CCA-102: Data Communications

ASSIGNMENT

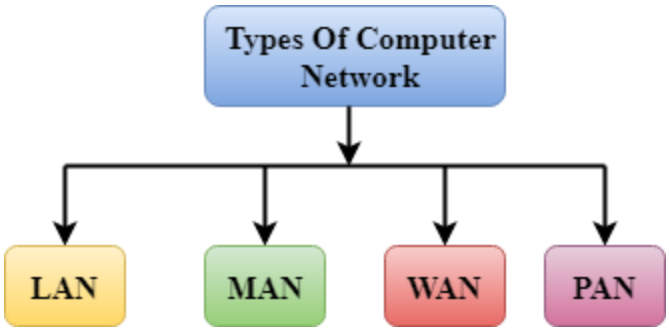
Q1. What are the different types of networks?

Ans.

Computer Network Types

A computer network is a group of computers linked to each other that enables the computer to communicate with another computer and share their resources, data, and applications.

A computer network can be categorized by their size. A **computer network** is mainly of **four types**:



- LAN(Local Area Network)
- PAN(Personal Area Network)
- MAN(Metropolitan Area Network)
- WAN(Wide Area Network)

LAN(Local Area Network)

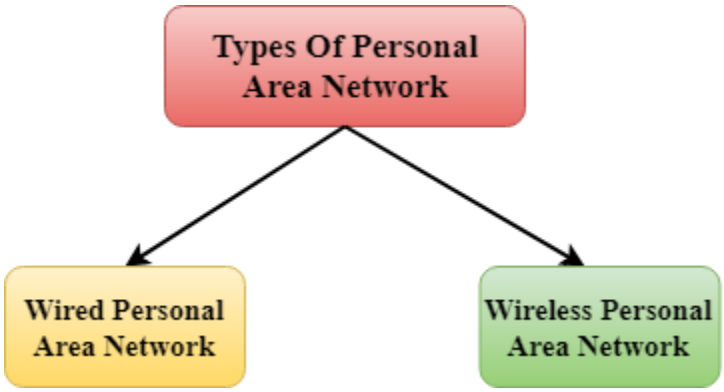
- Local Area Network is a group of computers connected to each other in a small area such as building, office.
- LAN is used for connecting two or more personal computers through a communication medium such as twisted pair, coaxial cable, etc.
- It is less costly as it is built with inexpensive hardware such as hubs, network adapters, and ethernet cables.
- The data is transferred at an extremely faster rate in Local Area Network.

- Local Area Network provides higher security.

PAN(Personal Area Network)

- Personal Area Network is a network arranged within an individual person, typically within a range of 10 meters.
- Personal Area Network is used for connecting the computer devices of personal use is known as Personal Area Network.
- **Thomas Zimmerman** was the first research scientist to bring the idea of the Personal Area Network.
- Personal Area Network covers an area of **30 feet**.
- Personal computer devices that are used to develop the personal area network are the laptop, mobile phones, media player and play stations.

There are two types of Personal Area Network:



- Wired Personal Area Network
- Wireless Personal Area Network

Wireless Personal Area Network: Wireless Personal Area Network is developed by simply using wireless technologies such as WiFi, Bluetooth. It is a low range network.

Wired Personal Area Network: Wired Personal Area Network is created by using the USB.

Examples Of Personal Area Network:

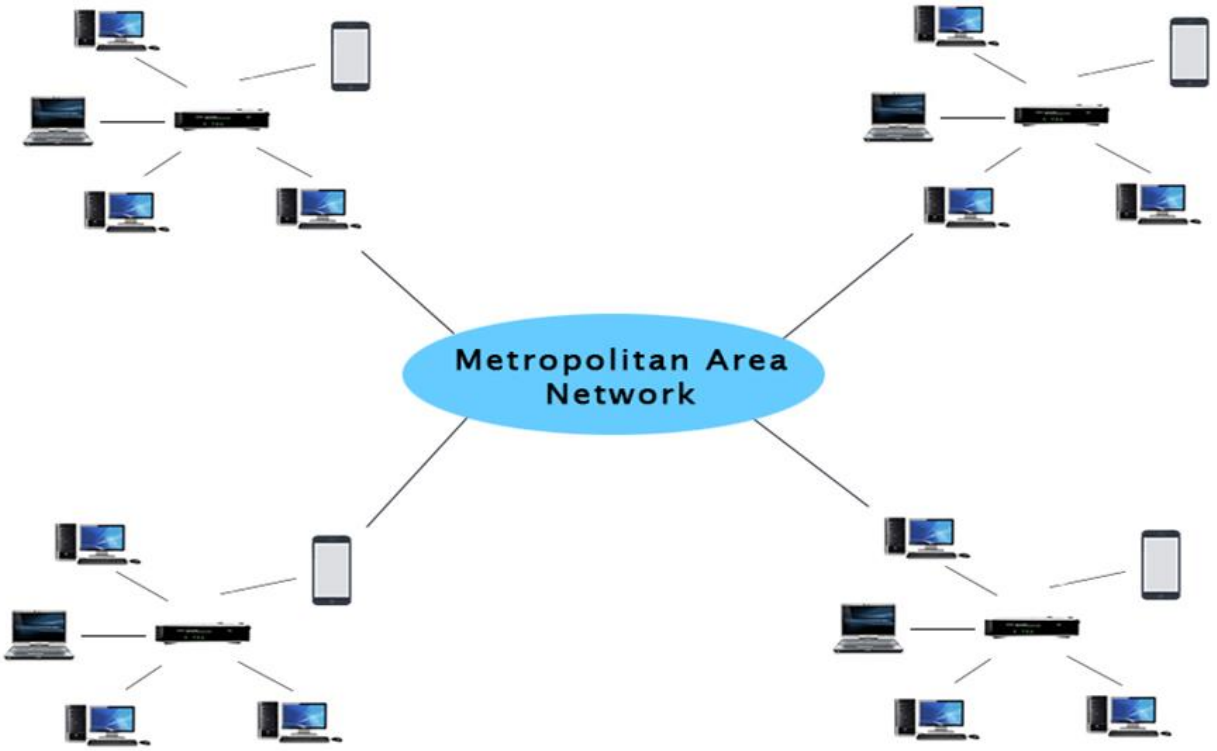
- **Body Area Network:** Body Area Network is a network that moves with a person. **For example**, a mobile network moves with a person.

Suppose a person establishes a network connection and then creates a connection with another device to share the information.

- **Offline Network:** An offline network can be created inside the home, so it is also known as a **home network**. A home network is designed to integrate the devices such as printers, computer, television but they are not connected to the internet.
- **Small Home Office:** It is used to connect a variety of devices to the internet and to a corporate network using a VPN

MAN(Metropolitan Area Network)

- A metropolitan area network is a network that covers a larger geographic area by interconnecting a different LAN to form a larger network.
- Government agencies use MAN to connect to the citizens and private industries.
- In MAN, various LANs are connected to each other through a telephone exchange line.
- The most widely used protocols in MAN are RS-232, Frame Relay, ATM, ISDN, OC-3, ADSL, etc.
- It has a higher range than Local Area Network(LAN).



