Unit - 4 Introduction to Networks and LAN connection components.

Network :-

→ Two or more computers are connected together to sharing data or and information is called network.

→ In network computers are connected either by wired [cable] or wireless (wi-fi).

→ These networked devices use a system of rules called communications protocols to transmit information over physical or wireless technologies.

→ A server is a main computer that manages resources connected to a network.

→ Any user on the network can access the resources stored on the server.

Networking ?

→ The process of making connections and building relationships among computers are called networking.

→ The main purpose of networking is transmiting or sharing data and res-ources.

A computer network consists of various kind of nodes.

→ Servers, networking hardware, personal computers and other specialized or general purpose hosts can all be nodes in a computer network.

Need of Networking :—

(I) The need for networking is mainly to break the barriers of distance, time and cost.

(II) Networking is used for sharing resources, exchanges files or allowing electronic communications.

(III) Noth Networking can even help you find unadvertised jobs / internships.

(IV) we can easily access the files stored on various computers on a network.

(v) Networking also allows many people to work simultaneously on the data stored in a database.

(vi) Computer networks allow people to communicate through emails and instant messaging facilities.

Classification of Networking —

⇒ Based on area covered
LAN
WAN
MAN
CAN
PAN

⇒ Based on communication media
Wired
wireless

⇒ Based on communication
Point-to-point
multi-point
Broadcast

⇒ Based on type of architecture
Peer-to-peer
Client Server
Hybrid

Based on area covered, there are various types of network :—

PAN :—
→ PAN stand for Personal area Network.

→ PAN is the most basic type of computer network.

→ This network is restrained to a single person that is communication between the computer devices is centered only on an individual's workspace.

→ Its transmission speed is very high with very easy maintenance and very low cost.

→ This uses Bluetooth, IrDA and zigbee as technology.

Examples of PAN are USB, computer, phone, tablet, Printer, PDA etc.

Printer

Laptop

PDA

Smartphone

Tablet

**⇒ LAN :-**

→ LAN stands for local area network

→ A LAN is a computer network that connects computers through a common communication path contained within a limited area.

→ A LAN encompasses two or more computers connected over a server.

→ The two important technologies involved in this network are ethernet and wifi.

→ It ranges up to 2km & transmission speed is very high with easy maintenance and low cost.

Example :- of LAN are networking in a home, school, library, laboratory, college office etc.
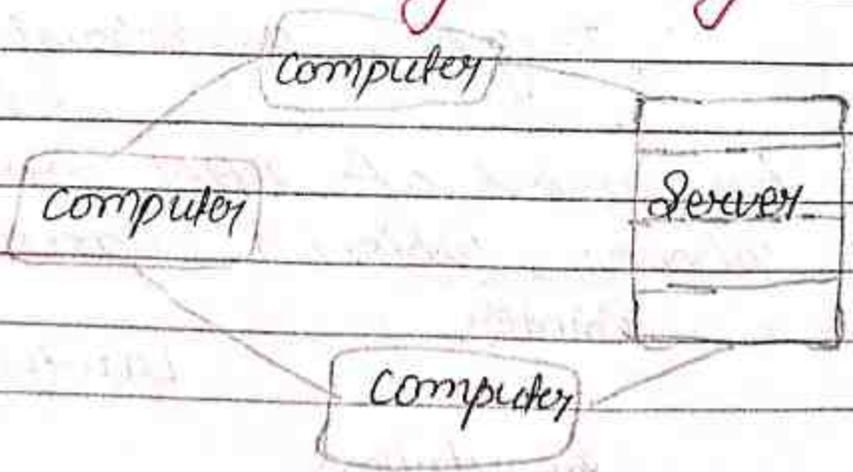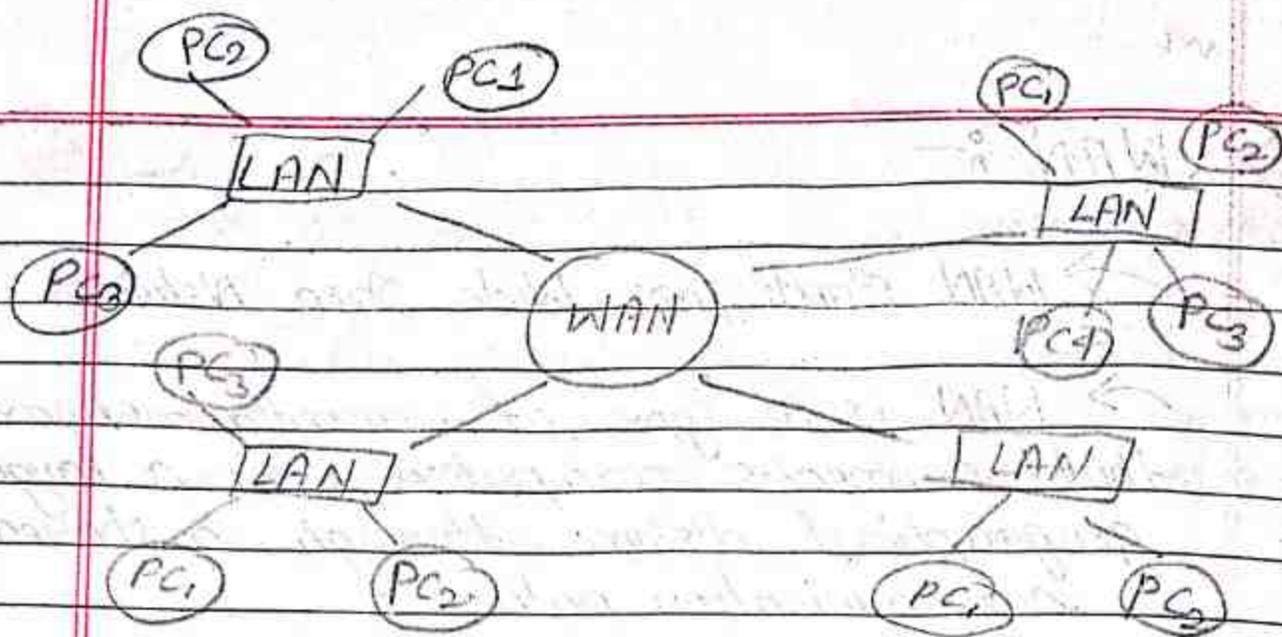
WAN :-

