is directly connected to other nodes in the network. A mesh topology can be a fully or partially connected mesh topology:

- In a fully connected mesh topology, each computer in the network has a direct connection to all the other computers in that network.
- In a partially connected mesh topology, at least two computers in the network have connections to other computers in that network.
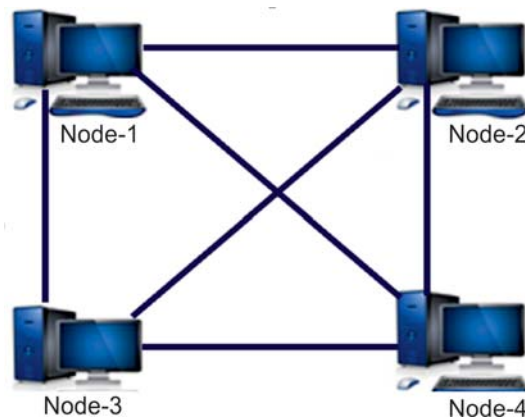

Fig 1.17 Mesh Topology

Advantages of Mesh Topology:

- Data can be transmitted from different devices simultaneously. This topology can withstand high traffic.
- If any of the components fails, there is always an alternate route available. So, data transfer doesn't get affected.
- Expansion and modification in topology can be done without disrupting other nodes.

Disadvantages of Mesh Topology:

- Installation and configuration process is difficult.
- Cabling cost is more.

1.6.2.5 Tree Topology:

A Tree topology is a special type of structure where many nodes are connected in hierarchical structure like the branches of a tree.In Computer Networking, tree topology is known as a combination of a Bus and Start network topology.Tree network topology is the simplest topology in which only one route exists between any two nodes on the network. The pattern of connection resembles a tree in which all branches spring from one root, hence Called Tree Topology.
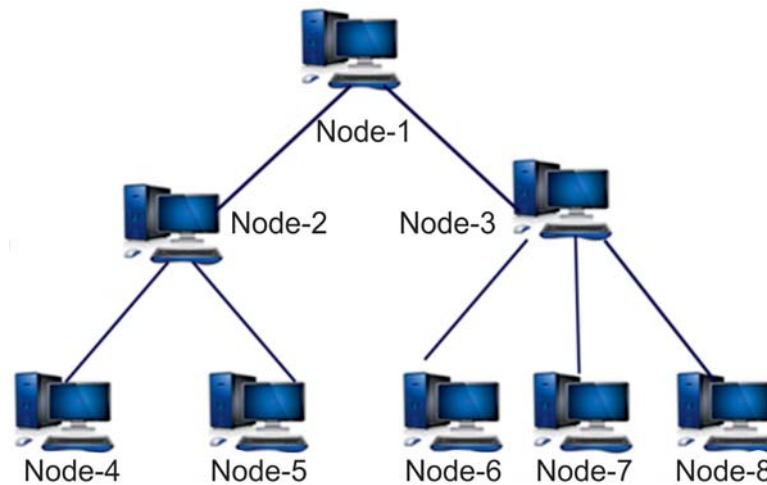

Fig 1.18 Tree Topology

Advantages of Tree Topology:

- It is an extension of Star and bus Topologies.

- Expansion of Network is possible and easy.

- We can divide the whole network into segments (star networks), which can be easily managed and maintained.

- Error detection and correction is easy.

- If one segment is damaged, other segments are not affected

Disadvantages of Tree Topology

- Because of its basic structure, tree topology, relies heavily on the main bus cable, if it breaks whole network goes down.

- The maintenance becomes difficult when more nodes are added.

- Scalability of the network depends on the type of cable used.

- It has higher cabling cost in setting up a tree structure.

1.6.2.6 Hybrid Topology:

A hybrid topology is a type of network topology that uses two or more other network topologies, including bus topology, mesh topology, ring topology, star topology and tree topology.It is a

mixture of any two or more topologies. In the following figure, Bus, Star and Tree topologies are connected to form a Hybrid Topology.
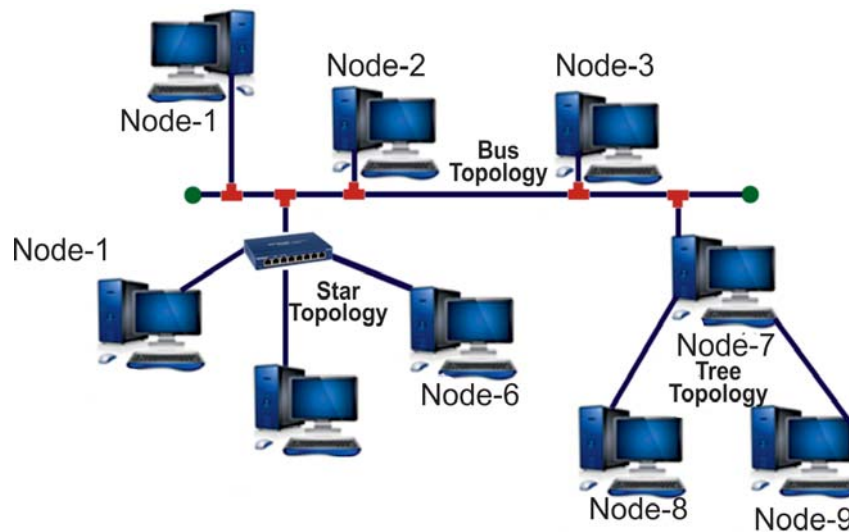

Fig 1.19 Hybrid Topology

Advantages of Hybrid Topology:

- Reliable as Error detecting and troubleshooting is easy.

- Scalable as size can be increased easily.

Disadvantages of Hybrid Topology:

- Complex in design.

- Costly.

1.7 DATA COMMUNICATION

Data communication is the exchange of data between two or more computers (a sender/source and a receiver/destination) with the help of communication medium. The device that transmits the data is known as sender/ source and the device that receives the transmitted data is known as receiver/destination.Data communication must fulfil following three conditions:

1. **Delivery**: Network should deliver the data at intended destination.

2. **Accuracy:** Data communication should be free from fault.

3. **Time limit**: Data should reach at destination without any delay.

1.7.1 Components of Data Communication

There can be many varieties of components that may involve in Data communication. Some of the essential components of data communication are as follows:

1. **Sender**: Sender prepares information (data) and sends it

2. **Medium**: It carries the information from sender to receiver. It can be guided or unguided media.

3. **Receivers**: Receiver receives the information sent by the sender.

4. **Protocol**: These are the set of rules that manages data transmission between sender and receiver
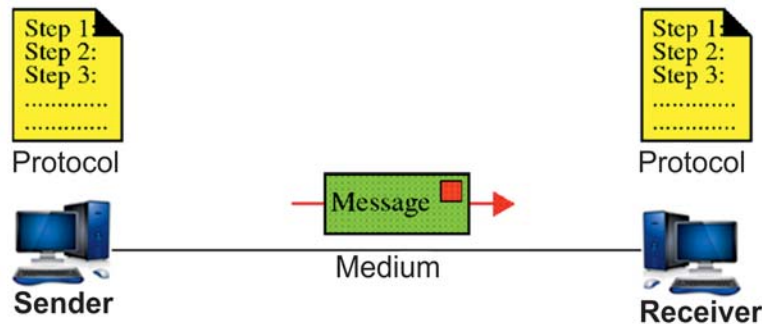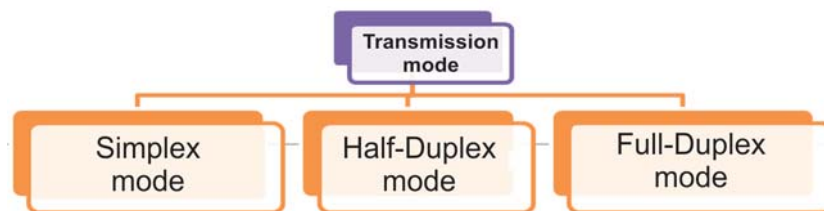

Fig 1.20 Data Communication

1.7.2 **Modes of data transmission:**

Modes of data transmission refer to the direction of flow of data between sender and receiver. Modes of data transmission are given below:

1. **Simplex**: In this mode of data transmission, communication is in one direction only. In this type of data transfer mode, only sender can broadcast information and receivers can only receive the broadcasted information. No receiver can send any type of information to anyone. Example: television communication.
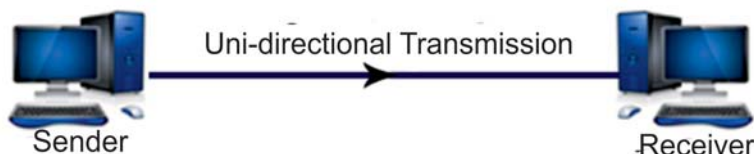