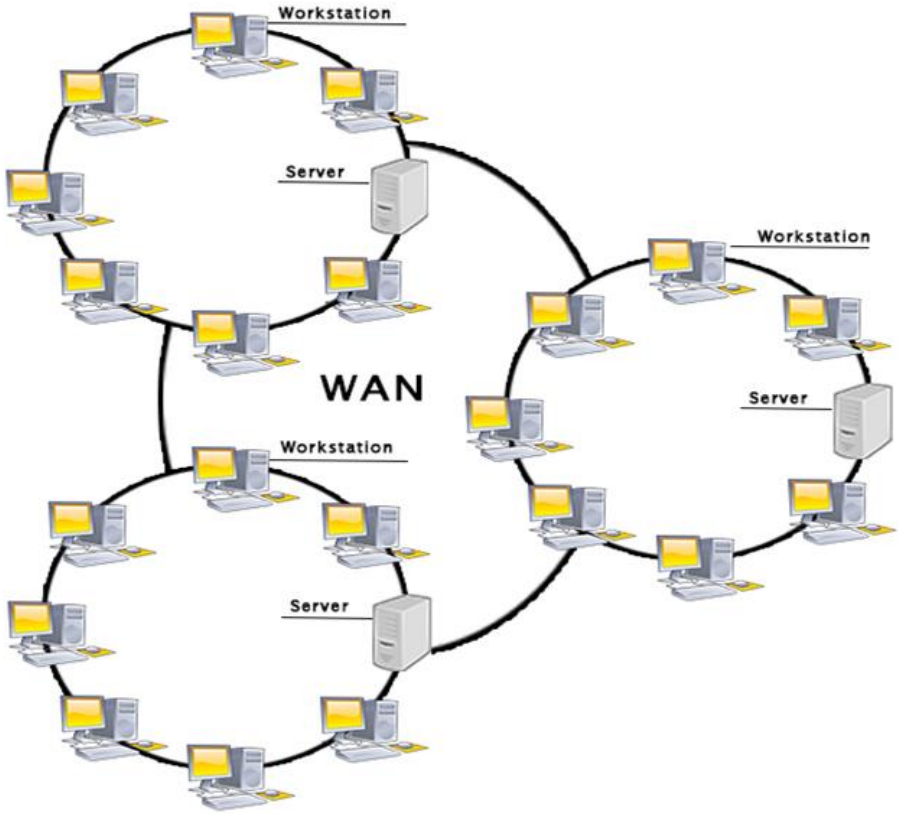
Uses Of Metropolitan Area Network:

- MAN is used in communication between the banks in a city.
- It can be used in an Airline Reservation.
- It can be used in a college within a city.
- It can also be used for communication in the military.

WAN(Wide Area Network)

- A Wide Area Network is a network that extends over a large geographical area such as states or countries.
- A Wide Area Network is quite bigger network than the LAN.
- A Wide Area Network is not limited to a single location, but it spans over a large geographical area through a telephone line, fibre optic cable or satellite links.
- The internet is one of the biggest WAN in the world.

- A Wide Area Network is widely used in the field of Business, government, and education.



Examples Of Wide Area Network:

- **Mobile Broadband:** A 4G network is widely used across a region or country.
- **Last mile:** A telecom company is used to provide the internet services to the customers in hundreds of cities by connecting their home with fiber.
- **Private network:** A bank provides a private network that connects the 44 offices. This network is made by using the telephone leased line provided by the telecom company.

Advantages Of Wide Area Network:

Following are the advantages of the Wide Area Network:

- **Geographical area:** A Wide Area Network provides a large geographical area. Suppose if the branch of our office is in a different city then we can connect with them through WAN. The internet provides a leased line through which we can connect with another branch.
- **Centralized data:** In case of WAN network, data is centralized. Therefore, we do not need to buy the emails, files or back up servers.
- **Get updated files:** Software companies work on the live server. Therefore, the programmers get the updated files within seconds.
- **Exchange messages:** In a WAN network, messages are transmitted fast. The web application like Facebook, Whatsapp, Skype allows you to communicate with friends.
- **Sharing of software and resources:** In WAN network, we can share the software and other resources like a hard drive, RAM.
- **Global business:** We can do the business over the internet globally.
- **High bandwidth:** If we use the leased lines for our company then this gives the high bandwidth. The high bandwidth increases the data transfer rate which in turn increases the productivity of our company.

Disadvantages of Wide Area Network:

The following are the disadvantages of the Wide Area Network:

- **Security issue:** A WAN network has more security issues as compared to LAN and MAN network as all the technologies are combined together that creates the security problem.
- **Needs Firewall & antivirus software:** The data is transferred on the internet which can be changed or hacked by the hackers, so the firewall needs to be used. Some people can inject the virus in our system so antivirus is needed to protect from such a virus.
- **High Setup cost:** An installation cost of the WAN network is high as it involves the purchasing of routers, switches.
- **Troubleshooting problems:** It covers a large area so fixing the problem is difficult.

Q2. Explain the Shielded twisted pair (STP) and Unshielded twisted pair(UTP)

Ans. Explain the shielded twisted pair(STP)

Shielded Twisted Pair

Shielded twisted pair is a special kind of copper telephone wiring used in some business installations. An outer covering or shield is added to the ordinary twisted pair telephone wires; the shield functions as a ground.

Twisted pair is the ordinary copper wire that connects home and many business computers to the telephone company. To reduce crosstalk or electromagnetic induction between pairs of wires, two insulated copper wires are twisted around each other. Each signal on twisted pair requires both wires. Since some telephone sets or desktop locations require multiple connections, twisted pair is sometimes installed in two or more pairs, all within a single cable. Shielded twisted pair is often used in business installations. The more common kind of wire that is installed to your home is *unshielded twisted pair*.

Twisted pair is now frequently installed with two pairs to the home, with the extra pair making it possible for you to add another line (perhaps for modem use) when you need it.

Twisted pair comes with each pair uniquely color-coded when it is packaged in multiple pairs. Different uses such as analog, digital, and Ethernet require different pair multiples.

Although twisted pair is often associated with home use, a higher grade of twisted pair is often used for horizontal wiring in LAN installations because it is less expensive than coaxial cable.

The wire you buy at a local hardware store for extensions from your phone or computer modem to a wall jack is not twisted pair. It is a side-

by-side wire known as *silver satin*. The wall jack can have as many five kinds of hole arrangements or pinouts, depending on the kinds of wire the installation expects will be plugged in (for example, digital, analog, or LAN) . (That's why you may sometimes find when you carry your notebook computer to another location that the wall jack connections won't match your plug.)

Unshielded Twisted Pair Cable (UTP)

Unshielded twisted pair (UTP) cables are widely used in the computer and telecommunications industry as Ethernet cables and telephone wires.