→ WAN stands for Wide Area Network.

→ WAN is a type of computer network that connects computers over a large geographical distance through a shared communication path.

→ It is not restrained to a single location but extends over many locations.

→ WAN can also be defined as a group of local area network that communicate with each other with a range above 50km.

→ These kinds of networks use telephone line, satellite links and other long range communications technology to connect.

→ Its transmission speed is very low and it comes with very high maintenance and very high cost.

MAN :-

→ MAN Stands for Metropolitan Area Networks.

→ MAN is larger than LAN but smaller than WAN. ✓

→ This is the type of computer network that connects computer over a geographical distance through a Shared communication path over the city, town, or metropolitan area. ✓

→ This network mainly uses FDDI, CDDI and ATM ✓ as the technology with a range from 5km to 50km.

→ Its transmission speed is average.

→ It is difficult to maintain and it comes with high cost.

Example :— Consider the cable television network.

LAN1		LAN2
Hospital LAN	MAN	College LAN
LAN4		LAN 3
School LAN		Factory LAN
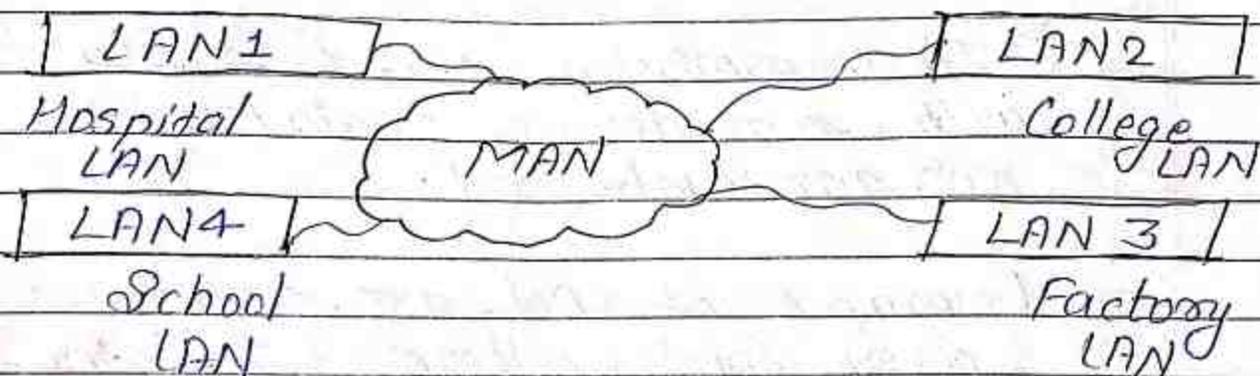
CAN :—

