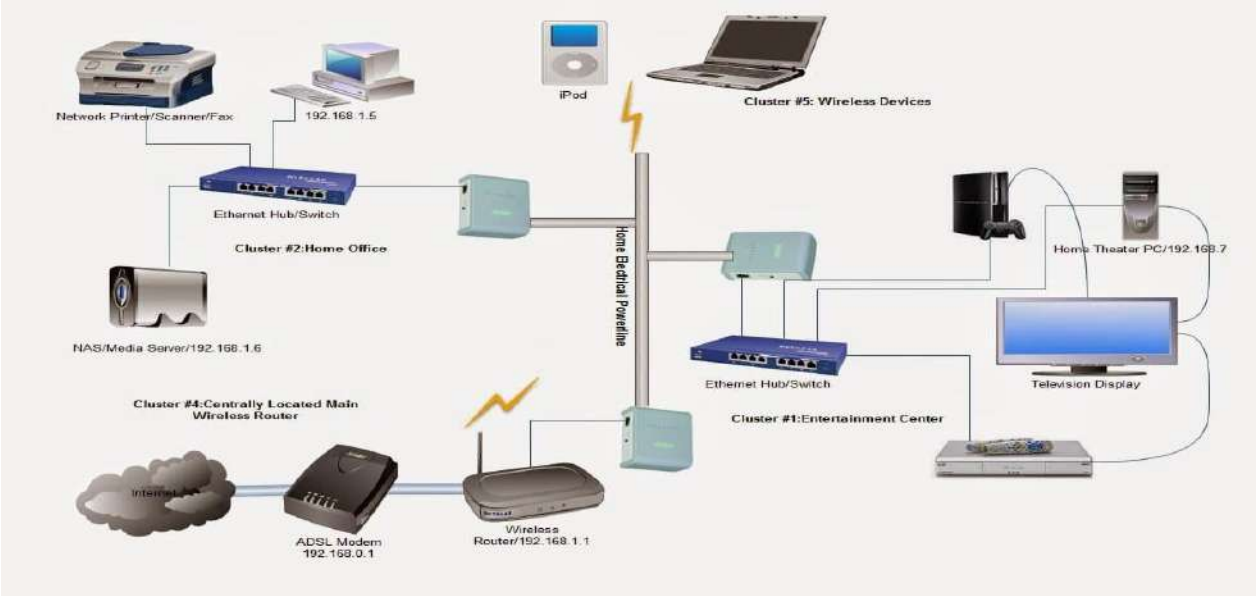
Unit : 2 introduction to Computer Networks

Network:-

The collection of interconnected computing devices is called a network. Two computing devices are said to be interconnected if they are capable of sharing and exchanging information.



Benefits of Network: -

(1) Resource Sharing: Resource Sharing means to make the applications/programs, data(files) and peripherals available to anyone on the network irrespective of the physical location of the resources and the user.

(2) Reliability: Reliability means to keep the copy of a file on two or more different machines, so if one of them is unavailable (due to some hardware crash or any other) them its other copy can be used.

(3) Cost Factor: Cost factor means it greatly reduces the cost since the resources can be shared. For example a Printer or a Scanner can be shared among many computers in an office/Lab.

(4) Communication Medium: Communication Medium means one can send and receive messages. Whatever the changes at one end are done, can be immediately noticed at another.

EVOLUTION OF NETWORKING

ARPANET (1969) – US Government formed an agency named ARPANET(Advanced Research Project Agency Network) to connect computers at various universities and defence agencies to share data/information efficiently among all of them.

NSFNET (1985) - National Science Foundation Network was a program of coordinated, evolving projects sponsored by the National Science Foundation (NSF) from 1985 to 1995 to promote advanced research and education networking in the United States. The program created several nationwide backbone computer networks in support of these initiatives. Initially created to link researchers to the NSF-funded supercomputing centers, through further public funding and private industry partnerships it developed into a major part of the Internet backbone.

INTERNET (1990)- INTER-connection NETwork , The worldwide network of networks.

Data communication terminologies:

Concept of communication: Communication is the act of sending and receiving data from one device to another device or vice-versa. Data can be of any form i.e. text, image, audio, video and multimedia files.

Components of Data communication:

Sender: A device that can send data over a network i.e. computer, laptop, smart phone etc.

Receiver: A device can receive data over a network i.e. computer, laptop, smart phone etc.

The sender and receivers are basically called **nodes**.

Message: It is the data/information that needs to be shared between the sender and receiver.

Communication media: It is the medium through which the data/information is travelled between the
sender and receiver. These may be wired or wireless.

Protocols: A network protocol is an established set of rules that determine how data is transmitted between different devices in the same network. Essentially, it allows connected devices to communicate with each other, regardless of any differencesin their internal processes, structure or design.

Measuring Capacity of Communication Media: In data communication, the transmission medium is also known as channel. The capacity of a channel is the maximum amount of signals or traffic that a channel can carry. It is measured in terms of bandwidth and data transfer rate as described below:

Bandwidth

Bandwidth of a channel is the range of frequencies available for transmission of data through that channel.

Higher the bandwidth, higher the data transfer rate.

Normally, bandwidth is the difference of maximum and minimum frequency contained in the composite signals.

Bandwidth is measured in Hertz (Hz). 1
KHz = 1000 Hz, 1 MHz =1000

Data Transfer Rate

Data travels in the form of signals over a channel. One signal carries one or more bits over the channel. Data transfer rate is the number of bits transmitted between source and destination in one second. It is also known as bit rate. It is measured in terms of bits per second (bps). The higher units for data transfer rates are:

1 Kbps=1024 bps
1 Mbps=1024 Kbps
1 Gbps=1024 Mbps

IP Address:

An IP address is a unique address that identifies a device on the internet or a local network. IP stands for "Internet Protocol," which is the set of rules governing the format of data sent via the internet or local network.