Fig 1.22 Simplex Mode

2. **Half duplex**: In this mode of data transmission, information can flow in both directions but not at the same time. In other words, if information is sent by one node then second can only receive it or vice versa as shown in the following figure. Example: walky-talky system used by police and army.
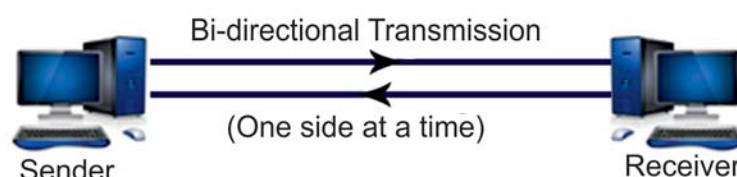

Fig 1.23 Half-duplex Mode

3. **Full duplex**: In this mode of data transmission, information can be transmitted in both directions at same time as shown in following figure. It provides fast communication between nodes. Example: Telephone System:
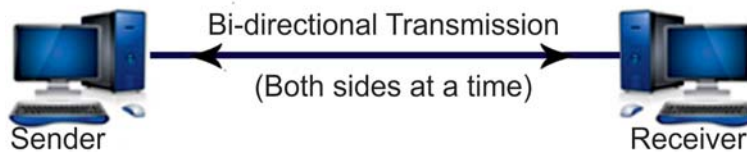

Fig 1.24 Full-Duplex Mode

POINTS TO REMEMBER

1. A network is a group of two or more computers that are linked in order to share resources such as printers, files and other resource.

2. A computer that is not connected to a network is known as a standalone computer.

3. A computer network consists of several components like Computer, Network Interface Card, HUB/Switch, Router etc.

4. On the basis of its area of distribution, network is divided into some categories like PAN(Personal Area Network), LAN (Local Area Network), MAN (Metropolitan Area Network) andWAN (Wide Area network).

5. A personal area network, or PAN, is a computer network organized around an individual person within a single building.

6. A LAN is a network that is used for communicating among computer devices, usually within an office building or home.

7. A MAN is distributed to a city, college campus or large area just like Cable TV network it is also single. Many LANs are connected in it.

8. A WAN covers a large geographic area such as country, continent or even whole of the world. WAN can contain multiple smaller networks such as LANs or MANs.

9. Network Topology refers to the way in which the various nodes or computers of a network are linked together.

10. Some examples of Network Topologies are Bus, Ring, Star, Mesh, Tree and Hybrid.

11. Data communication is the exchange of data between two or more computers (a sender/ source and a receiver) with the help of communication medium.

12. Components of Data Communication are Sender, Medium, Receivers and Protocol.

13. In Star Topology, all the nodes are connected to a central device. This central device can be a Hub, a Router or a Switch.

14. There are three modes of Data Transmission- Simplex, Half-Duplex and Full Duplex.

EXERCISE

Que:1 Fill in the blanks

I _____ is a group of two or more computers that are linked in order to share resources such as printers, files, and other resources.

A. Network   B. Internet

C. Wireless   D. Topology

II Which of the following is the smallest type of network?

A. MAN   B.WAN

C. LAN   D. None of these

III _____ is a device that allows you to connect multiple computers to a single network.

A. HUB   B. BUS

C. Ring   D. Star

IV In _____ network topology, a single backbone cable is shared by all the devices.

A. BUS   B.TREE

C.MESH   D.STAR

V _____ prepares information and sends it.

A. Protocol   B. Receiver

C. Sender   D. Hub

Que:2 Write True/False

I We cannot Share hardware or Software among network devices.

II LAN covers a large geographic area.

III In full duplex, information can be transmitted in both directions.

IV Protocols are set of rules by which data transmission takes place between nodes.

Que:3 Write the Full Forms:

      I   LAN   :   _____

      II   MAN   :   _____

      III WAN   :   _____

      IV PAN   :   _____

      V   NIC   :   _____

**Que:4 Short answer type questions**

      I   Write the names of any four Network Topologies.

      II   Define Network Interface Card (NIC).

      III   Write the name of components of data communication.

      IV   Write a short note on HUB.

      V   What are the two types of ring topologies?

Que:5 Long Answer type questions

      I   What is Network? Explain its advantages and disadvantages.

      II   Explain the various components of computer network.

      III   Write about different types of networks.

      IV   Explain the various modes of data transmission?

Lab Activity

1. Give the name of different Topologies in the given diagram:
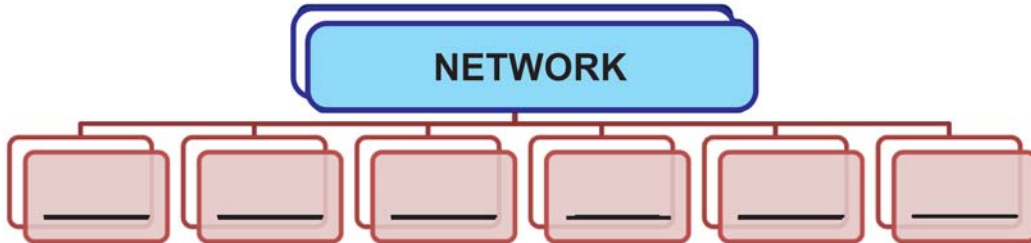
2. Identify the following topology and write the name of various components of the given topology.
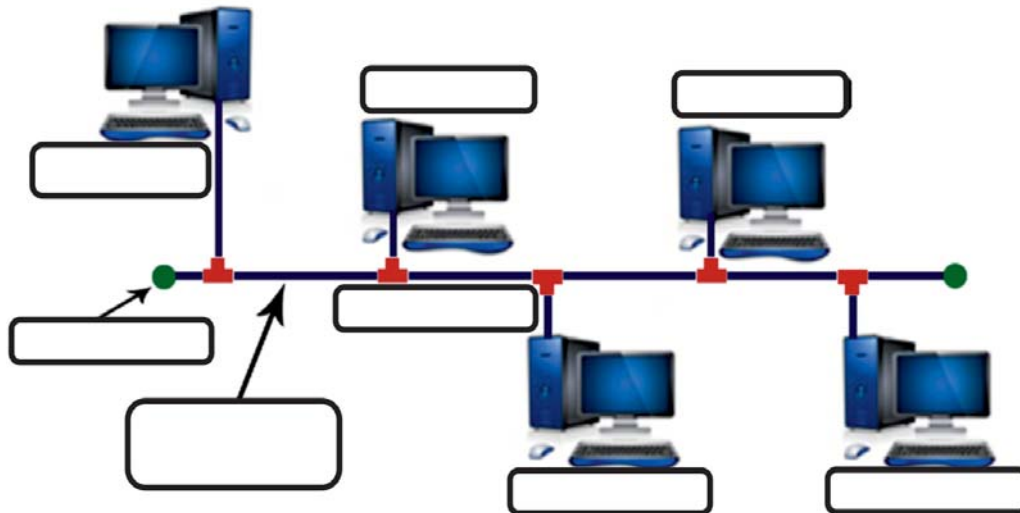
Name of Topology:

INTERNET APPLICATIONS

2.1 INTRODUCTION TO INTERNET

The Internet is the global system of interconnected computer networks that communicates between various networks and devices. It is a network of networks that consists of private, public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies.

Internet is a worldwide collection of computer networks, cooperating with each other to exchange data using a common software standard through telephone wires and satellite links. Internet users can share information in a variety of forms. One can surf for any kind of information regarding various topics such as Technology, Health & Science, Social Studies, Geographical Information, Information Technology, Products etc. over the internet with the help of any search engine.

Apart from communication and source of information, the internet also serves a medium for entertainment. For example: Online Games, Songs Videos, Social Networking Apps etc.Internet also provides a concept of electronic commerce that allows the business deals to be conducted on electronic systems. The Internet allows us to use many services like Internet Banking, Online Shopping, Online Ticket Booking, Online Bill Payment, email etc.

2.2 E-MAIL

Email, stands for "electronic mail" is one of the most commonly used features over the Internet. It allows us to send and receive messages to and from anyone with an email address, anywhere in the world.

Email is a way of sending electronic messages or data from one computer user to one or more recipients. Various webmail services are as follows:

1. Gmail
2. Yahoo! Mail
3. Rediff Mail
4. Hotmail

Fig 2.1 E- mail

2.3 CAPTCHA CODE

A CAPTCHA stands for "Completely Automated Public Turing test to tell Computers and Humans Apart". It is a type of test used in computing to determine whether or not the user is human.