In an UTP cable, conductors which form a single circuit are twisted around each other in order to cancel out electromagnetic interference (EMI) from external sources. Unshielded means no additional shielding like meshes or aluminum foil, which add bulk, are used.
UTP cables are often groups of twisted pairs grouped together with color coded insulators, the number of which depends on the purpose.

Techopedia explains: Unshielded Twisted Pair Cable (UTP)

An UTP cable is made up of a bundle of twisted pairs. The twisted pairs are small 22- or 24- American Wire Gauge (AWG) sized wires twisted around each other.

The wires are typically made of copper with polyethylene (PE) or FEP insulation which is color coded depending on the application of the cable being made.

For instance, AT&T pioneered the 25-pair color code UTP cable for indoor telephone applications with color-pairs like white-blue, blue-white, white-orange, orange-white and others.

The bundle is often covered with a PE jacket typically colored grey. The two wires carry equal yet opposite signals and the destination of the signal detects the difference between the two.

They are typically used in computer networking such as Ethernet for short-to-medium distances because of their relatively cheap price compared to optical fiber and coaxial cables.

Q3. What is difference between baseband and broadband transmission?

Ans. **Differentiating Between Baseband and Broadband Signaling**

Two types of signaling methods are used to transmit information over network media: baseband and broadband. Before we get any further into 802.3 standards we should clarify the difference between the two.

Exam Alert: Baseband and broadband

Be prepared to identify the characteristics of baseband and broadband for the Network+ exam.

Baseband

Baseband transmissions typically use digital signaling over a single wire; the transmissions themselves take the form of either electrical pulses or light. The digital signal used in baseband transmission occupies the entire bandwidth of the network media to transmit a single data signal. Baseband communication is bidirectional, allowing computers to both send and receive data using a single cable. However, the sending and receiving cannot occur on the same wire at the same time.

Note: Ethernet and baseband

Ethernet networks use baseband transmissions; notice the word "base"—for example, 10BaseT or 10BaseFL.

Using baseband transmissions, it is possible to transmit multiple signals on a single cable by using a process known as *multiplexing*. Baseband uses Time-Division Multiplexing (TDM), which divides a single channel into time slots. The key thing about TDM is that it doesn't change how baseband transmission works, only the way data is placed on the cable.

Broadband

Whereas baseband uses digital signaling, broadband uses analog signals in the form of optical or electromagnetic waves over multiple transmission frequencies. For signals to be both sent and received, the

transmission media must be split into two channels. Alternatively, two cables can be used: one to send and one to receive transmissions.

Multiple channels are created in a broadband system by using a multiplexing technique known as *Frequency-Division Multiplexing (FDM)*. FDM allows broadband media to accommodate traffic going in different directions on a single media at the same time.

Q4. What is the difference between a hub, modem, router and a switch?

Ans. **Hub:**

Hub is a networking devices which is used to transmit the signal to each port (except one port) to respond from which the signal was received. Hub is operated on Physical layer. In this packet filtering is not available. It is of two types: Active Hub, Passive Hub.

Modem

A modem (modulator-demodulator) is a device that modulates an analog signal to digital information. It also decodes carrier signals to demodulates the transmitted information.

The main aim of the modem is to produce a signal that can be transmitted easily and decoded to reproduce the digital data in its original form. Modems are also used for transmitting analog signals, from Light Emitting Diodes (LED) to radio.

Modem

ROUTER

A router is a networking device that distributes (or routes) your internet connection from your modem to all of your devices, such as mobile phones, laptops, desktop computers, and smart TVs. This enables them all to connect to the internet at the same time. A router also makes it possible for different devices to communicate with one another over the network.

There are many different types of routers, but two of the popular ones are wired and wireless routers. Wired (or hard-lined) routers need to be physically connected to a modem and a device with cables. In comparison, wireless routers use built-in antennas to communicate with other devices on your WiFi network. However, a wireless router still needs to be physically connected to your modem with a cable to send and receive information from the web.

Switch

A network switch is a computer networking device that connects various devices together on a single computer network. It may also be used to route information in the form of electronic data sent over networks. Since the process of linking network segments is also called bridging, switches are usually referred to as bridging devices.

Q5. When you move the NIC cards from one PC to another PC, does the MAC address gets transferred as well?

Ans. When **you move the NIC cards from one PC to another PC**, **does the MAC address gets transferred as well**? Yes, that's because **MAC addresses** are hard-wired into the **NIC** circuitry, not the **PC**. This also means that a **PC** can have **a different MAC address** when the **NIC card** was replace by **another one**

Q6. When troubleshooting computer network problems, what common hardware-related problems can occur?

Ans. **When troubleshooting computer network problems, what common hardware-related problems can occur**? A large percentage of a **network** is made up of **hardware**. **Problems** in these areas **can** range from malfunctioning hard drives, broken NICs **and** even **hardware** startups

Q7. In a network that contains two servers and twenty workstations, where is the best place to install an Anti-virus program?

Ans.

In a network that contains two servers and twenty workstations, where is the best place to install an anti-virus program? When troubleshooting computer network problems, what common hardware-related problems can occur?

You need AT LEAST three levels of security.

1. A good firewall. This can stop intrusions, malware, unauthorized access, etc. before they reach the workstations.
2. Antivirus software on the servers and at the endpoint workstations. This software should be centrally managed to keep end users updated constantly and to minimize user meddling with the settings. Good antivirus will also protect email clients.
3. Educated and aware users who: do not casually install downloaded programs; don't click on unknown links; don't fall for phishing emails, etc. Establish a strong password policy for all users. You should consider not giving your users Administrative rights on their accounts. They will complain that they cannot install what they need and your workload will increase but, I guarantee you, your entire environment will be more reliable and secure.
   Remember: your computing environment is only as secure as your weakest link and non-compliant user.

   There is no one simple answer on where to start to troubleshooting network problems. You have to know several things:

1. The first thing I try to find out is if the problem affects one user, a group of users or all users.
2. Is the problem connecting to internal resources or external (internet). Problems can be physical as in a bad connection; configuration as in ip issues; or software issues.

   A good method for troubleshooting is to “divide and conquer”. By that I mean, you go halfway back in your network and see if the problem exists there, then go forward or back halfway and check again.

   In order to troubleshoot your network you should have a detailed network map, list of devices, IP address assignments. And remember, you don't know it all: keep a list of associates, help resources and manufacturer references close at hand and don't be afraid to ask for help. We IT folks usually love to help each other because we can all learn something new

Q8. Define Static IP and Dynamic IP? Discuss the difference between IPV4 and IPV6.

Ans.

What is a static IP address?

A static IP address is simply an address that doesn't change. Once your device is assigned a static IP address, that number typically stays the same until the device is decommissioned or your network architecture changes. Static IP addresses generally are used by servers or other important equipment.

Static IP addresses are assigned by Internet Service Providers (ISPs). Your ISP may or may not allocate you a static IP address depending on the nature of your service agreement. We describe your options a little later, but for now assume that a static IP address adds to the cost of your ISP contract.