Switching techniques:

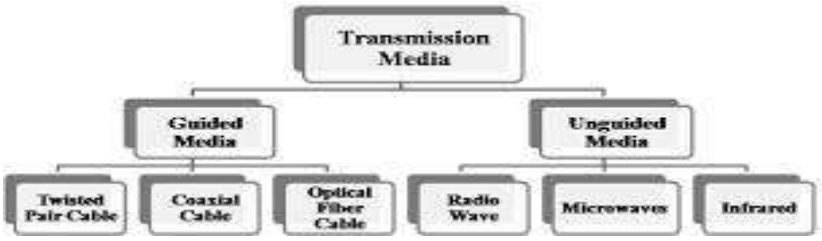
In large networks, there may be more than one path for transmitting data from sender to receiver. Selecting a path that data must take out of the available options is called switching. There are two popular switching techniques – **circuit switching and packet switching**.

Circuit switching: Circuit switching is a type of network configuration in which a physical path is obtained and dedicated to a single connection between two endpoints in the network for the duration of a dedicated connection. Ordinary landline telephone service uses circuit switching.

Packet switching: Packet switching is the method by which the internet works; it features delivery of packets of data between devices over a shared network. For example the school web server is sending you a webpage over the internet or you sending an email to a friend.

Transmission Media: Transmission media is a communication channel that carries the information from the sender to the receiver. All the computers or communicating devices in the network must be connected to each other by a Transmission Media or channel.

- A Transmission medium is a medium of data transfer over a network.
- The selection of Media depends on the cost, data transfer speed, bandwidth and distance. Transmission media may be classified as



Transmission Media: Guided (Wired)

Twisted Pair Cable: Twisted pair or Ethernet cable is most common type of media which consists four insulated pairs of wires twisted around each other. It is low-cost, low-weight and easy to install flexible cables. It can transfer data up to 1Gbps speed covering 100 meters distance. It uses RJ-45 Connector for connecting computers and network devices. **Co-axial Cable:** This type of cable consists a solid insulated wire surrounded by wire mesh, each separated by some kind of foil or insulator. The inner core carries the signal and mesh provides the ground. Co-axial Cable or Coax, is most common in Cable TV transmission. It can carry data up to 500 meters.

Fiber Optic Cable: Optical fiber consists of thin glass or glass like material and carries light signals instead of electric current. Signal are modulated and transmitted in the form of light pulses from source using Light Emitting Diode (LED) or LASER beam. Optical fibers offer secure and high-speed transmission up to a long distance.

Transmission Media: Unguided (Wireless)

Infrared Wave: It used for short-range (approx. 5 meters) communication using wireless signals. It is mostly used in Remote operated devices like TV, Toys, Cordless phones etc.

Radio waves: Radio wave uses Radio frequencies (3KHz-3 GHz) to make broadcast network like AM/FM network within city. Radio wave propagates in Omni direction (surrounding) and penetrate solid walls/buildings.

Microwaves: Microwave are high energy radio waves, used for line of sight communication using Parabolic antenna aligned with each other. It is high speed wave and can cover distance up to 100 km).

Network Devices: Hardware device that are used to connect computers, printers, fax machines and other electronic devices to a network are called network device. There are many types of network devices used in networking and some of them are described below:

MODEM (Modulator Demodulator): It is a device that converts digital signal to analog signal (modulator) at the sender's site and converts back analog signal to digital signal (demodulator) at the receiver's end, in order to make communication possible via telephone lines. It enables a computer to transmit data over telephone or cable lines.

There are two types of MODEM, which are as follows

(i) Internal Modem Fixed within a computer.

(ii) External Modem Connected externally to a computer.

Ethernet card: An Ethernet card in your computer serves one basic function: to transmit data from the network to your computer. Ethernet cards are physical expansion cards that insert into a PCI expansion slot on a computer.

RJ45: RJ45 connectors are commonly seen with Ethernet network cables. Ethernet cables with RJ45 connectors are also called RJ45 cables. These RJ45 cables feature a small plastic plug on each end, and the plugs are inserted into RJ45 jacks of Ethernet devices.

Hub: A Hub is a connecting device which connects multiple computers together to form a Local Area Network (LAN). Hubs make broadcast type Network and do not manage traffic over the network channel. Signal entering any port is broadcast out on all other ports. *It broadcast the signals to all computers connected in the network.* It provides various RJ-45 ports to connect Twisted Pair cable in STAR topology, making them act as a single network segment. Now days, Switch is used in place of Hubs.

Types of Hub:

- ***Active Hub:*** *Amplifies the signal when required and works as a Repeater.*
- ***Passive Hub:*** *It simply passes the signal without any change*.

Switch: A switch is a hardware device, which is used to connect several nodes to form a Network. *It redirects the received signals only to the intended Node i.e. controls Network traffic.*It is also used to segment a big network into different Sub networks (Subnet) to control the network traffic and security. It can also use to combine various small network segments to form a big Network (as in Tree topology).

Hub V/s Switch: There is a vast difference between switch and hub. A hub forwards each incoming packet (data) to all the hub ports, while a switch forwards each incoming packet to the specified recipient.

Repeater: Repeater is a hardware device, which is used to amplify the signals when they are transported over a long distance. The basic function of a repeater is to amplify the incoming signal and retransmit it, to the other device.