CAPTCHA codes are mostly used on the signup or login pages of websites. A CAPTCHA is a technique that protects websites by generating and grading tests that humans can pass but current computer programs cannot. For example, humans can read distorted text as the one shown below, but current computer programs can't.

Fig 2.2 CAPTCHA

2.4 CONCEPT OF DOWNLOAD AND UPLOADING

Downloading is a process of receiving data/file from a remote computer (server) to the computer of the user (client). We can use this option to download any media from the internet such as Study Material, E-Books, Images, Songs & Videos.

Uploading is a process of sending data/file from a local computer (client) to a remote computer (Server). We can upload our files like Notes, Pictures, Video Lectures etc Google Drive, Social Media Sites, Youtube etc.

2.5 CLOUD NETWORKING & CLOUD PRINTING

The term Cloud refers to a Network or Internet. In other words, we can say that Cloud is something, which is present at remote location. Cloud can provide services over public and private networks, i.e., WAN, LAN or VPN. Applications such as e-mail, web conferencing, customer relationship management (CRM) execute on cloud.

Cloud Networking: Cloud networking refers to manipulating, configuring and accessing the hardware and software resources remotely. It offers online data storage, infrastructure, and application.
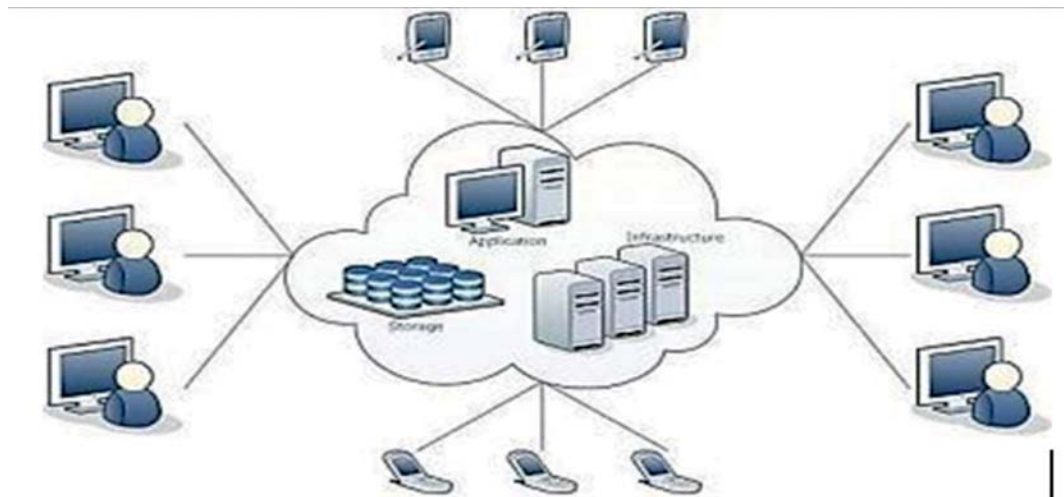

Fig 2.3Cloud Networking

Cloud networking offers platform independency, as the software is not required to be installed locally on the PC. In cloud networking it is simple to add more hardware and software. Cloud networking provides the ability to scale up and down when additional users are added and when the application requirements change.

Cloud Printing:

Cloud Printing enables users to print documents and other materials on any device associated with the cloud (network). We can connect all our devices including our computers, laptops, tablets, phones etc. to one particular printer. We can print straight from any of the devices those are not directly connected to the printer but connected to the cloud network using Internet.

Fig 2.4 Cloud Printing

Cloud printing services allows the user to print from any web-connected device by routing print jobs between your computer, smartphone or tablet and sends them to an internet connected printer. It also allows users to quickly discover printers and print from their own device without the need to set up driver installations. Users can create content and send the file to a cloud printing service provider via whatever device they choose, which then routes the file to a cloud-attached printer at a location selected by the user.

2.6 GOOGLE APPS

Apps is an abbreviation for *application*. An app is a piece of software/program. It can work on the Internet, on our computer or on our phone or other electronic device. The word "app" is a more modern usage, but this is really the same thing as a program.

Google refers to their online services as apps, but they also sell a specific suite of services known as Google Apps.

Google Apps is a suite of Web-based applications from Google that includes e-mail, calendar, word processing, spreadsheet and presentations. Let's have a look at the common google apps:

2.6.1 Gmail

'Google Mail' or 'Gmail' is a free email service provided by Google. In many ways, Gmail is like any other web-based email service: You can send and receive emails**,** block spam**,** create an address book, and perform other basic email tasks. But it also has some more unique features that help to make it one of the most popular email services on the Web.

Fig 2.5 Google Apps

2.6.1.1 Creating new account

In this section, we'll study about how to get started with email by creating an account in Gmail.

Note: We are using Chrome as our browser; however other browsers such as Internet Explorer and Firefox will look similar.
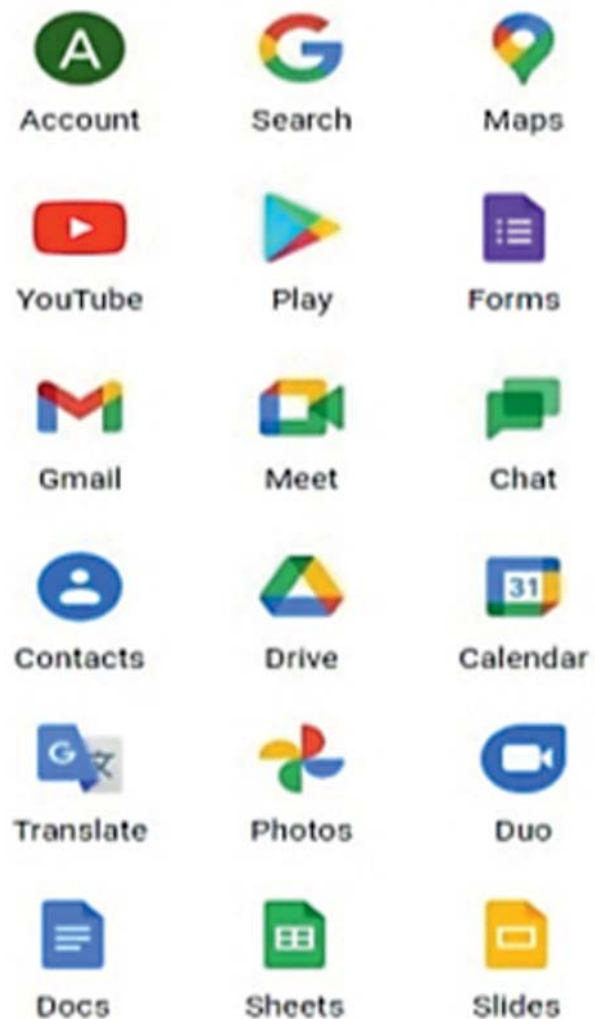
Follow these step-by-step instructions to create a Gmail account

- Open the internet browser.

- Type www.gmail.com in the address bar:

Fig 2.6 Gmail
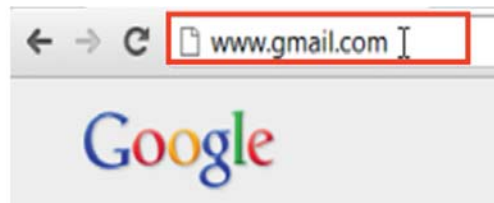
Note**:** You can also click on ”**Gmail”** link at the top right corner of the google homepage.
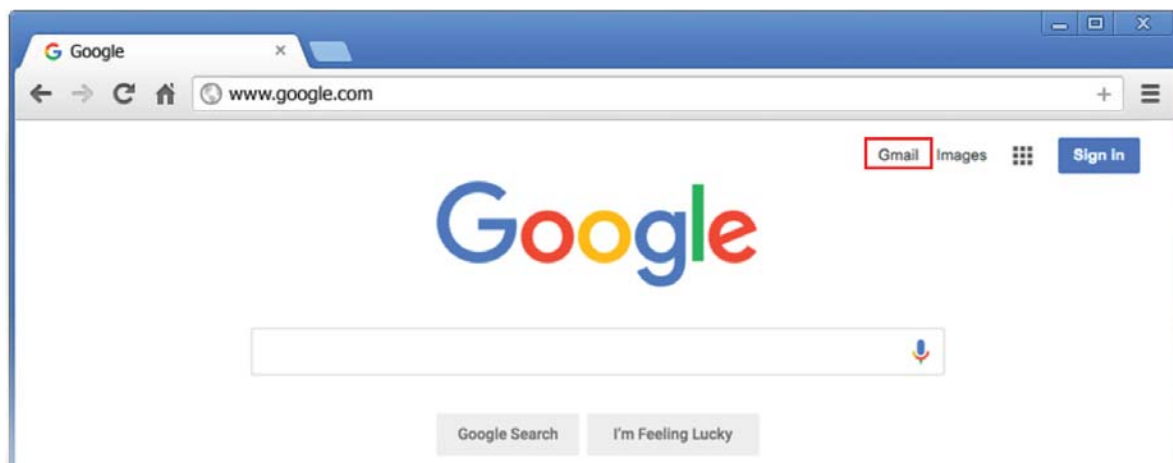