A static IP address may be IPv4 or IPv6; in this case the important quality is static. Some day, every bit of networked gear we have might have a unique static IPv6 address. We're not there yet. For now, we usually use static IPv4 addresses for permanent addresses.

What is a dynamic IP address?

As the name suggests, dynamic IP addresses are subject to change, sometimes at a moment's notice. Dynamic addresses are assigned, as needed, by Dynamic Host Configuration Protocol (DHCP) servers.
We use dynamic addresses because IPv4 doesn't provide enough static IP addresses to go around. So, for example, a hotel probably has a static IP address, but each individual device within its rooms would have a dynamic IP address.
On the internet, your home or office may be assigned a dynamic IP address by your ISP's DHCP server. Within your home or business network, the dynamic IP address for your devices -- whether they are personal computers, smartphones, streaming media devices, tablet, what have you -- are probably assigned by your network router. Dynamic IP is the standard used by and for consumer equipment.

Differences between IPv4 and IPv6

IPv4 and IPv6 are internet protocol version 4 and internet protocol version 6, IP version 6 is the new version of Internet Protocol, which is way better than IP version 4 in terms of complexity and efficiency.

Difference Between IPv4 and IPv6:

IPv4	IPv6
IPv4 has 32-bit address length	IPv6 has 128-bit address length
It Supports Manual and DHCP address configuration	It supports Auto and renumbering address configuration
In IPv4 end to end connection integrity is Unachievable	In IPv6 end to end connection integrity is Achievable

IPv4	IPv6
It can generate 4.29×109 address space	Address space of IPv6 is quite large it can produce 3.4×1038 address space
Security feature is dependent on application	IPSEC is inbuilt security feature in the IPv6 protocol
Address representation of IPv4 is in decimal	Address Representation of IPv6 is in hexadecimal
Fragmentation performed by Sender and forwarding routers	In IPv6 fragmentation performed only by sender
In IPv4 Packet flow identification is not available	In IPv6 packetflow identification are Available and uses flow label field in the header
In IPv4 checksumfield is available	In IPv6 checksumfield is not available
It has broadcast Message Transmission Scheme	In IPv6 multicast and any cast message transmission scheme is available
In IPv4 Encryption and Authentication facility not provided	In IPv6 Encryption and Authentication are provided

IPv4	IPv6
IPv4 has header of 20-60 bytes.	IPv6 has header of 40 bytes fixed

Q9. Discuss TCP/IP model in detail.

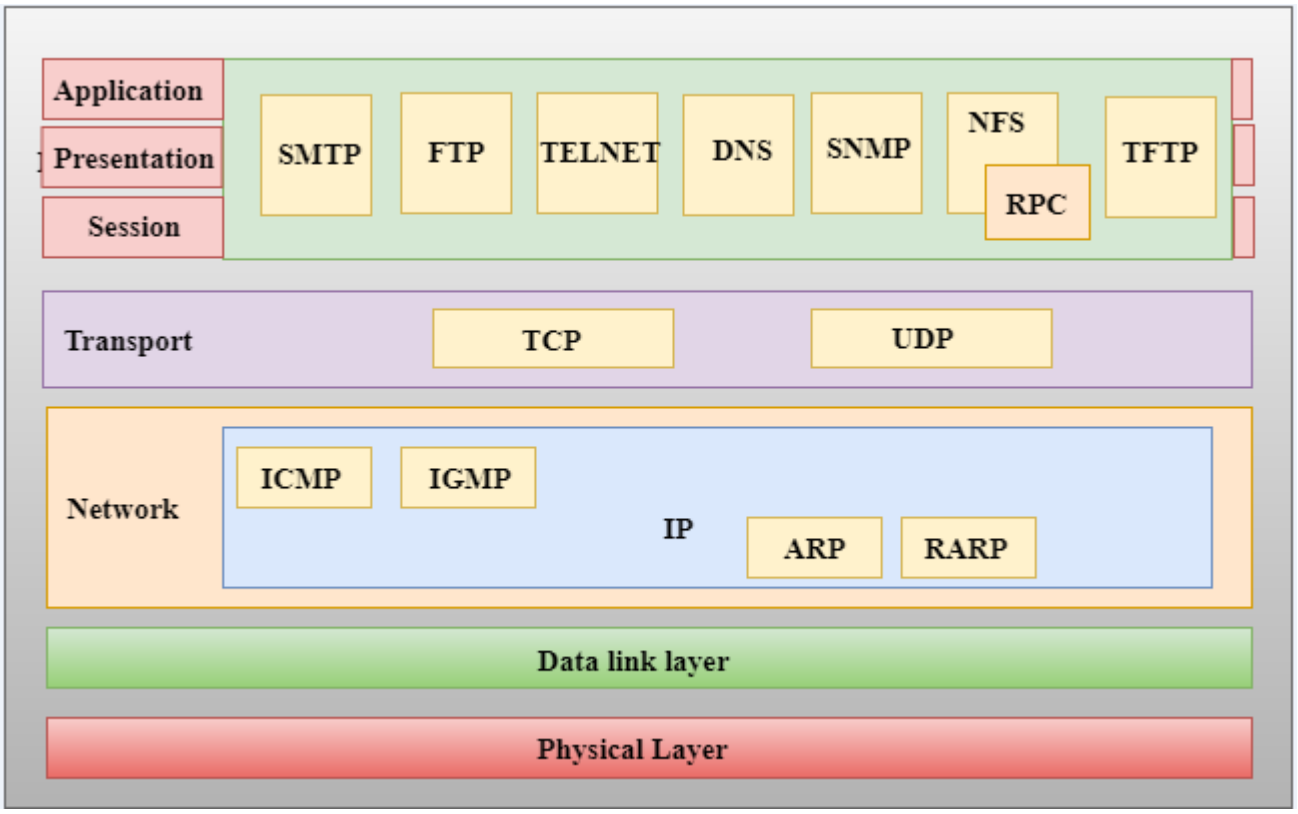
Ans.

TCP/IP model

- The TCP/IP model was developed prior to the OSI model.
- The TCP/IP model is not exactly similar to the OSI model.
- The TCP/IP model consists of five layers: the application layer, transport layer, network layer, data link layer and physical layer.
- The first four layers provide physical standards, network interface, internetworking, and transport functions that correspond to the first four layers of the OSI model and these four layers are represented in TCP/IP model by a single layer called the application layer.
- TCP/IP is a hierarchical protocol made up of interactive modules, and each of them provides specific functionality.

Here, hierarchical means that each upper-layer protocol is supported by two or more lower-level protocols.

Functions of TCP/IP layers:



Network Access Layer

- A network layer is the lowest layer of the TCP/IP model.
- A network layer is the combination of the Physical layer and Data Link layer defined in the OSI reference model.
- It defines how the data should be sent physically through the network.
- This layer is mainly responsible for the transmission of the data between two devices on the same network.
- The functions carried out by this layer are encapsulating the IP datagram into frames transmitted by the network and mapping of IP addresses into physical addresses.
- The protocols used by this layer are ethernet, token ring, FDDI, X.25, frame relay.