Router: A router is used to connect different networks together. i.e. for two or more LANs to be interconnected, you need a router

- The basic role of Routers in a network is to determine the best possible route (shortest path) for the data packets to be transmitted. In a large network (WAN), multiple routers works to facilitate speedy delivery of data packets.
- Router maintains a table of addresses (called routing table) that keeps a track of paths connected to it.

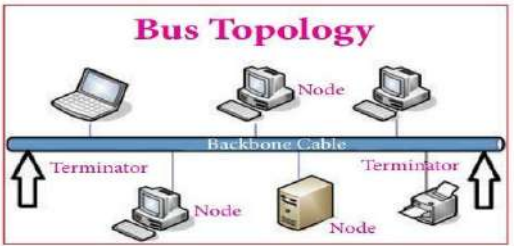
Gateway:

- A gateway is a device, which is used to connect dissimilar networks. The gateway establishes an intelligent connection between a local network and external networks, which are completely different in structure.
- Gateway is also called protocol converter that convert data packets from one protocol to other and connects two dissimilar networks.
- A gateway can be implemented in hardware, software or both, but they are usually implemented by software installed within a router.
- A LAN gets connected to Internet (WAN) using a gateway.

Network Topologies:

Topology: Topology refers to the way in which the device/computer/workstations attached to the network are interconnected.

The layout of interconnection of devices in a network is called Topology.



Different Topologies are: Star, Bus, Tree, Mesh.

BUS Topology: - The bus topology uses a common single cable (backbone cable) to connect all the workstations. Each computer performs its task of sending messages without the help of the central server. However, only one workstation can transmit a message at a particular time in the bus topology.

Advantages:

(i) Easy to connect and install.
(ii) Involves a low cost of installation time.
(iii) Can be easily extended.

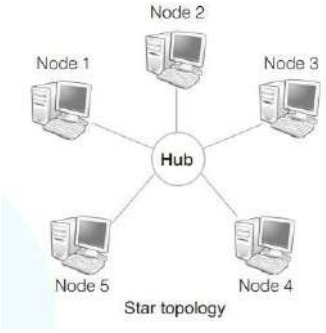
Disadvantages:-

(i) The entire network shuts down if there is a failure in the central cable.
(ii) Only a single message can travel at a particular time.
(iii) Difficult to troubleshoot an error.

STAR Topology: -In Star topology, each node is directly connected to a central device like Hub or Switch. It is most popular topology to form Local Area Networks (LAN).

Advantages:

(i) Easy to troubleshoot
(ii) A single node failure does not affects the entire network.
(iii) Fault detection and removal of faulty parts is easier.
(iv) In case a workstation fails, the network is not affected.



Star topology

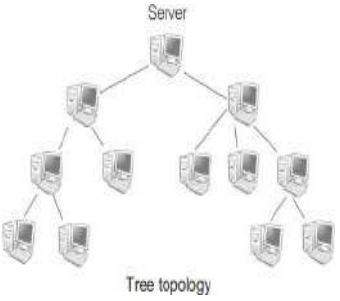
Disadvantages: -

(i) Difficult to expand.
(ii) Longer cable is required.
(iii) The cost of the hub and the longer cables makes it expensive over others.
(iv) All nodes are dependent on central node. if the central device (Switch) goes down then entire network breaks down.

TREE Topology: - The tree topology combines the characteristics of the linear bus and the star topologies. It consists of groups of star – configured workstations connected to a bus backbone cable.

Advantages:

(i) Eliminates network congestion.
(ii) The network can be easily extended.
(iii) Faulty nodes can easily be isolated from the rest of the network.



Tree topology

Disadvantages:

- Uses large cable length.
- Requires a large amount of hardware components and hence is expensive.
- Installation and reconfiguration are very difficult.

Types of Computer Network:

A computer network may be small or big as per number of computers and other network devices linked together. A computer network may contain devices ranging from handheld devices (like mobile phones, tablets, laptops) connected through Wi-Fi or Bluetooth within a single room to the millions of computers spread across the globe. Based on the size, coverage area, data transfer speed and complexity, a computer network may be classified as:

LAN (Local Area Network): A Local Area Network (LAN) is a network that is limited to a small area. It is generally limited to a geographic area such as within lab, school or building. It is generally privately-owned networks over a distance up to a few kilometers. Now-a-days, we also have WLAN (Wireless LAN) which is based on wireless network.

MAN (Metropolitan Area Network): MAN is the networks cover a group of nearby corporate offices or a city and might be either private or public. Cable TV network or cable based broadband internet services are examples of MAN.

WAN (Wide Area Network): These are the networks spread over large distances, say across countries or even continents through cabling or satellite uplinks are called WAN. Typically, a WAN combines multiple LANs that are geographically separated. It is a network of network. The world's most popular WAN is the Internet.

PAN (Personal Area Network): A Personal Area Network is computer network organized around an individual person. It generally covers a range of less than 10 meters. Personal Area Networks can be constructed with cables or wirelessly.