Fig 2.7 Google Home Page

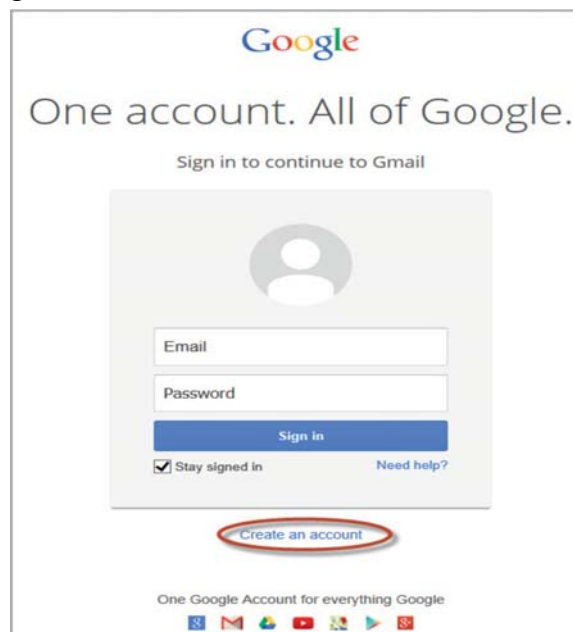We'll now be in the 'Sign in' section.

Fig 2.8 Create New Account and Sign In

As we don't have a Google account yet, we need to create one. Click **Create an account**. To set up our new account, Google needs some information about us –

- Our first and lastname.

- The '**choose your username'** is the unique email address that we wish to create, which will be placed before '@gmail.com'. Because it needs to be unique, Google may have to check the availability of any name that we decide on to make sure that no one already has it. Type an email name into the 'choose your username' box. Once we finalize our email address, it's a good idea to make a note of it so that we can refer to it until we remember it.

- We'll need to give a password so that we can log in securely to our account. We should try to set a password with at least 8 characters long to be secure. Use letters and numbers to make the password more secure and difficult to guess. We'll need to re-enter our password in the "Confirm your password" box to ensure its accuracy.

- Then fill Birthday (Month, Day, Year), Select Gender (Male/Female), Enter Mobile phone number and any other e-mail address (if exist).
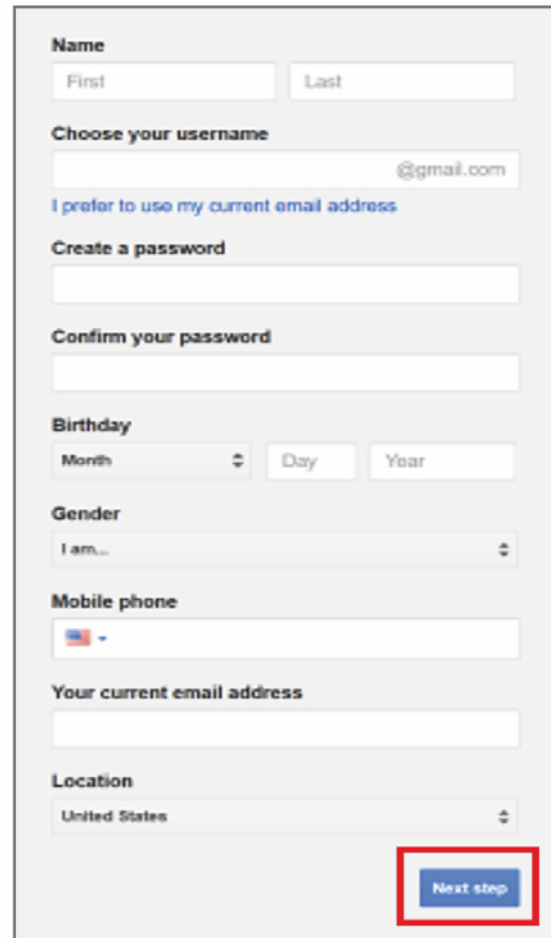

Fig. 2.9 opening gmail account

Once we have completed this page fully, clicking **Next Step** will take us to the next Page.
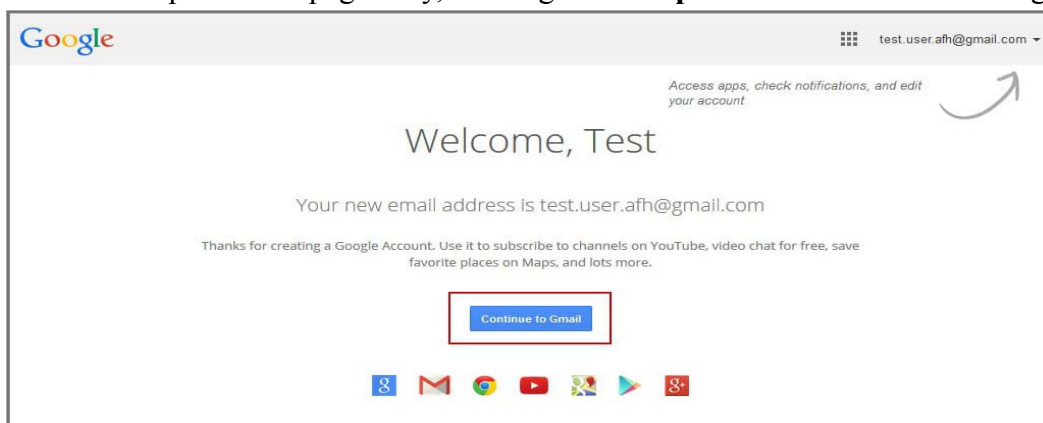
Fig 2.10 Continue to Gmail

We will now have set up our account. Click "Continue to Gmail" to go to our inbox and get started.

2.6.1.2 Log-in to Gmail account:

Follow these step-by-step instructions to Login a Gmail account

- Open the internet browser.

- Type www.gmail.com in the address bar:

- Type the email or phone in the textbox and Click on **Next** button as shown in the Fig 2.11

- Type the password that you choose for your Gmail account in a textbox and the click on **Next** button as shown in the Fig 2.12

Fig 2.11 Login–User ID   Fig 2.12 Login–Password

2.9.1.3 How to send E-mail?

To send an email, click "Compose Mail" located above the folder list. An entry form appears in the Gmail interface.

ਚਿੱਤਰ 2.13 **Compose Mail**

INTERNET APPLICATIONS
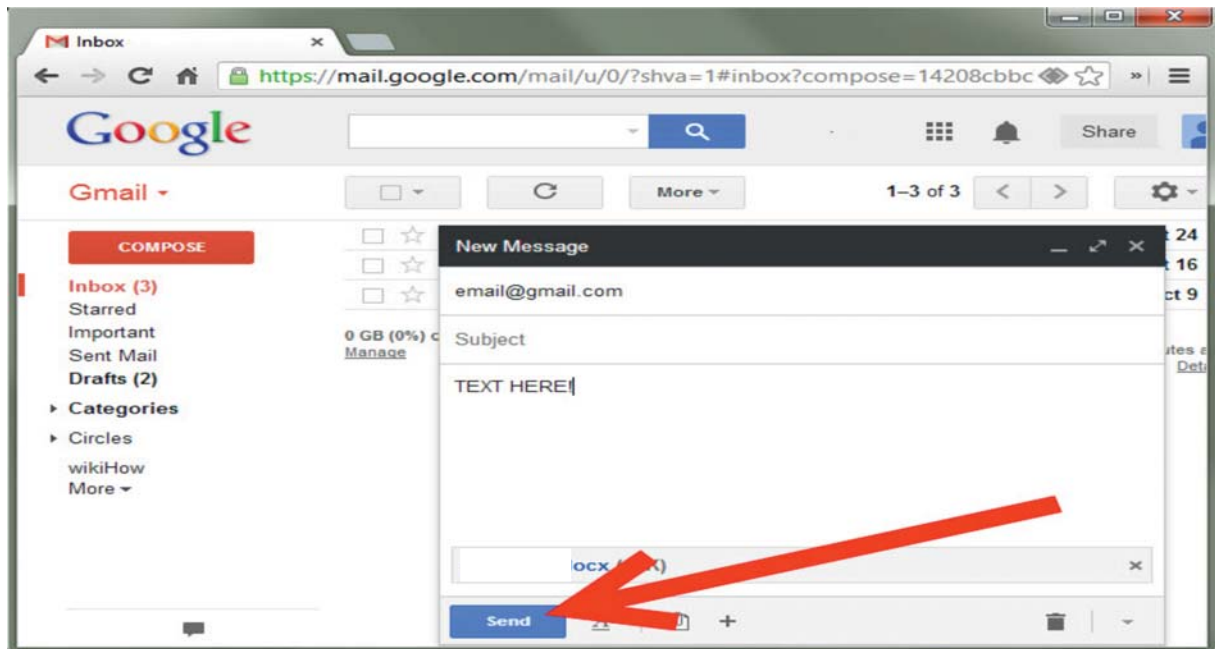
Fig 2.14 Send Mail