Internet Layer

- An internet layer is the second layer of the TCP/IP model.
- An internet layer is also known as the network layer.
- The main responsibility of the internet layer is to send the packets from any network, and they arrive at the destination irrespective of the route they take.

Following are the protocols used in this layer are:

IP Protocol: IP protocol is used in this layer, and it is the most significant part of the entire TCP/IP suite.

Following are the responsibilities of this protocol:

- **IP Addressing:** This protocol implements logical host addresses known as IP addresses. The IP addresses are used by the internet and higher layers to identify the device and to provide internetwork routing.
- **Host-to-host communication:** It determines the path through which the data is to be transmitted.
- **Data Encapsulation and Formatting:** An IP protocol accepts the data from the transport layer protocol. An IP protocol ensures that the data is sent and received securely, it encapsulates the data into message known as IP datagram.
- **Fragmentation and Reassembly:** The limit imposed on the size of the IP datagram by data link layer protocol is known as Maximum Transmission unit (MTU). If the size of IP datagram is greater than the MTU unit, then the IP protocol splits the datagram into smaller units so that they can travel over the local network. Fragmentation can be done by the sender or intermediate router. At the receiver side, all the fragments are reassembled to form an original message.
- **Routing:** When IP datagram is sent over the same local network such as LAN, MAN, WAN, it is known as direct delivery. When source and destination are on the distant network, then the IP datagram is sent indirectly. This can be accomplished by routing the IP datagram through various devices such as routers.

ARP Protocol

- ARP stands for **Address Resolution Protocol**.
- ARP is a network layer protocol which is used to find the physical address from the IP address.
- **The two terms are mainly associated with the ARP Protocol:**
  - **ARP request:** When a sender wants to know the physical address of the device, it broadcasts the ARP request to the network.
  - **ARP reply:** Every device attached to the network will accept the ARP request and process the request, but only recipient recognize the IP address and sends back its physical address in the form of ARP reply. The recipient adds the physical address both to its cache memory and to the datagram header

ICMP Protocol

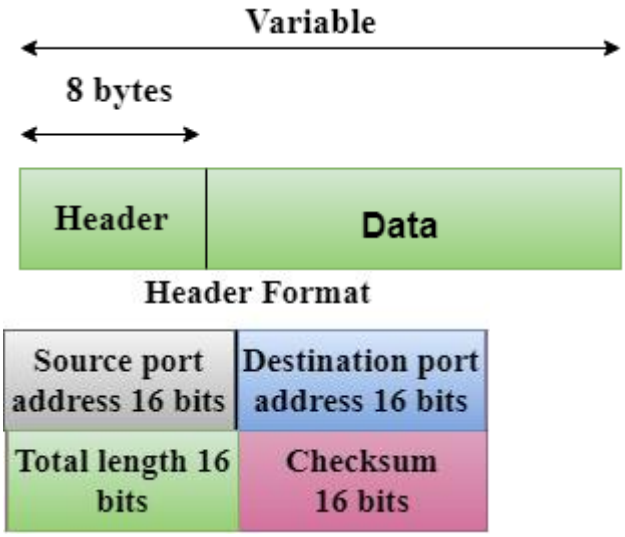
- **ICMP** stands for Internet Control Message Protocol.
- It is a mechanism used by the hosts or routers to send notifications regarding datagram problems back to the sender.
- A datagram travels from router-to-router until it reaches its destination. If a router is unable to route the data because of some unusual conditions such as disabled links, a device is on fire or network congestion, then the ICMP protocol is used to inform the sender that the datagram is undeliverable.
- An ICMP protocol mainly uses two terms:
  - **ICMP Test:** ICMP Test is used to test whether the destination is reachable or not.
  - **ICMP Reply:** ICMP Reply is used to check whether the destination device is responding or not.
- The core responsibility of the ICMP protocol is to report the problems, not correct them. The responsibility of the correction lies with the sender.
- ICMP can send the messages only to the source, but not to the intermediate routers because the IP datagram carries the addresses of the source and destination but not of the router that it is passed to.

Transport Layer

The transport layer is responsible for the reliability, flow control, and correction of data which is being sent over the network.

The two protocols used in the transport layer are **User Datagram protocol and Transmission control protocol**.

- **User Datagram Protocol (UDP)**
  - It provides connectionless service and end-to-end delivery of transmission.
  - It is an unreliable protocol as it discovers the errors but not specify the error.
  - User Datagram Protocol discovers the error, and ICMP protocol reports the error to the sender that user datagram has been damaged.
  - **UDP consists of the following fields:**
    Source port address: The source port address is the address of the application program that has created the message.
    Destination port address: The destination port address is the address of the application program that receives the message.
    Total length: It defines the total number of bytes of the user datagram in bytes.
    Checksum: The checksum is a 16-bit field used in error detection.
  - UDP does not specify which packet is lost. UDP contains only checksum; it does not contain any ID of a data segment.



- **Transmission Control Protocol (TCP)**
  - It provides a full transport layer services to applications.
  - It creates a virtual circuit between the sender and receiver, and it is active for the duration of the transmission.
  - TCP is a reliable protocol as it detects the error and retransmits the damaged frames. Therefore, it ensures all the segments must be received and acknowledged before the transmission is considered to be completed and a virtual circuit is discarded.
  - At the sending end, TCP divides the whole message into smaller units known as segment, and each segment contains a sequence number which is required for reordering the frames to form an original message.
  - At the receiving end, TCP collects all the segments and reorders them based on sequence numbers.

Application Layer

- An application layer is the topmost layer in the TCP/IP model.
- It is responsible for handling high-level protocols, issues of representation.
- This layer allows the user to interact with the application.
- When one application layer protocol wants to communicate with another application layer, it forwards its data to the transport layer.

- There is an ambiguity occurs in the application layer. Every application cannot be placed inside the application layer except those who interact with the communication system. For example: text editor cannot be considered in application layer while web browser using **HTTP** protocol to interact with the network where **HTTP** protocol is an application layer protocol.

Following are the main protocols used in the application layer:

- **HTTP:** HTTP stands for Hypertext transfer protocol. This protocol allows us to access the data over the world wide web. It transfers the data in the form of plain text, audio, video. It is known as a Hypertext transfer protocol as it has the efficiency to use in a hypertext environment where there are rapid jumps from one document to another.
- **SNMP:** SNMP stands for Simple Network Management Protocol. It is a framework used for managing the devices on the internet by using the TCP/IP protocol suite.
- **SMTP:** SMTP stands for Simple mail transfer protocol. The TCP/IP protocol that supports the e-mail is known as a Simple mail transfer protocol. This protocol is used to send the data to another e-mail address.
- **DNS:** DNS stands for Domain Name System. An IP address is used to identify the connection of a host to the internet uniquely. But, people prefer to use the names instead of addresses. Therefore, the system that maps the name to the address is known as Domain Name System.
- **TELNET:** It is an abbreviation for Terminal Network. It establishes the connection between the local computer and remote computer in such a way that the local terminal appears to be a terminal at the remote system.
- **FTP:** FTP stands for File Transfer Protocol. FTP is a standard internet protocol used for transmitting the files from one computer to another computer.