Comparison between PAN, LAN, MAN and WAN: -

Parameter	PAN	LAN	MAN	WAN
Area covered	Small Area (upto 10m radius)	A building or campus (upto 1 km)	A city (upto 100 Km radius)	Entire country, Continent or Globe
Networking Cost	Negligible	inexpensive	expensive	Very expensive
Transmission	Speed High speed	High speed	Moderate speed	Low speed
Error Rate	Lowest	Lowest	Moderate	Highest
Network Devices used	WLAN, USB Dongle, Blutooth	LAN/WLAN, HUB/Switch, Repeater, Modem	Router, Gateway	Router, Gateway
Technology/ Media used	infrared, Bluetooth	Ethernet, Wi-Fi	Optical fiber, Radio wave, Microwave	Microwave, Satellite

Network Protocols:

HTTP (Hyper Text Transfer Protocol) :

- The Hyper Text Transfer Protocol is a set of rules which is used to access/retrieve linked web pages across the web using web browser program.
- The more secure and advanced version is HTTP is HTTPS (HTTP Secure), which controls the transfer of information in encrypted form to provide more security and privacy.
- Other protocols like File Transfer Protocol (FTP) and Telnet can also be used with URL. FTP is used to transfer files from web server to web client or vice-versa.

- Telnet is protocol which used for login on remote computer to access/transfer files or trouble shooting.

FTP (File Transfer Protocol) is a network protocol for transmitting files between computers over Transmission Control Protocol/Internet Protocol (TCP/IP) connections. **Point-to-Point Protocol (PPP)** is a TCP/IP protocol that is used to connect one computer system to another. Computers use PPP to communicate over the telephone network or the Internet. A PPP connection exists when two systems physically connect through a telephone line.

TCP/IP stands for **Transmission Control Protocol/Internet Protocol** and is a suite of communication protocols used to interconnect network devices on the internet. TCP/IP is also used as a communications protocol in a private computer network.

TELNET is commonly used by **terminal emulation programs that allow you to log into a remote host**. However, TELNET can also be used for terminal-to-terminal communication and interprocess communication. TELNET is also used by other protocols (for example, FTP) for establishing a protocol control channel.

E-Mail (Electronic Mail):

Email is the short form of electronic mail. It is one of the ways of sending and receiving message(s) using the Internet. An email can be sent anytime to any number of recipients at anywhere. The message can be either text entered directly onto the email application or an attached file (text, image, audio, video, etc.) stored on a secondary storage. An existing file can be sent as an attachment with the email.

E-Mail Protocols:

Email are handled and exchanged through various mail servers in order to deliver email to mail client. The mail client and mail servers exchange information with each other using some protocols. The followings are commonly used protocols for email handling-

SMTP (Simple Mail Transfer Protocol): This protocol is used to send emails from sender to recipient's mail server.

IMAP (Internet Message Access Protocol): This is a standard client/server protocol for accessing e-mails from local e-mail server.

POP3 (Post Office Protocol 3): This protocol facilitates users to access mailboxes and download messages to their computer.

Voice over Internet Protocol (VoIP):

- Voice over Internet Protocol or VoIP, allows voice call (telephone service) over the Internet. VoIP offers voice transmission over a computer network (IP) rather than through the regular telephone network. It is also known as Internet Telephony or Broadband Telephony. Examples of VoIP:- WhatsApp, Skype, Google Chat etc.
- VoIP works on the principle of converting the analogue voice signals into digital and then transmitting them over the broadband line.
- These services are either free or very economical. That is why these days international calls are being made using VoIP.

Overview of Internet:

- Internet is a network of networks that consists of millions of private, public, academic, business, and government networks, that are linked by various wired, wireless, and optical networking technologies.
- The Internet is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to serve several billion users worldwide.

- The modern Internet is an extension of ARPANET (Advance Research Project Agency Network), created in1969 by the American Department of Defense.
- In 1990 the British Programmer Tim Berners-Lee developed Hypertext and HTML to create World Wide Web (WWW).
- The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents of the World Wide Web (WWW), the communicational infrastructure to support mail, chat and transfer of Text, Images, Audio, Video etc.

Introduction to web services:

World Wide Web (WWW):
World Wide Web, which is also known as a Web, is a collection of websites or web pages stored in web servers and connected to local computers through the internet. These websites contain text pages, digital images, audios, videos, etc. Users can access the content of these sites from any part of the world over the internet using their devices such as computers, laptops, cell phones, etc. The WWW, along with internet, enables the retrieval and display of text and media to your device.
There sources of the Web (HTML pages) are transferred via the Hypertext Transfer Protocol (HTTP), may be accessed by users by a software application called a web browser, and are published by a software application called a web server.
Tim Berners-Lee—a British computer scientist invented the revolutionary World Wide Web in 1990 by defining three fundamental technologies that lead to creation of www: HTML ,URL, HTTP.

HTML(Hyper Text Markup Language):
Hyper Text Markup Language (HTML) is a language which is used to design standardized Web Pages, so that the Web contents can be read and under stood from any computer using web browser.
Basic structure of every web page is designed using HTML. HTML uses tags to define the way page content should be displayed by the web browser. Web pages are stored as .html or .htm files.
Extensible Markup Language (XML): Extensible Markup Language is a markup language and file format for storing, transmitting, and reconstructing arbitrary data. It defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

Domain Name: A domain name is a unique, easy-to-remember address used to access websites, such as 'google.com', and 'facebook.com'.

URL(Uniform Resource Locator):
URL—Uniform Resource Locator is a unique address of web resources located on the web. It provides the location and mechanism (protocol) to access the resource. URL is sometimes also called a web address.
A URL contains protocol, domain, sub domain and name of web page along with directory.

In the above URL, http is the protocol name, it can be https, http, FTP, Telnet, etc. www is a sub domain. ncert.nic.in is the domain name. Textbook is directory and *textbook.htm* is webpage.