The Recipients:

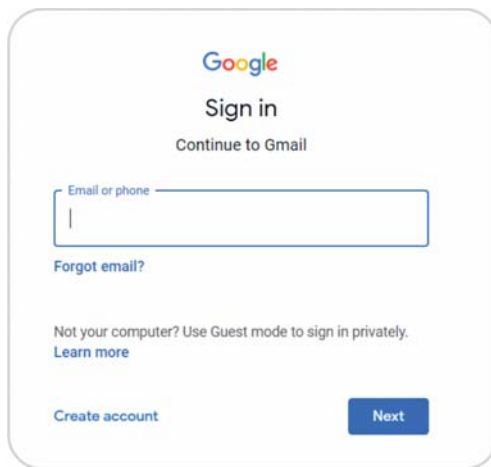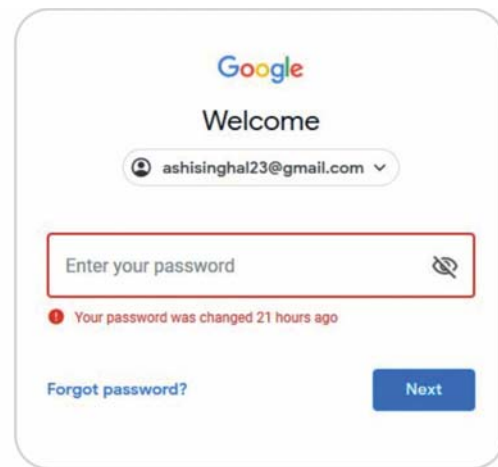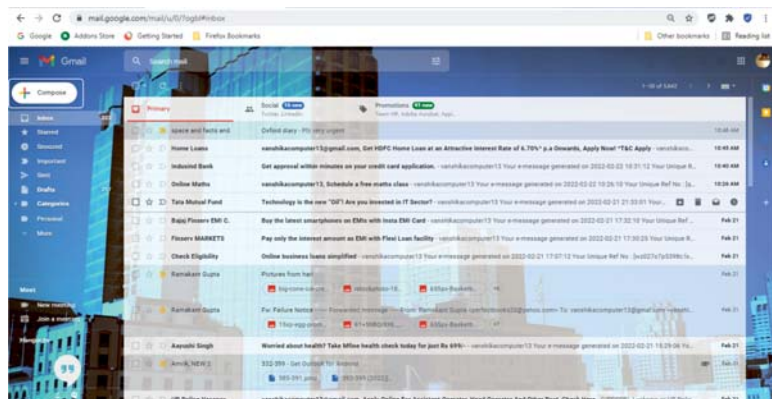- In the "**To:**" box, type the address of the person we want to write an email to. For multiple recipients, separate the addresses with commas.

- **Cc** means "carbon copy". To add/view the "**Cc:**" recipients, click on Cc option and type the addresses of people who are not the main recipients of the message, but we still want to send a copy to.

- **Bcc** stands for "Blind Carbon Copy". To add/view the "**Bcc:**" recipients, click on Bcc option and type the addresses of people we want to send a copy of the mail to, without knowing other recipients.

The Subject:

- In "Subject:", enter the subject of the email.

Body Contents of Gmail:

- Type the message in the window shown below the Subject field. By default, Gmail will send a message in HTML format. When we finish typing our mail, click the "Send" button to send it immediately or we can save it as a draft.

Attach file(s) with email message:

- In the new message window, click the paper-clip icon to add an attachment. From the Open dialog box, select the files we wish to attach, then click "Open".We can see the list of attachment added to our message in the message window.
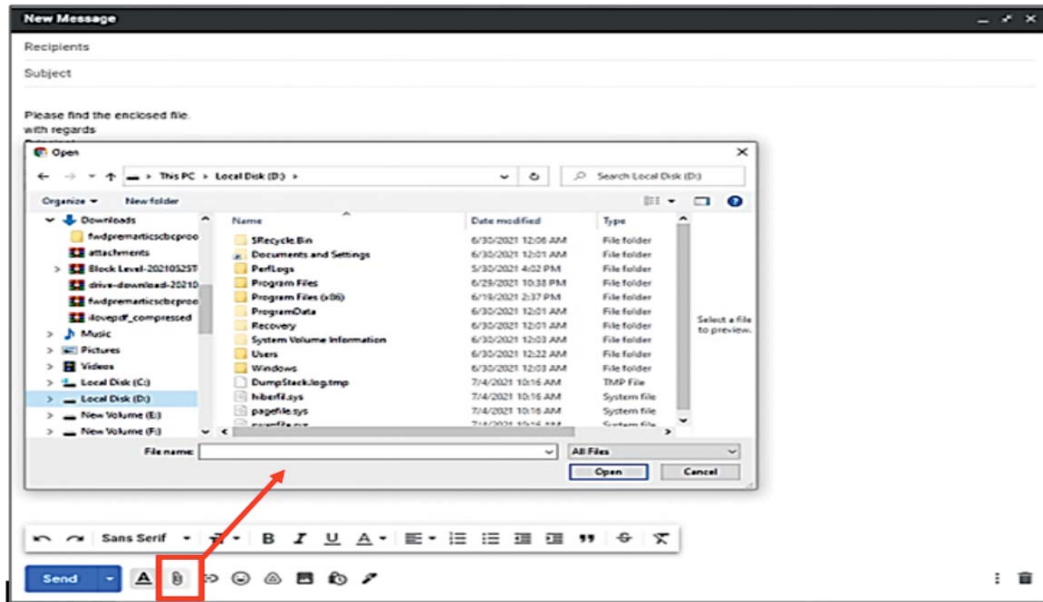
Fig 2.15 Window to Upload an Attachment

2.6.1.4 How to Read E-mail?

All received emails are stored in the inbox. The number of unread messages is indicated to the right of the "Inbox" folder. Gmail automatically checks if new messages arrived. To read any email, just click on the email that appears at the right side of the Gmail Interface

By default, a single message is summed up in one line:

- Dispatcher
- Subject
- The first words of the message
- Dispatch/Receiving date (or time)
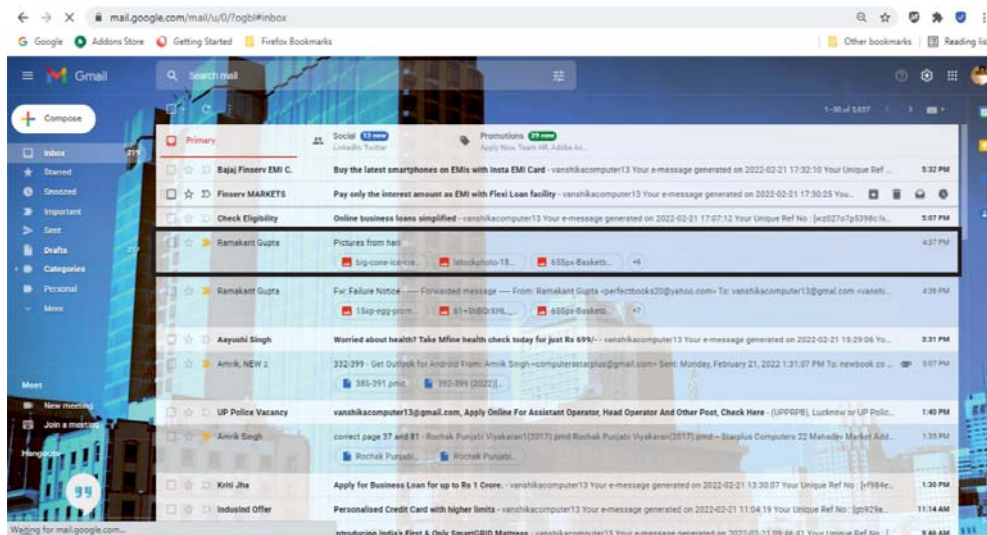
Fig 2.16 Reading mails