Q10. What is a Web Browser (Browser)? Give some example of browsers.

Ans.

What Is a Browser?

A web browser, or browser for short, is a computer software application that enables a person to locate, retrieve, and display content such as webpages, images, video, as well as other files on the World Wide Web. Browsers work because every web page, image, and video on the web has its own unique Uniform Resource Locator (URL), allowing the browser to identify the resource and retrieve it from the web server.

5 Popular Browsers

1. Google Chrome

Chrome, created by internet giant Google, is the most popular browser in the USA, perceived by its computer and smartphone users as fast, secure, and reliable. There are also many options for customization in the shape of useful extensions and apps that can be downloaded for free from the Chrome Store. Chrome also allows easy integration with other Google services, such as Gmail. Due to the success of the "Chrome" brand name, Google has now extended it to other products, for example, Chromebook, Chromebox, Chromecast, and Chrome OS.

2. Apple Safari

Safari is the default on Apple computers and phones, as well as other Apple devices. It's generally considered to be an efficient browser, its slick design being in keeping with the ethos of Apple. Originally developed for Macs, Safari has become a significant force in the mobile market due to the domination of iPhones and iPads. Unlike some of the other browsers listed, Safari is exclusive to Apple, it doesn't run on Android devices, and the Windows version of Safari is no longer supported by important security updates from Apple.

3. Microsoft Internet Explorer and Edge

Although it has been discontinued, Internet Explorer is worthy of mention as it was the go-to browser in the early days of the internet revolution, with usage share rising to 95% in 2003. However, its relatively slow start-up speed meant that many users turned to Chrome and Firefox in the years that followed. In 2015, Microsoft announced that Microsoft Edge would replace Internet Explorer as the default browser on Windows 10, making Internet Explorer 11 the final version to be released. At the time of writing, the market share of Microsoft Edge remains lower than Internet Explorer, which is still used by many people around the world.

4. Mozilla Firefox

Unlike Chrome, Safari, Internet Explorer, and Microsoft Edge, Firefox is an open-source browser, created by community members of the Mozilla Foundation. It is perhaps the most customizable of the main browsers, with many add-ons and extensions to choose from. In late 2003, it had a usage share of 32.21% before gradually losing out to competition from Google Chrome. It currently remains a strong competitor in the "desktop" field but has a lower market share in the mobile arena, where Google Chrome and Apple Safari tend to dominate.

5. Opera

Another web browser worthy of mention is Opera, which is designed for Microsoft Windows, Android, iOS, macOS, and Linux operating systems. It has some interesting features and is generally considered to be a reliable option by many users. Many of its earlier features have gone on to be incorporated into rival browsers. It also has a distinct user interface. At the time of writing, Opera has a usage of just 2.28% but remains influential, albeit from the fringes.

Q11. What is a search engine? Give example.

Ans.

Search Engine

Also known as a web search engine and an internet search engine, a search engine is a (usually web-based) computer program that collects and organizes content from all over the internet. The user enters a query composed of keywords or phrases, and the search engine responds by providing a list of results that best match the user's query. The results can take the form of links to websites, images, videos, or other online data.

10 Examples of Search Engines

1. Google

Google is the biggest search engine in the world by far. It handles over 5 billion searches each day and has a market share of over 90% at the time of writing (August 2019). Developed originally by Larry Page and Sergey Brin in 1997, Google has become so successful that it has become synonymous with search engine services, even entering the dictionary as a verb, with people using expressions such as: "I googled it" when they've searched for something online.

2. Bing

The origins of Microsoft's Bing can be found in the technology company's earlier search engines, MSN Search, Windows Live Search, and Live Search. Bing was launched in 2009 with high hopes that it could usurp its rival Google, but despite attracting many fans, things haven't quite worked out that way. Even so, Bing is the third largest search engine worldwide after Google and Baidu. It is available in 40 different languages.

3. Yahoo!

Yahoo! Search is another big player in the search engine world. However, for much of its history it has supplied the user interface, but

relied on others to power the searchable index and web crawling. From 2001 to 2004, it was powered by Inktomi and then Google. From 2004, Yahoo! Search was independent until a deal was struck with Microsoft in 2009 whereby Bing would power the index and crawling.

4. Ask.com

Originally known as Ask Jeeves, Ask.com is a little different from Google and Bing, as it uses a question and answer format. For a number of years, Ask.com was focused on becoming a direct rival to the big search engines, but nowadays, answers are supplied from its vast archive and users contributions, along with the help of an unnamed and outsourced third-party search provider.

5. Baidu

Founded in the year 2000 by Robin Li and Eric Xu, Baidu is the most popular search engine in China, and the fourth most visited website in the world, according to Alexa rankings. Baidu has its origins in RankDex, a search engine previously developed by Robin Li in 1996. As well as its Chinese search engine, Baidu also offers a mapping service called Baidu Maps and more than 55 other internet-related services.

6. AOL.com

AOL, now styled as Aol. and originally known as America Online, was a big player in the early days of the internet revolution, providing a dial-up service for millions of Americans in the late 1990's. Despite AOL's decline as broadband gradually replaced dial-up, the AOL search engine is still used by a significant minority of searchers. On June 23, 2015, AOL was acquired by Verizon Communications.

7. DuckDuckGo

DuckDuckGo (DDG) has a number of features that distinguish it from its main competitors. It has a strong focus on protecting searchers' privacy, so rather than profiling users and presenting them with personalized results, it provides the same search results for any given search term. There's also an emphasis on providing quality rather than quantity when

it comes to search results. DDG's interface is very clean and not overladen with adverts.

8. WolframAlpha

WolframAlpha markets itself as a computational knowledge engine. Instead of answering the queries of searchers with a list of links, it responds with mathematical and scientific answers for their questions, using externally sourced "curated data". WolframAlpha was launched in 2009 and has become a valuable tool for academics and researchers.

9. Yandex

Launched in 1997, Yandex is Russia's largest search engine, and the country's fourth most popular website. Outside of Russia, the search engine also has a major presence in Ukraine, Belarus, Kazakhstan, and other countries of the Commonwealth of Independent States. As well as search, Yandex offers many other internet-related products and services, including maps and navigation, music, eCommerce, mobile applications, and online advertising.

10. Internet Archive

The Internet Archive provides free public access to a wide range of digital materials. A nonprofit digital library based in San Francisco, it's a great tool for tracing the history domains and seeing how they have evolved over the years. Besides websites, you can also find software applications and games, movies/videos, music, moving images, and a huge collection of public-domain books. The Internet Archive also campaigns for a free and open internet.

Q12. What is the Internet & WWW? What are the uses of internet in our daily life?

Ans.