→ CAN stands for campus Area Network

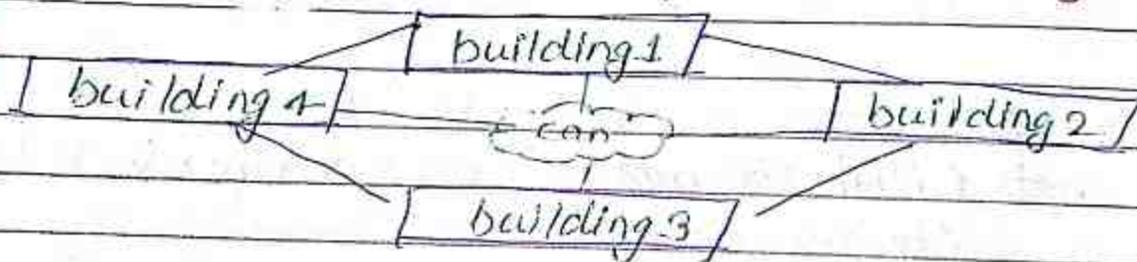→ CAN is bigger than a LAN but smaller than a MAN.

→ This type of network that is usually used in places like a school and college.

→ This network covers a limited geographical area that is, it spreads across several buildings with in the campus.

→ CAN mainly use Ethernet technology with a range from 1km to 5km.

→ Its transmission speed is very high with a moderate maintenance cost and moderate cost.

Example of CAN are networks that cover shool, colleges, buildings etc.

```
           ┌─────────────┐
           │  building 1 │
           └─────────────┘
┌──────────────┐           ┌──────────────┐
│  building 4  │── can ──  │  building 2  │
└──────────────┘           └──────────────┘
           ┌─────────────┐
           │  building 3 │
           └─────────────┘
```

Computer Hardware :-

→ Hardware refers to the physical components of computer.

→ Computer Hardware is any part of the computer that we wen can touch these

parts.

Hardware component :—

CPU, RAM, storage devices, motherboard, Graphics interprocessing unit (GPU), cooling system, power supplying Unit (PSU), input devices, Output devices, Network Interface card (NIC), Sound card, optical, optical Drive.

list of software component :—

→ operating system (windaos, macOS, linux etc.)
→ Networking protocals

→ Device drive → System utilities

→ Application software (word processor, web browsers etc).
→ Utilities and tools.

→ Firmware (embedded software on hardware device.
→ Antivirus and security software
→ Programming language and compiler
→ middleware (connects software application)
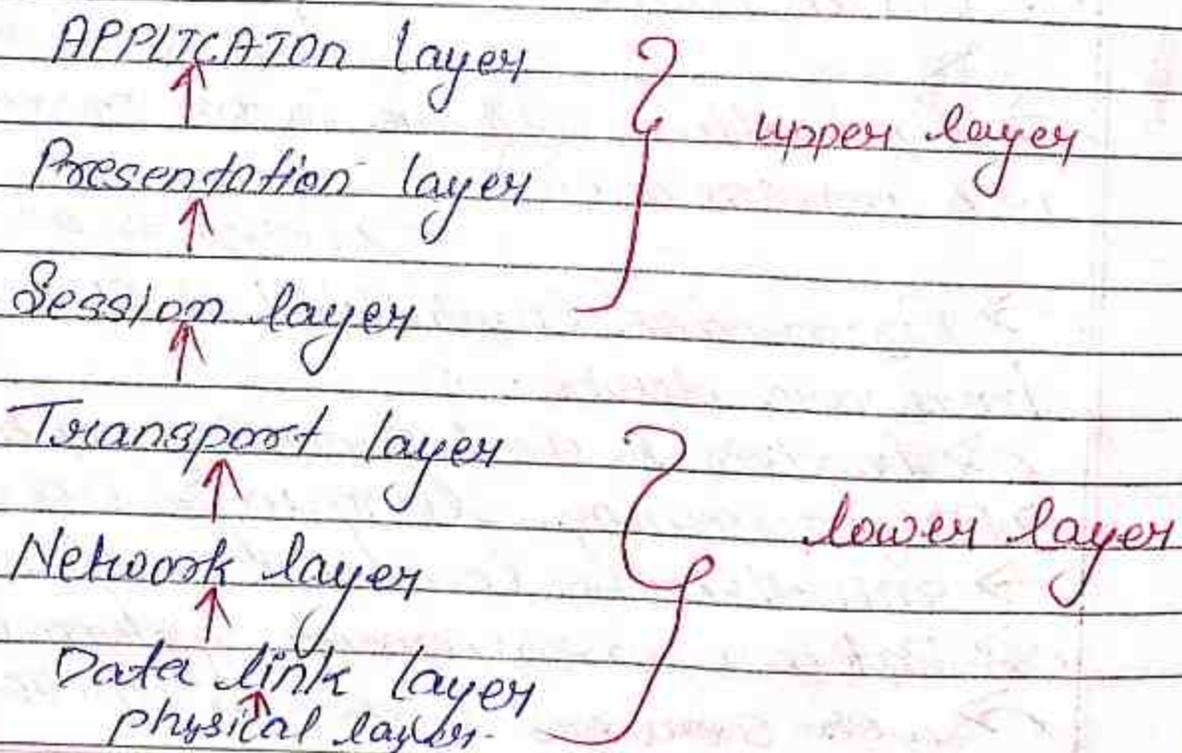→ Database management system (DBMS)
→ web servers and web applications.