2.6.2 Google Calendar:

Google Calendar is a time-management web application and mobile app created by Google. Users are required to have a Google Account in order to use this app. Google Calendar allows multiple calendars to be created.Each calendar can be shared, either read-only or with full edit control, and either with specific people or with everyone (public calendars). Google Calendar allows users to create and edit events. Events can have a start time and stop time, with an option for an "All-day event". Reminders can be enabled for events, with options available for type and time.
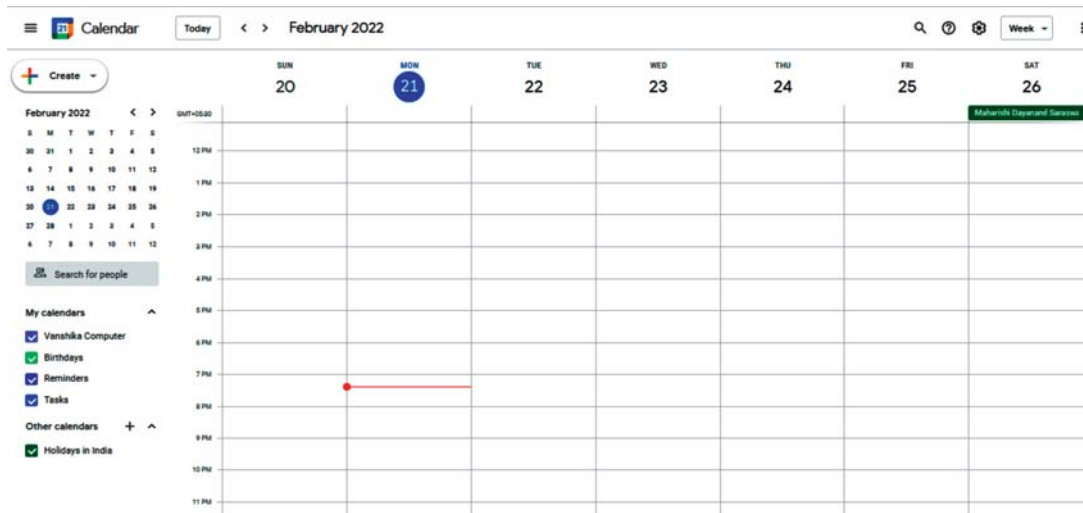
Fig 2.17 Google Calendar

2.6.3 Google Maps:

Google Maps is a web mapping service developed by Google. It offers satellite imagery, street maps, 360° panoramic views of streets (Street View), real-time traffic conditions (GoogleTraffic), and route planning for traveling by foot, car, two-wheeler, or public transportation. Google Maps for Android and iOS devices
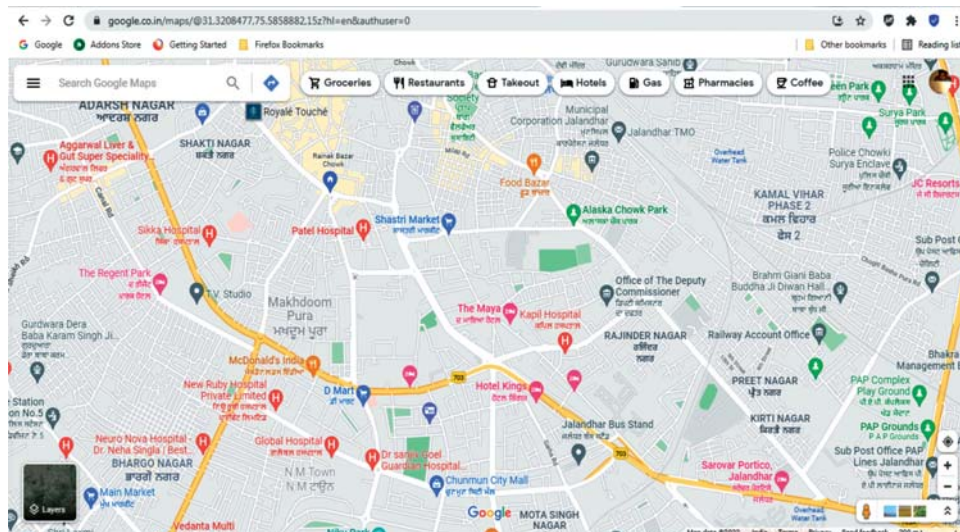
Fig 2.18 Google Maps

was released in September 2008 having features GPS, turn-by-turn navigation along with dedicated parking assistance.

2.6.4 Google Translate:

Google Translate is a multilingual neural machine translation service developed by Google, to translate text, documents and websites from one language into another. Google Translate is a free service that translates words, phrases, and web pages between English and over 100 other languages.

Fig 2.19 Google Translate

2.6.5 Google Docs

Google Docs is an online word processor that allows us to create and format text documents online. Using google docs, we can collaborate also with other people in real time. Google Docs allows us to create and edit text documents right in our web browser, no special software is required. Even better, multiple people can work at the same time and we can see people's changes as they make them, and every change is saved automatically.

Fig 2.20 Google Docs

2.6.6 Google Sheets

Google Sheets is a web-based online spreadsheet application that enables the users to create, update and modify spreadsheets and share the data online in real time. Google Sheets allows us to format spreadsheets online and simultaneously work with other people.

2.6.7 Google Slides

Google Slides is an online presentation app that allows us to show off our ideas in a visual way. Google Slides allows us to easily collaborate and share presentations with text, photos, audio, or video files. It can be accessed in a web browser from any device with an internet connection.

2.6.8 Google Form

Google Forms is free online software that allows us to create surveys, quizzes. The collected information through these forms can be automatically entered into a spreadsheet.

2.6.9 Google Sites

Google Sites allows us to create a website without having to know how to code it our self. The great thing about Google Sites is that we get to choose who can and can't access our site. So, whether we want external visitors to be able to visit our site or we want to give collaborative editing privileges to certain users, we can easily do that with just a few clicks using Google Sites.

2.6.10 Google Photos

Google Photos is a photo sharing and storage service developed by Google. It was announced in May 2015. It works for both Android and iOS devices, and provides an automatic backup for our media. It organizes pictures and videos automatically and provides also the feature of sharing media with others.

2.6.11 Google Lens

Google Lens is an AI-powered technology that uses your smartphone camera and deep machine learning to not only detect an object in front of the camera lens, but understand it too. It can perform various actions such as scanning, translation, shopping, and more. Google Lens offers the following features:

- Google Lens facilitates to translate text by pointing our phone at text. This can also work offline.

- It allows Smart Text Selection as we can point our phone's camera at text, then highlight that text within Google Lens, and copy it to use in our phone.

- It allows Smart Text search as when we highlight text in Google Lens, we can also search that text with Google. This is handy if we need to look up a definition of word, for instance.

- It works for just about any item we can think of, accessing shopping or reviews.

- Google Lens allows us to just scan the questions and come up with answers.

- Google Lens facilitates to detect and identify our surroundings.

2.6.12 Google Meet:

Google Meet is a video conferencing service from Google. It's a great solution for both individuals and businesses to have meetings through audio and video calls. Google Meet is available on the web, phones and tablets for Android and iOS. Google Meet is a handy app to conduct online school classes.

2.6.13 Google Play Store:

Google Play Store is Google's online store for use on Android-powered smartphones, tablets, Google TV and similar devices. We can use it to purchase and download apps, music, books, movies and similar contents. The Google Play store, which comes pre-installed on Android devices, allows users to purchase, download and install applications from Google and third-party developers.

2.6.14 Google Drive

Google Drive is a service offered by Google that allows us to store and share files online. The service was launched on April 24, 2012 and provides 15 GB of free storage. Additional storage can be purchased for a monthly fee.

2.6.14.1 Benefits of Google Drive

- Google Drive allows us to send large files to our colleagues, clients and friends directly from our Gmail account.

- Google Drive allows us to access our files remotely. With Drive, all our files become available on the web.

- Google Drive has its own mobile application which gives us access to our files on our iPhone or smartphone, no matter where we are.

- Google Drive has an efficient built-in search engine which allows us to find content easily with a keyword. We can also look for files by owner or by file type.

- Google Drive is equipped with an OCR (optical character recognition) function, which allows us to search for words or expressions in scanned documents. For example, finding someone's name in an old newspaper article that was scanned and saved on Google Drive is possible**.**

- Google Drive allows users to open various types of files, like.ai (Adobe Illustrator) and even .psd (Photoshop) files.