Internet The internet is a public network of network with a maze of wired and wireless connections between separate groups of servers computers and countless devices from around the world

WWW (World Wide Web)

The World Wide Web is the common system for navigating the internet. It is not the only system that can be used for such access, but it is by far the most common one.

10 uses of internet in our daily life

1. Uses of the Internet for business promotion and digital marketing:

Today, the Internet is a prime and main source for business promotion and marketing. You use the internet to build the presence of your local business online to get more customers.
You can sell your products on your own online store website or also by using online selling platforms such as amazon. You can also create, run, and grow your online store by using third party software and business services.

Due to the uses of the internet, and the large of amount consumer and broad market eCommerce, online selling, digital marketing, dropshipping, advertising and software development industries are in a boom.

We can see new apps, services, and creative businesses starting up every single day, which in turn is creating jobs, employment opportunities, economic development. It's also challenging traditional shopping and selling experiences. But more than that providing growth opportunities for small business owners, traditional store owners, and marketers to utilize eCommerce options.

I believe that the uses of the Internet in business have brought about an exciting stir in the business world and it will not hold back anymore. Use of Google Ad words, Facebook ads, and content marketing are common in product and services marketing on the Internet.

You can use the internet to promote and advertise any type of business:

- You can build an online presence for your business through google my business, google map, and Facebook page.
- You can promote and market products by using social media apps such as WhatsApp.
- You can use email marketing to send personalized and targeted offers.

- You can create your business website to promote your product and services.
- You can use eCommerce or online selling platforms to sell products online.
- You can use search engine optimize, content marketing to drive more customers to your online store or business website.
- You can use the internet to create daily deals, coupon codes, product discounts, and many other new and existed customers.
- You can also use the Affiliate Marketing platform – performance-based marketing to promote and sell your products online.
- You can use paid video, search engine, and social media advertising.

The Internet is populated by online marketing, eCommerce, Advertising, education, and entertainment content. There are millions of IT professionals, content creators, consumers, and businesses are involved in these daily activities 24/7/365.

Not only that, but there are also various web-based applications and companies that help you in the promotion, marketing, and sales process. You as a business owner don't have to do all the works on your own. You can use hire digital marketing agencies or contractors, you can automate lead generation and marketing, You can track, manage customers, deals, tasks by using CRM and many other things.

2. Uses of the Internet in Students daily life

Students have a free platform to learn throughout their lifetime. People in the age group 18 to 35 are among the most frequent users of the Internet today and these people are mostly students from all over the world. They are using the Internet to learn new skills and even acquire degrees in professional online courses.

Students can learn technical, non-technical skills by using the internet. And the cost of online learning is less than the traditional method of learning. It's because there are various sources, educators, and methods to acquire new knowledge and skills.
One of those is the following, where you can learn any kind of skills in a few hours/week/months/year at a low price. And you will also get lifetime access to all the course material and future updates. You can do it on a mobile, desktop, tablet, and anywhere, anytime.

It wasn't possible before the advent of the Internet to expand knowledge at this speed and low price. That's why the Internet is playing a crucial role in our education. That's why due to easy access to education on the internet, technological and lifestyle changes happen fast.

3. Uses of the Internet to increase the speed of daily tasks

Our routine is initiated by the Internet. It is the first thing in the morning we do- see our notifications and emails. The Internet has made human life so much easier, now the biggest and toughest tasks are done in minutes. No matter it is a simple email, pizza order, shopping or money transfer it is so much easier by the use of the Internet in life.

4. Uses of the Internet for online selling or Shopping

Shopping has become a hassle-free task now and almost anybody can order products online after comparison with other websites. The boom and the resultant competition in the online shopping business are evident. Shopping sites are more interesting because of the huge discounts different companies are offering customers.

People are attracted to them and this is good news especially for the Indian shopper because of our frugal spending habits. The customer can pay cash for the delivery of a product delivered to his house in a few hours and can return the product if he is not satisfied with it.

Shopping on the Internet is affordable, convenient, and saves time. The Use of Walmart, Amazon, Flipkart, Paytm, snapdeal, and many others for online shopping is common on the internet.

People can sell and buy anytime anywhere and through any device. That's how the Internet is affecting our shopping habits in daily life. And all this process is called eCommerce. eCommerce has changed business and now it's an important part of our life.

5. Use of the Internet for research and development

The pace of work towards innovation and quality of research is developed by Internet tools. It is not tough to research on the Internet. From small business owners to big universities everyone is getting the benefits of the Internet for research and development. Data analysis,

data entry, data research, data management, etc. services are in demand.

A person who is a data scientist and **data analyst** are really important for innovative decision-making. Even the **importance of Microsoft Excel in business** is being realized by people now. Similarly, CRM and Google Analytics are helping businesses to track, analyze the consumer's behavior on websites and advertising campaigns.
Decision making is an important part of all kinds of businesses and organizations. Success and failure depend on our decision. After the rise of online business and higher competition on the Internet to conduct business, it's really important that decisions do not be a burden on the organization. That's why today you can visualize, analyze, and monitor customers' data in real-time by using data analysis tools. That helps the business to remain competitive in the market through better data analysis.

Any information we need regarding health, money, law, RTI, etc. everything is in front of us within a few seconds. So, it is really important that we use the power of the Internet for practical benefits.

6. Use of the Internet provide us quick and free communication

The Internet is undoubtedly the most effective and far-reaching communication tool we have at present. Communication on the Internet is free and fast. We all are connected with each other on various computers and IP. Skype, chat messengers, social media is common for personal and professional purposes.

Indeed we are also using standardized communication protocols but the Internet evolves constantly by using artificial intelligence and search engines to find out how we communicate, how this can be made simpler for us to use, and have a better experience in the shortest possible time.

This ability to communicate at breakneck speeds enables us to finish our tasks faster and become more efficient.

7. International uses of the Internet by working remotely and providing business services

It is obvious that the presence of the Internet has made doing business much easier. But it has also created its own set of challenges such as high competition, needs for quality content, etc. But knowledge is power and anyone can do business and job after learning more about it.

As the newer generations start to log into the Internet there are possibilities of completely new business and jobs. Nowadays the Internet is widely used in making money. If you have talent, then you can earn money by sitting at home on the Internet.

It is hard to imagine how many people working in 9-5 jobs want to leave into jobs and work independently as freelancers or start their own Internet business. The emergence of websites such as Upwork.com, Freelancer websites has given people the option to work remotely (from home) according to their own schedule and commitment.

Thousands of freelancers or professionals are doing this on a daily basis to earn more than their bread and butter costs. Facebook business pages, Google AdWords, Paytm, blogs, YouTube channels, Amazon, and other affiliate marketing methods are various tools used to make money by providing things of value to Internet users.

If you have an idea that can provide a facility to people then you can start an online business by using any computer and information technology tool.

8. Uses of the Internet in Money Management

The use of the Internet is not limited to only earning money, it can also be used to manage money. We can now see hundreds of websites, apps, and other tools that help us in handling daily transactions, transfers, management, budget planning, etc. and this trend is growing steadily.