The complete unique address of the page on a website is called **URL** (Uniform Resource Locator) e.g. *http://www.cbse.nic.in/welcome.html*

Since computers on the network are identified by its IP addresses, so it is required to convert a Domain name or URL typed in the Browser, in to its corresponding IP address. This process is called Domain Name Resolution. This resolution is done by the designated servers called DNS servers, provided by the Internet Service Providers (ISP) like BSNL, Airtel, Jio etc.

Website:

- Website is a collection of related web pages that may contain text, images, audio and video. The first page of a website is called home page. Each website has specific internet address (URL) that you need to enter in your browser to access a website.
- A website is a collection of web pages related through hyperlinks, and saved on a web server. A visitor can navigate pages by clicking on hyperlinks.
- The main purpose of website is to make the information available to people at large. For example, a company may advertise or sell its products, a government organization may publish circulars, float tenders, invite applications for recruitments etc.
- A website can be accessed by providing the address of the website (URL) in the browser. The main page of website (Home page) will be open when it is opened on the browser.

Web Page:

- A web page is a document on the WWW that is viewed in a web browser. Basic structure of a web page is created using HTML (Hyper Text Markup Language).
- To make web pages more attractive, various styling CSS (Cascading Style Sheets) and formatting are applied on a web page.
- Further, program codes called scripts also used to make webpage interactive and define different actions and behavior. JavaScript, PHP and Python are commonly used script language.
- The first page of the website is called a home page which contains Menus and Hyperlinks for other web pages.
- A web page is usually a part of a website and may contain information in different forms, such as: text, images, audio & video, Hyperlinks, interactive contents (chat etc.)

A web page can be of two types: Static Web Page and Dynamic Web Page

Web Browsers:

- A web browser or simply 'browser' is a software application used to access information on the World Wide Web. When a user requests some information, the web browser fetches the data from a web server and then displays the webpage on the user's screen.
- The popular web browsers are Google Chrome, Mozilla Firefox, Internet Explorer, Opera, Safari, Lynx and Netscape Navigator, Microsoft Edge etc.
- A web browser essentially displays the HTML documents which may include text, images, audio, video and hyperlinks that help to navigate from one web page to another. The modern browsers allow a wide range of visual effects, use encryption for advanced security and also have cookies that can store the browser settings and data.

Web Server:

- A web server is used to store and deliver the contents of a website to web clients such as a browser.
- A Computer stores web server software and a website's contents (HTML pages, images, CSS style sheets, and JavaScript files). The server needs to be connected to the Internet so that its contents can be made accessible to others.
- Web server as a software, is a specialized program that understands URLs or web addresses coming as requests from browsers, and responds to those requests.
- The server is assigned a unique domain name so that it can be accessed from anywhere using Internet. The web browser from the client computer sends a HTTP request for a page containing the desired data or service. The web server then accepts request, interprets, searches and responds (HTTP response) against request of the web browser. The requested web page is then displayed in the browser of the client. If the requested web page is not found, web server generates "Error: 404 Not found" as a response.

Web Hosting:

- A web hosting service is a type of Internet hosting service that allows individuals and organisations to make their website accessible via the World Wide Web. In Simple, uploading of website on Web Server is known as hoisting. To upload the website, we need some web space on server to upload website. This space is available on some nominal charges.
- All web servers are assigned a unique numeric address called IP address when connected to the Internet. This IP address needs to be mapped/changed to domain name (Textual name) of the website using DNS (Domain Name Service). Thus, user can access website by providing domain name through a browser (URL). The domain name has to be registered (purchased) with an authorized agency i.e. Registrar Domain Names.

QUESTIONS ON COMPUTER NETWORKING

MULTIPLE CHOICE QUESTIONS(1 MARK EACH)

1. _____ is a communication methodology designed to deliver both voice and multimedia communications over Internet protocol.
   (A) SMTP **(B) VoIP** (C) PPP (D) HTTP

2. Which of the following is used to receive emails over Internet?
   a) SMTP **b) POP** c) PPP d) VoIP

3. What is the size of IPv4 address?
   (a)32 bits (b) 64 bits (c) 64 bytes (d) 32 bytes

4. _____protocol provides access to command line interface on a remote computer.
   a)FTP **b)Telnet** c)VoIP d)SMTP

5. _____is a communication methodology designed to deliver electronic mail (E-mail) over the internet.
   (a) VoIP (b) HTTP (c) PPP **(d) SMTP**

6. Which protocol is used for transferring files over a TCP/IP network?
   a) **FTP** b) SMTP c) PPP d) HTTP

7. Network in which every computer is capable of playing the role of a client, or a server or both at same time
   is called
   a) local area network **b) peer-to-peer network** c) dedicated server network d) wide area network

8. .....is a communication methodology designed to establish a direct and dedicated communication between an internet user and his/her ISP.
   a) VoIP (b) SMTP **(c) PPP** (d)HTTP

9. Identify the device on the network which is responsible for forwarding data from one device to another
   (a) NIC **(b) Router** (c) RJ45 (d) Repeater

10. Which of the following device send data to every connected node?
    a)Switch b)Repeater c)Router **d) Hub**

11. In which type of switching first the connection is established between sender and receiver and then the data is transferred?
    a) **Circuit** b)Message c)Packet d)None

12. Identify the cable which consists of an inner copper core and a second conducting outersheath:
(i)Twisted Pair **(ii) Co-axial** (iii) Fiber Optical (iv) Shielded Twisted Pair

13. In fiber optic transmission, data is travelled in the form of:

(i) **Light** (ii) Radio link (iii) Microwave Link (iv) Very low frequency

14. Which of the following devices modulates digital signals into analog signals that can be sentover traditional telephone lines?
(i) Router (ii) Gateway (iii) Bridge **(iv) Modem**