2.6.14.2 How to share file(s) from google drive?

1. Open your Google Drive

2. From the list of files and folders shown on the Google Drive, Select the name of a file or folder that we want to share and click the share icon at the top.
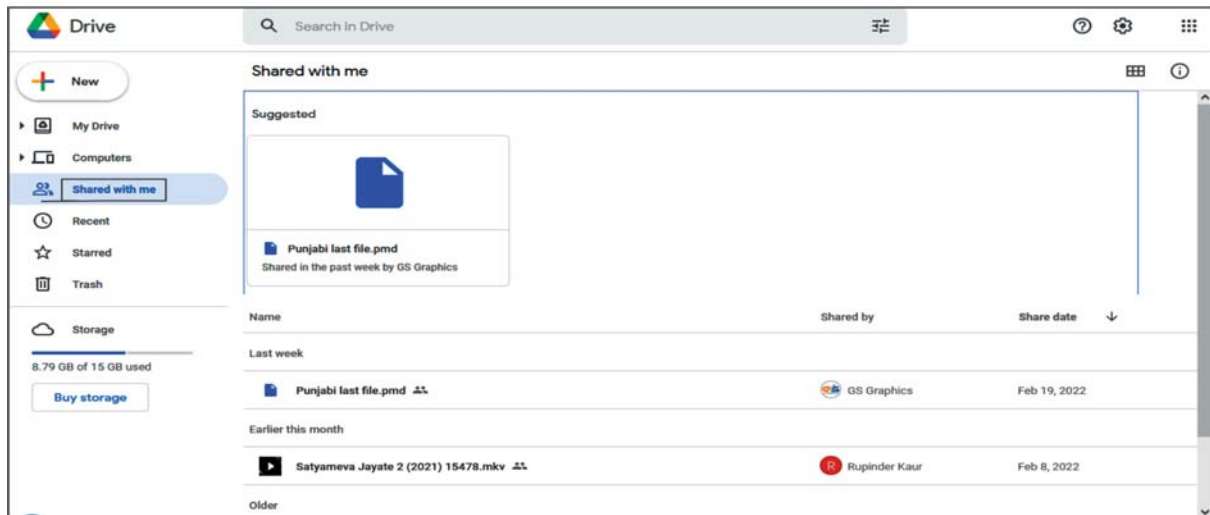
3. Under "People and groups" in the sharing box, type the email addresses of the people or Google Groups that we want to share with. We can also search for contacts by typing them into the box.
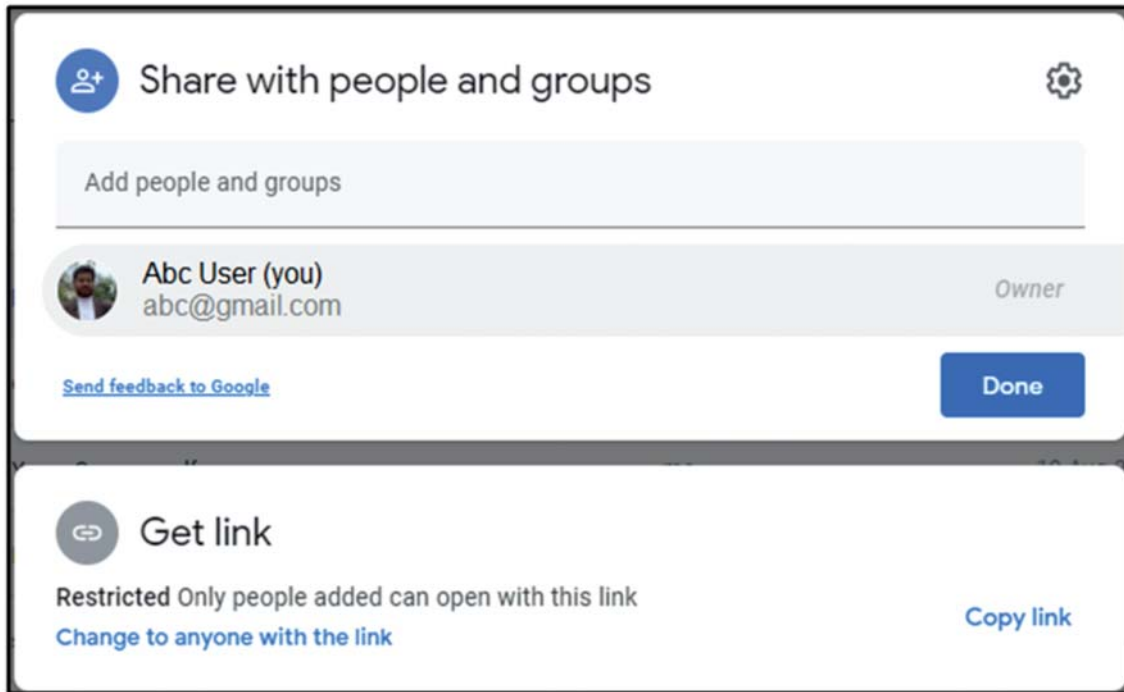
4. Choose the type of access we want to provide for these users by clicking the dropdown arrow to the right of the text box:
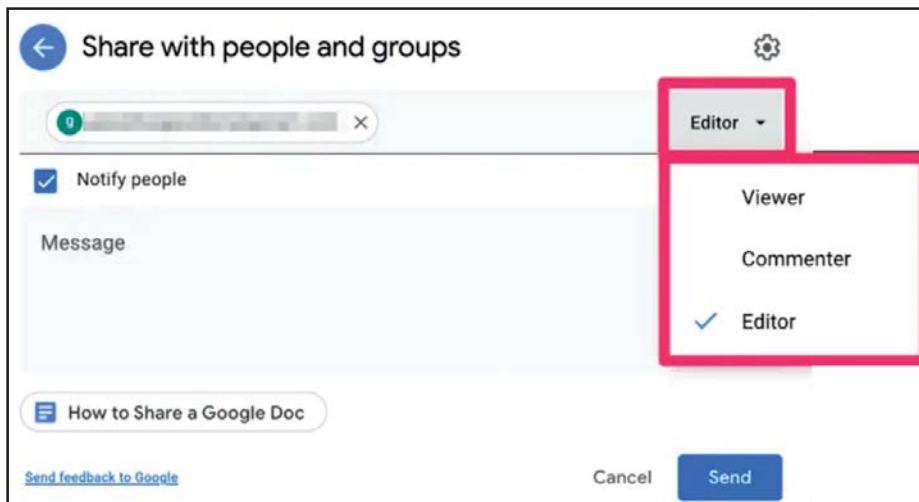
Fig 2.21 Share File – Access Levels

- **Editor**: Users can edit the file or folder and share it with others
- **Commenter**: Users can view and add comments to the file, but can't edit the file.
- **Viewer**: Users can see the file or folder but can't edit or comment on it

5. After setting the access level, click on **Send** button. The users will receive an email letting them know we've shared the file or folder with them.

6. If we want to share multiple files at once, add the files to a folder in Drive and then share the entire folder with the people we want to share the files.

2.7 DIGILOCKER

DigiLocker is an Indian digitization online service provided by the Ministry of Electronics and Information Technology (MeitY), Government of India under its Digital India initiative. DigiLocker provides an account in cloud to every Aadhaar holder to access authentic documents/certificates such as driving license, vehicle registration, academic mark sheet in digital format from the original issuers of these certificates. It also provides 1GB storage space to each account to upload scanned copies of legacy documents.

Fig 2.22

In the current scenario, the various Education Board including Punjab School Education Board also facilitates students to download their certificates of Class X and XII from DigiLocker and share them with agencies as required.

2.7.1 Objectives of Digital Locker

The key objectives with which the DigiLocker was introduced by the Government of India are as follows:

- To Enable digital empowerment among the citizens of the country.

- To minimize the physical usage of documents and enable the feature of e-signing by making documents available electronically.

- DigiLocker will increase the authenticity of documents by online upload and reduce the existence of fake documents.

- Web portals and mobile applications shall be made available for easy access.

- Reduce the administrative overhead of Government departments and agencies.

- With the availability of documents online on the cloud, residents can easily access the documents anytime and anywhere.

- Facilitates sharing of documents easily.

- Ensure privacy and authorized access to user's data.

2.8 INTERNET THREATS & SECURITY

An Internet threat is any threat that uses the World Wide Web to facilitate cybercrime. Internet threats are also known as Web threats. These threats use multiple types of malware and frauds. Sources of these threats can be links sent by an email or malware attachments etc. Cyber criminals steal information for subsequent sale.

2.8.1 Internet Threats:

The Internet is indeed private and secure, but there are a number of serious security risks. Some of the common internet threats are as follows:

Fig 2.23 Virus

- **Virus:** VIRUS stands for Vital Information Resources Under Siege. A computer virus is a computer program that cause damage to a computer software, hardware or data. It can also replicate itself into other computer programs. Once a virus is present on a computer, it typically performs some type of harmful action, such as corrupting data or files.