The use of Internet banking and mobile banking use is also growing. All the banks are really working hard to provide Internet banking and mobile apps to empower people to utilize the power of the Internet and the latest money management tools. Buxfer.com, mint.com, etc. websites and apps are providing free and premium services to manage your money.

9. Uses of the Internet in Everyday Politics

The Internet is a great tool for politicians to connect with people. The uses of the Internet are not only in personal and business life but it is common now in politics. Politicians are using various methods to influence people and youth on social media to favor their party. They are also using it to criticize other political parties.

Our Prime Minister of India Mr. Narender Modi and Chief Minister of Delhi Mr. Arvind Kejriwal are very active with their followers on Twitter and Facebook and sharing views on a particular topic. It is a widely accepted fact that Mr. Modi's success is largely attributed to his presence on social media and an active social media team.

It is also good for people to know about the progress of ministers on a particular task. If governing political parties use social media to show the progress of their work then it is great. But if they are only using it for condolence purposes then I think they have to think again about their social media political strategies.

10. Uses of the Internet for Teaching and Sharing Knowledge with others

The Internet is a very important tool for educators. Similarly, educators are using the Internet for teaching and sharing their knowledge and experience with the world. The Internet and its application is user-friendly and make students life easy. A teacher can use YouTube channels to teach students around the world. Teachers can use the blog in which they can share their career experiences with college graduates. There are various websites for teachers to teach online. Teachers can use blogs, websites, youtube, online course ebooks, online tools, content to create and distribute educational content.

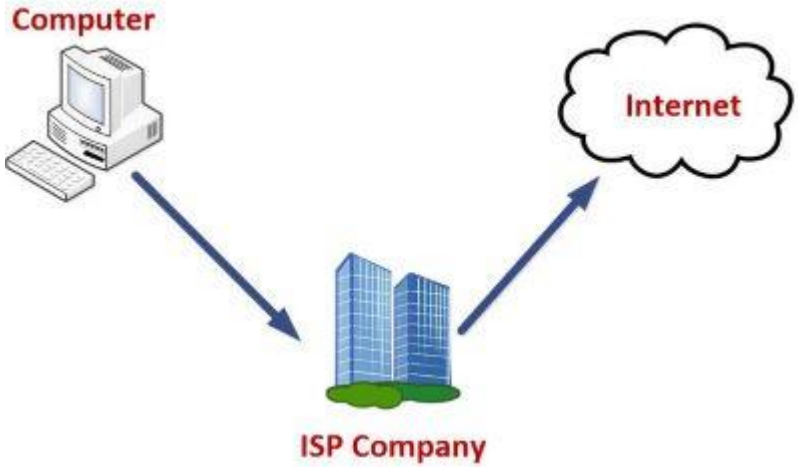
If you're free and want to spend your time doing productive things then create your own website. On the website, you can train people about the skills you're a master in.

Q13. What is an Internet Service Provider? Give some example of ISP in India.

Ans.

ISP: Internet Service Provider

ISP stands for Internet Service Provider. It is a company that provides access to the internet and similar services such as Website designing and virtual hosting. For example, when you connect to the Internet, the connection between your Internet-enabled device and the internet is executed through a specific transmission technology that involves the transfer of information packets through an Internet Protocol route.



Data is transmitted through different technologies, including cable modem, dial-up, DSL, high speed interconnects. Accordingly, based on the method of data transmission, the Internet access provided by ISPs can be divided into many types, some of which are as follows:

Dial-up Internet access: It is the oldest technology to provide Internet access by modem to modem connection using telephone lines. In this method, the user's computer is connected to a modem with a telephone line. This method has become outdated today due to slow connection speed. However, in remote areas, this method can be used where the broadband network is not available.

DSL: DSL, which stands for 'digital subscriber line' is an advanced version of the dial-up Internet access method. It uses high frequency to execute a connection over the telephone network and allows the internet and the phone connection to run on the same telephone line. This method offers an Asymmetric Digital Subscriber (ADSL), where the upload speed is less than the download speed, and a Symmetric Digital Subscriber Line (SDSL), which offers equal upload and download speeds. Out of these two, ADSL is more popular among users and is popularly known as DSL

Wireless Broadband (WiBB): It is a modern broadband technology for Internet access. It allows high-speed wireless internet within a large area. To use this technology, you are required to place a dish on the top of your house and point it to the transmitter of your Wireless Internet Service Provider (WISP).

Wi-Fi Internet: It is the short form for "wireless fidelity," which is a wireless networking technology that provides wireless high-speed Internet connections using radio waves. To use the internet, you are required to be within the range of wi-fi network. It is commonly used in public places such as hotels, airports, restaurants to provide internet access to customers.

ISDN: It is a short form of Integrated Services Digital Network. It is a telephone system network which integrates a high-quality digital transmission of voice and data over the same standard phone line. It offers a fast upstream and downstream Internet connection speed and allows both voice calls and data transfer.

Ethernet: It is a wired LAN (Local Area Network) where computers are connected within a primary physical space. It enables devices to communicate with each other via a protocol (a set of rules or common network language). It may provide different speeds such as 10 Mbps, 100 Mbps and 10 Gbps.

Q14. Discuss the difference between MAC address, IP address and Port address.

Ans. ## Difference between MAC Address and IP Address

Both MAC Address and IP Address are used to uniquely defines a device on the internet. NIC Card's Manufacturer provides the MAC Address, on the other hand Internet Service Provider provides IP Address.
The main difference between MAC and IP address is that, MAC Address is used to ensure the physical address of computer. It uniquely identifies the devices on a network. While IP address are used to uniquely identifies the connection of network with that device take part in a network.

Let's see the difference between MAC Address and IP Address:

S.NO	MAC Address	IP Address
1.	MAC Address stands for Media Access Control Address.	IP Address stands for Internet Protocol Address.
2.	MAC Address is a six byte	IP Address is either four byte

	hexadecimal address.	(IPv4) or eight byte (IPv6) address.
3.	A device attached with MAC Address can retrieve by ARP protocol.	A device attached with IP Address can retrieve by RARP protocol.
4.	NIC Card's Manufacturer provides the MAC Address.	Internet Service Provider provides IP Address.
5.	MAC Address is used to ensure the physical address of computer.	IP Address is the logical address of the computer.
6.	MAC Address operates in the data link layer.	IP Address operates in the network layer.
7.	MAC Address helps in simply identifying the device.	IP Address identifies the connection of the device on the network.
8.	MAC Address of computer cannot be changed with time and environment.	IP Address modifies with the time and environment.
9.	MAC Address can't be found easily by third party.	IP Address can be found by third party.

Q15. How do we view my Internet browser's history?

Ans.

Desktop or laptop computer

If you are using Windows, Linux, or macOS, there are quick shortcut key combinations that allow you to view your history.

Windows and Linux users: Ctrl+H

Apple users: Command + Shift + H

Once one of the above shortcut keys is pressed, a history section similar to the example below should appear. In the following screenshot, browsing history is being viewed in Google Chrome.