15. Out of the following guided media, which is not susceptible to external interference?
(i) Twisted Pair (ii) Co-axial Cable **(iii) Fiber Optical** (iv) Electric Wire

16. Which of the following device is used for sorting and distribution of data packet to theirdestination based on their IP Address?
(i) Gateway **(ii) Router** (iii) Bridges (iv) Switch

17. Which of the following device is used to connect network of different protocols so that theycan communicate properly?
(i) **Gateway** (ii) Router (iii) Bridges (iv) Switch

18. Which type of Network is generally privately owned and links the devices in a single office,building or Campus?
a. **LAN** b. MAN c. WAN d. PAN

19. Raj, is working as a Tech Support Engineer and sometimes he wants to work on Client'scomputer from his office. Identify the traditional protocol used for this purpose?
a. FTP **b.Telnet** c,HTTP d.POP3

20. Raj is looking for some information about How Router works, for this he opens the browser and typed the URL of requested site. In few moments he received the requested page on his browser screen. Identify the type of protocol, used between Browser (Client) and Web Server for the communication?
a. TCP/IP **b.HTTP** c,SMTP d.POP3

2 MARKS QUESTIONS

1. Write two points of difference between Bus topology and star topology.
2. Write two points of difference between XML and HTML.
3. Write the full forms of the following:
(i) HTTP (ii) FTP
4. Discuss the use of TELNET
5. Write two advantages and two disadvantages of circuit switching.
6. Differentiate between Web server and web browser. Write any two popular web browsers.
7. Classify each of the following Web Scripting as Client Side Scripting and Server SideScripting :
(i) Java Scripting
(ii) ASP
(iii) VB Scripting
(iv) JSP
8. What is Bandwidth? What is the measuring unit of Bandwidth in term of range

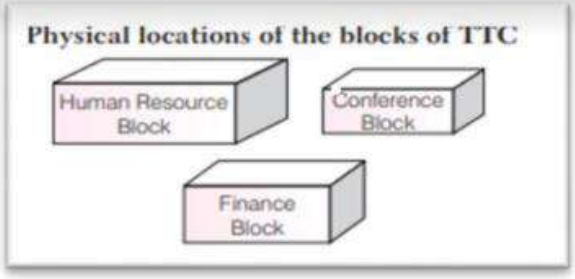
of frequencies a channel can pass?

9. (a) Write the full forms ithe following:
   (i) FTP (ii) HTTPS
   b)Name the protocols which are used for sending and receiving emails?

10. Write two differences between Coaxial and Fiber transmission media.

5 MARKS QUESTIONS

1. A professional consultancy company is planning to set up their new offices in India with its hub at
Hyderabad. As a network adviser, you have to understand their requirement and suggest them the best
available solutions. Their queries are mentioned as (i) to (v) below.



Block to block distance (in m)

Block (From)	Block (To)	Distance
Human Resource	Conference	110
Human Resource	Finance	40
Conference	Finance	80

Expected number of computers

Block	Computers
Human Resource	25
Finance	120
Conference	90

a) Which will be the most appropriate block, where TTC should plan to install their server?

b) Draw a block to block cable layout to connect all the buildings in the most appropriate manner for efficient communication.

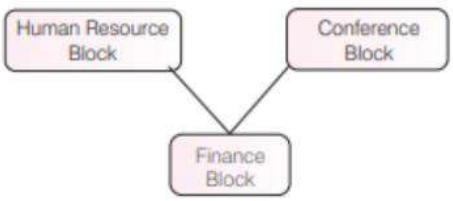
c) What will be the best possible connectivity out of the following, you will suggest to connect the new setup of offices in Bengalore with its London based office.
- Satellite Link
- Infrared
- Ethernet

d) Which of the following device will be suggested by you to connect each computer in each of the buildings?
- Switch
- Modem
- Gateway

e) Company is planning to connect its offices in Hyderabad which is less than1 km. Which type of network will be formed?

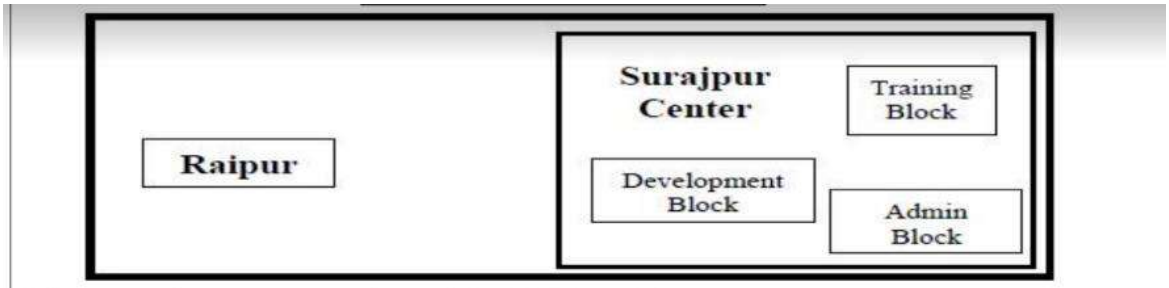
Sol: (i) The company should install its server in finance block as it is having maximum number of computers.

(ii) The layout is based on minimum cable length required, which is 120 metres in the above case.



(iii) Satellite Link.
(iv) Switch.
(v) LAN

2. FutureTech Corporation, a Bihar based IT training and development company, is planning to set up training centers in various cities in the coming year. Their first centeris coming up in Surajpur district. At Surajpur center, they are planning to have 3different blocks - one for Admin, one for Training and one for Development. Each block has number of computers, which are required to be connected in a network for communication, data and resource sharing. As a network consultant of this company,you have to suggest the best network related solutions for them for issues/problems raised in question nos. (i) to (v), keeping in mind the distances between variousblocks/locations and other given parameters.