- Spyware: Spyware is a malicious program designed to enter our device. It collects the data and forward it to a third party without our consent. Once the spyware program is installed, it starts collecting information without our knowledge.

Fig 2.24 Spyware

  Some spyware programs are relatively harmless and collect very generic information that does not personally identify us. Other harmful spyware programs may record our actual keystrokes, including passwords. Such spywares may search through any of our files looking for something that looks like a credit card number etc. These types of spyware programs can definitely be harmful.

  Spyware often enters our system when we install some type of free software from an untrusted source. Since we authorized the installation, conventional protection methods, such as antivirus software, do not prevent spyware from getting installed in this manner.

Fig 2.25 Trojan horse

- **Trojan horse:** A Trojan horse, often shortened to Trojan, is a type of malware designed to provide unauthorized, remote access to a user's computer.

  Trojan horses do not have the ability to replicate themselves like viruses; however, they can lead to viruses being installed on a machine since they allow the computer to be controlled by the Trojan creator. The term gets its name from the Greek story of the

Trojan War, when the Greeks offered the Trojans a peace offering in the form of a large wooden horse. However, once the Trojans wheeled the horse behind their closed gates and night fell, the soldiers hidden inside the horse climbed out and opened the city gates, allowing the Greek army to infiltrate Troy and capture the city. Trojan horse software operates the same way, where Trojan is our computer and the horse is the malware application.

- **Phishing Scams:** Phishing is an e-mail fraud method in which the wrongdoer send legitimate-looking email in an attempt to gather personal and financial information.

Fig 2.26 Phishing Scam

These messages appear to come from well-known and trustworthy Web sites. The message tricks people into providing sensitive information, such as their login details. A typical scam consists of a message that describes some issue with our account and requires us to login to our account to confirm something. The message looks very official, using logos and formal language, just like we would expect from a genuine source. When we follow the link, the webpage looks very real - but if we look closely, the Internet address is actually not the official one. Financial institutions don't send out these types of messages.

2.8.2 Internet Security:

By the mean of Internet Security, we refer to the software or preventive measures which are used to protect our computer from the internet threats like malicious activities. Some of the common tools and techniques used for this purpose are given below:

- **Anti-virus:** The best way to deal with the internet threats such as a computer virus is to use antivirus software. Antivirus software helps to protect a computer system from viruses and other harmful programs. One of the most common ways to get a virus on our computer is to download a file from the Internet that is infected. Antivirus software scans our online activity to make sure we are not downloading infected files. Antivirus software also helps to detect and remove viruses from our computer system if we do get infected. Some of the commonly used antivirus are Norton, Kaspersky, Avira, Avast, Mcafee etc.

- **Anti-Spyware:** Anti-spyware is a type of software that is effective to detect and remove unwanted spyware programs. Removing spyware can be difficult as often the program installs itself again as quickly as we delete it. To counter spyware, we need to use a dedicated spyware management tool. Some antivirus softwares are bundled with the spyware management tools.

- **Prevention from Trojan Horse:** To keep our system safe from Trojan horses, we should never download or install software from a source we don't trust upon. Never open an attachment or run a program received via email from unknown or untrusted sources. Make sure a Trojan antivirus is installed on our computer and having a valid license.

- **Prevention from Phishing Scam:** In order to protect yourself from these Phishing Scams, don't follow the link and login only from the official website.

2.9 CYBER CRIME & CYBER ETHICS

2.9.1 Cyber Crime:

Cybercrime is a crime that involves a computer and a network. The computer may have been used to commit the crime and in many cases, it is also the target. Cybercrime may threaten a person or a nation's security and financial health. Cyber Crime is an unlawful act wherein the computer is either a tool or a target or both. Cyber Crimes can involve criminal activities that are traditional in nature, such as theft, fraud, forgery, defamation and mischief.

Fig 2.27 Cybercrime

Any offenses committed against individuals or groups of individuals to harm the reputation or cause physical or mental trauma through electronic means can be defined as Cybercrime. Electronic means can include but are not limited to, the use of modern telecommunication networks such as the Internet (networks including chat rooms, emails, notice boards and groups) and mobile phones (Bluetooth/SMS/MMS).

We can categorize Cyber Crimes in two ways:

- **Computer as a Target**: Using a computer to attack other computers. For Example: Hacking, Virus/Worm attacks, DOS attack etc.

- **Computer as a Weapon:** Using a computer to commit real world crimes. For Example: Cyber Terrorism, IPR violations, Credit card frauds, EFT frauds etc.

2.9.1.1 Preventive measures against Cyber Crime:

Anyone using the internet should exercise some basic preventive measures. Here are some measures you can take to protect yourself against the range of cybercrimes.

1. The user must use a full-service internet security suite.

2. The user must use strong passwords for various online websites.

3. Keep your software updated.

4. Keep your personal and private information locked down.

5. It's a good idea to start with a strong encryption password as well as a virtual private network.

6. You can teach your kids about acceptable use of the internet without shutting down communication channels.

7. Keep yourself up to date on major security breaches.

8. Take measures to protect yourself against identity theft:

9. If you believe that you've become a victim of a cybercrime, you need to alert the local police.

2.9.2 Cyber Ethics

Cyber Ethics is the conduct of acceptable usage of online resources by a user. Cyber ethics refers to the code of responsible behaviour on the internet. It is to be ensured that users understand their responsibilities for conducting themselves online.

2.9.2.1 Principles of Cyber Ethics:

Don'ts:

- Do not use a computer to cause harm to other people.
- Do not interfere with other people's computer work.
- Do not snoop around in other people's computer files.
- Do not use a computer to steal unauthorized information.
- Do not copy or use proprietary software for which you have not paid.
- Do not use other people's computer resources without proper authorization.

Do's:

- Do think about the social consequences of the act that you are doing online.
- Do always use a computer in ways that ensure respect for your fellow humans.

POINTS TO REMEMBER

1. E-mail allows us to send and receive messages to and from anyone with an email address, anywhere in the world.

2. A CAPTCHA is a type of test used in computing to determine whether or not the user is human.

3. All emails received are stored in the inbox.

4. Google Apps is a suite of Web-based applications from Google that includes e-mail, calendar, word processing, spreadsheet and presentations.

5. Cloud networking refers to manipulating, configuring, and accessing the hardware and software resources remotely.

6. Cloud Printing enables users to print documents and other materials remotely on any device associated with the cloud (network).

7. The Internet is indeed private and secure, but there are a number of serious security risks.

8. Phishing is an e-mail fraud method in which the wrongdoer sends out legitimate-looking email in an attempt to gather personal and financial information from recipients.

9. Cyber Ethics refers to the code of responsible behaviour on the internet.

10. Cyber Crime uses a computer as a Target or/and a computer as a Weapon.

11. Google Drive is a service offered by Google that allows us to store and share files online with multiple users.

EXERCISE

Que:1 Multiple Choice Questions

I **'Gmail'** is a free email service provided by_____.

A. Yahoo   B. Google

C. Rediff mail   D. Hotmail

II A _____ is a type of test used in computing to determine whether or not the user is human.

A. CAPTCHA   B. DERTSA

C. HEPTCHA   D. NEPHCA

III _____is a type of malware designed to provide unauthorized, remote access to a user's computer.

A. Spyware   B. Trojan

C. Malware   D. Horse

IV _____ is a computer program that replicates itself into other computer programs.

A. Spyware   B. Virus

C. Phishing   D. Malware

V _____ is an Indian digitization online service provided by the Ministry of Electronics and Information Technology (MeitY), Government of India under its Digital India initiative.

A. DigiLocker

B. DigiProgram

C. DigiHacker

D. DigiBanker

Que:2 Write True/False

I   Spyware is an e-mail fraud method in which the wrongdoer sends out legitimate-looking email in an attempt to gather personal and financial information from recipients.

II   Google Drive does not allow us to store and share files online.

III   The best way to deal with the threat of a computer virus is to use antivirus software.

IV   The Web threat is any threat that uses the World Wide Web to facilitate cybercrime.

V   Google Meet is a video conferencing service by Google.

Que:3 Short Questions Answer

I   Define E-mail.

II   Give the names of any four Google apps?

III   Define Cyber Ethics?

IV   What is DigiLocker?

V   What is Cloud printing?

Que:4 Long Questions Answers?

I   What are Google Apps? Explain any two Google Apps.

II   What is Google Drive? Write various benefits of Google Drive.

III   Write about various methods of Internet Security.

IV   What is Cyber Crime? Write various preventive measures against Cyber Crimes.

Lab Activity

Give the name of different apps whose icons are shown below:

_____

_____

_____

_____

_____

_____

_____