Distance between various blocks/locations:

Block	Distance
Development to Admin	28 m
Development to Training	105 m
Admin to Training	32 m
Surajpur Campus to Coimbatore Campus	340 km

Number of computers:

Block	Number of Computers
Development	90
Admin	40
Training	50

(i) Suggest the most appropriate block/location to house the SERVER in the Surajpur center (out of the 3 blocks) to get the best and effective connectivity. Justify your answer.

(ii) Suggest why should a firewall be installed at the Surajpur Center?

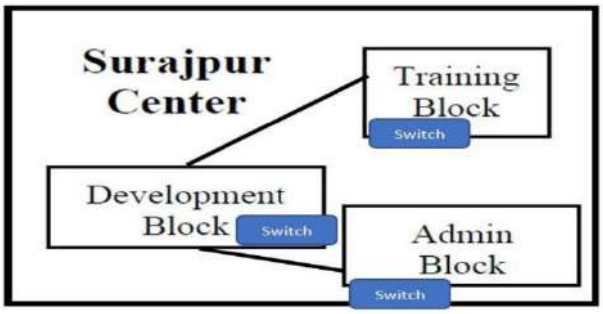
(iii) Suggest the best wired medium and draw the cable layout (Block to Block) to most efficiently connect various blocks within the Surajpur Center.

(iv) Suggest the placement of the following devices with appropriate reasons:
a) Switch/Hub b) Router

(v) Suggest the best possible way to provide wireless connectivity between Surajpur Center and Raipur Center.

Sol: i) Development because it contains more number of computers
ii) Surajpur centre has multiple blocks and firewall ensures security. So it is required. It allows or block unwanted attacks.

iii)

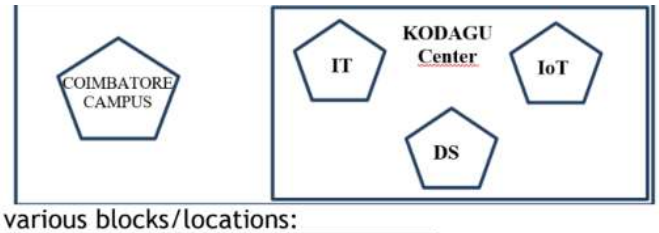


iv) a) Switch/Hub – In every block to interconnect the devices within every block
b) Router -In development block because server is going to be placed here

v) Satellite

3. Total-IT Corporation, a Karnataka based IT training company, is planning to set up training

centers in various cities in next 2 years. Their first campus is coming up in Kodagu district. At Kodagu campus, they are planning to have 3 different blocks, one for AI, IoT and DS (Data Sciences) each. Each block has number of computers, which are required to be connected in a network for communication, data and resource sharing. As a network consultant of this company, you have to suggest the best network related solutions for them for issues/problems raised in question nos. (i) to (v), keeping in mind the distances between various blocks/locations and other given parameters.



Distance between various blocks/locations:

Block	Distance
IT to DS	28 m
IT to IoT	55 m
DS to IoT	32 m
Kodagu Campus to Coimbatore Campus	304 km

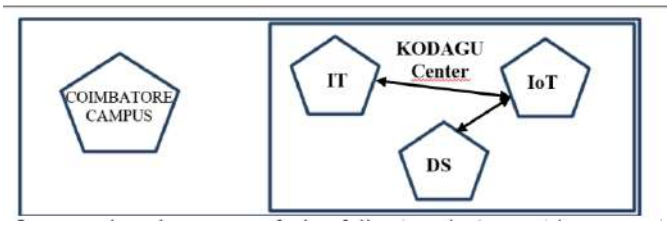
Number of computers:

Block	Number of Computers
IT	75
DS	50
IoT	80

(i) Suggest the most appropriate block/location to house the SERVER in the Kodagu campus (out of the 3 blocks) to get the best and effective connectivity. Justify your answer.
Ans: IoT block, as it has the maximum number of computers.

(ii) Suggest a device/software to be installed in the Kodagu Campus to take care of data security.
Ans:Firewall

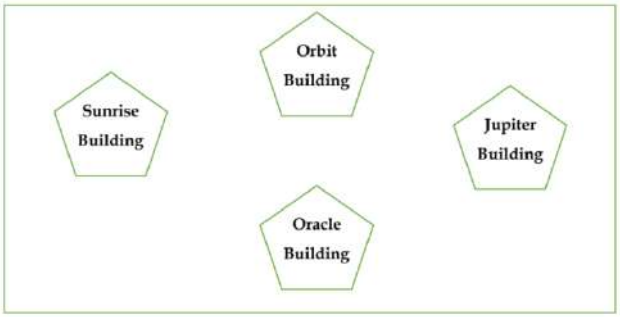
(iii) Suggest the best wired medium and draw the cable layout (Block toBlock) to most efficiently connect various blocks within the Kodagu Campus.
Ans:Optical fiber



(iv) Suggest the placement of the following devices with appropriate reasons:
a) Switch/Hub b) Router
Sol:a) Switch/Hub: In each block to interconnect the computers in that block.
b) Router: In IoT block (with the server) to interconnect all the three blocks.

(v) Suggest a protocol that shall be needed to provide Video Conferencing solution between Kodagu Campus and Coimbatore Campus.
Sol:VoIP

4. Aryan Infotech Solutions has set up its new center at Kamla Nagar for its office and web based activities. The company compound has 4 buildings as shown in the diagram below:



Distance between various buildings.	
Jupiter Building to Orbit Building	50 Mtrs
Orbit Building to Oracle Building	85 Mtrs.
Oracle Building to Sunrise Building	25 Mtrs.
Sunrise Building to Jupiter Building	170 Mtrs.
Jupiter Building to Oracle Building	125 Mtrs.
Orbit Building to Sunrise Building	45 Mtrs.

Number of Computers in each of the buildings is follows:	
Jupiter Building	30
Orbit Building	150
Oracle Building	15
Sunrise Building	35

i) Suggest a cable layout of connections between the buildings.

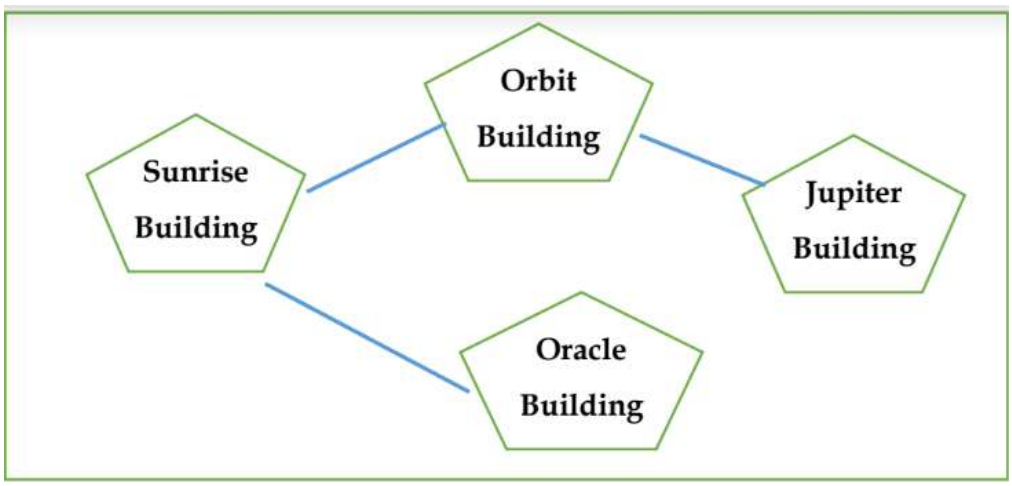
ii) Suggest the most suitable place (i.e. building) to house the server of this organisation with a
suitable reason

iii) Suggest the placement of the following devices with justification:
a. Internet Connecting Device/Modem
b. Switch

iv) The organisation is planning to link its sale counter situated in various parts of the same city,
which type of network out of LAN, MAN or WAN will be formed? Justify your answer.

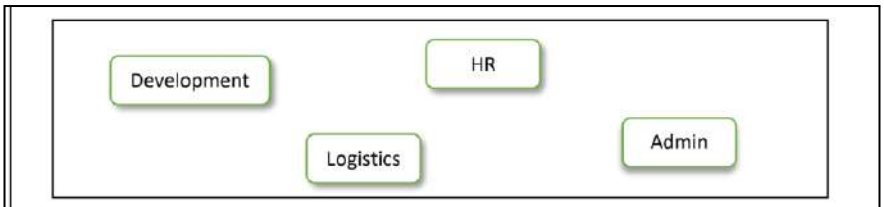
v) What do your mean by PAN? Explain giving example.

Sol: i)



ii) Orbit Building
iii) a. Internet Connecting Device/Modem- Orbit Building
b. Switch- Each Building
iv) MAN, it is formed to connect various locations of the city via various communication media.
v) PAN is “Personal Area Network”, basically configured at home area.

5. Magnolia Infotech wants to set up their computer network in the Bangalorebased campus having four
buildings. Each block has a number of computers that are required to be connected for ease of communication, resource sharing and data security. You are required to suggest the best answers to
the questions i) to v) keeping in mind the building layout on the campus.



Number of Computers.

Block	Number of computers
Development	100
HR	120
Admin	200
Logistics	110

Distance Between the various blocks

Block	Distance
Development to HR	50m
Development to Admin	75m
Development to Logistics	120m
HR to Admin	110m
HR to Logistics	50m
Admin to Logistics	140m

i) Suggest the most appropriate block to host the Server. Also justify your choice.

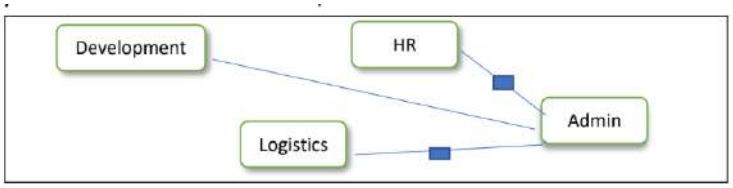
ii) Suggest the device that should should be placed in the Server building so that they can connect to Internet Service Provider to avail Internet Services.

iii) Suggest the wired medium and draw the cable block to block layout to economically connect the various blocks.

iv) Suggest the placement of Switches and Repeaters in the network with justification.

v) Suggest the high-speed wired communication medium between Bangalore Campus and Mysore campus to
establish a data network.

Sol: i) Admin Block since it has maximum number of computers.
ii) Modem should be placed in the Server building
iii) The wired medium is UTP/STP cables.



iv) Switches in all the blocks since the computers need to be connected to the network. Repeaters between Admin and HR block& Admin and Logistics block. The reason being the distance is more than 100m.
v) Optical Fiber cable connection.