OSI model :—

→ OSI stands for Network Interface card.

→ It was developed by ISO in the year of 1984.

→ OSI model describle have information from a software application in one come computer moves through a physical medium to a software applicatic in another computer.

It defines seven layers in a computer complete communication system.

APPLICATON layer ↑

Presentation layer ↑

Session layer ↑ } upper layer

Transport layer ↑

Network layer ↑ } lower layer

Data link layer ↑

physical layer.

① Physical layer ?

→ It is the lowest level of OSI model.
→ It transmit raw bits stream over the physical medium.
→ Devices are used in physical layer are   cable
                                              modem
   hub
                                              Repeaters
                                              Ethernet.

Function ~

→   Transmission mode   Various transmission modes are possible like simplex, Duplex, (Half duplex, full duplex).

          Simplex :- In this mode, out of two devices, only one device can transmit that the data and device can only receive the data.
                              Example :- keyboard, i/p from keyboard, monitor etc.

Half duplex : In this mode, out of two devices both devices can spend and receive the data but only one at a time not simultaneously. Example :- walkie-Talkie, Railway track etc.

From DLL L2 data | L2 data To DLL.

PL | 10101000l | | 10 101000l | PL
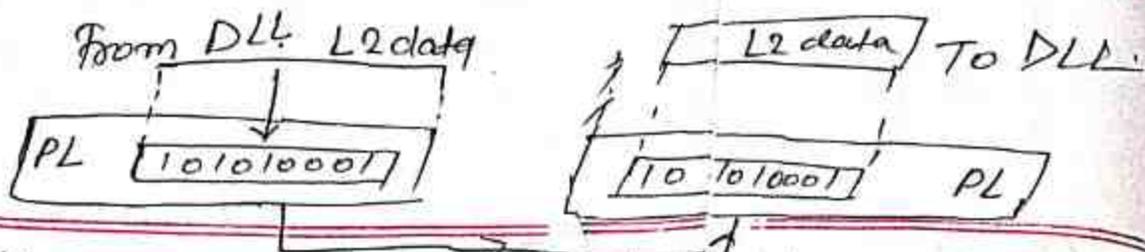
Full Duplex mode :- In this mode both device can send and receive the data simultaneously.

example :- Telephone Systems, chatting applications etc.

→ Bit rate control :- Physical layer define transmission rate no. of bits per sec.

→ It deals with hardware device such as modem, hubs, Repeter etc.

→ It contains information in the form of bits.
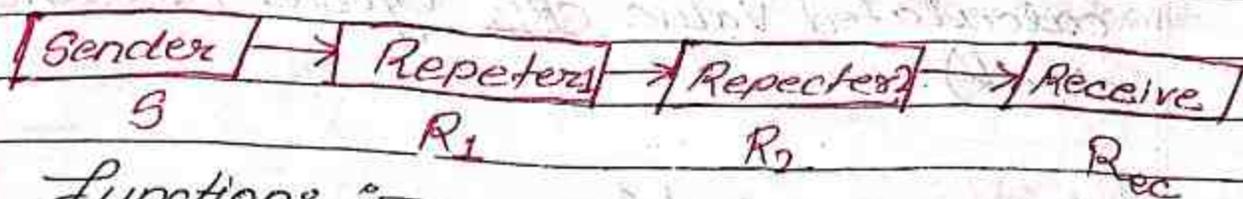
→ It helps in Physical Topology (Mesh, Star, Bus, Ring decision.

② Data link layer ?

→ In data link layer the message/ data/information is delivered node-to-node.
It defines of data on network.

→ Switch and Bridge devices are used this layer.

→ It provide reliable and efficient communication b/w two or more device.

| Sender | → | Repeters | → | Repecter | → | Receive |

S   R₁   R₂   Rec

functions :-

→ The main function of this layer is to make sure data transfer is error free form one node to another.

→ The data link layer contains information in the form of frames.

foaming :- The DLL translate the physical bit stream in the form of packets known as frame.

| Header | packet | Trailer |
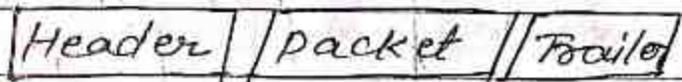
flow constant :- It is a technique in which constant data rate is maintained on the both side so that no data get corrupted.
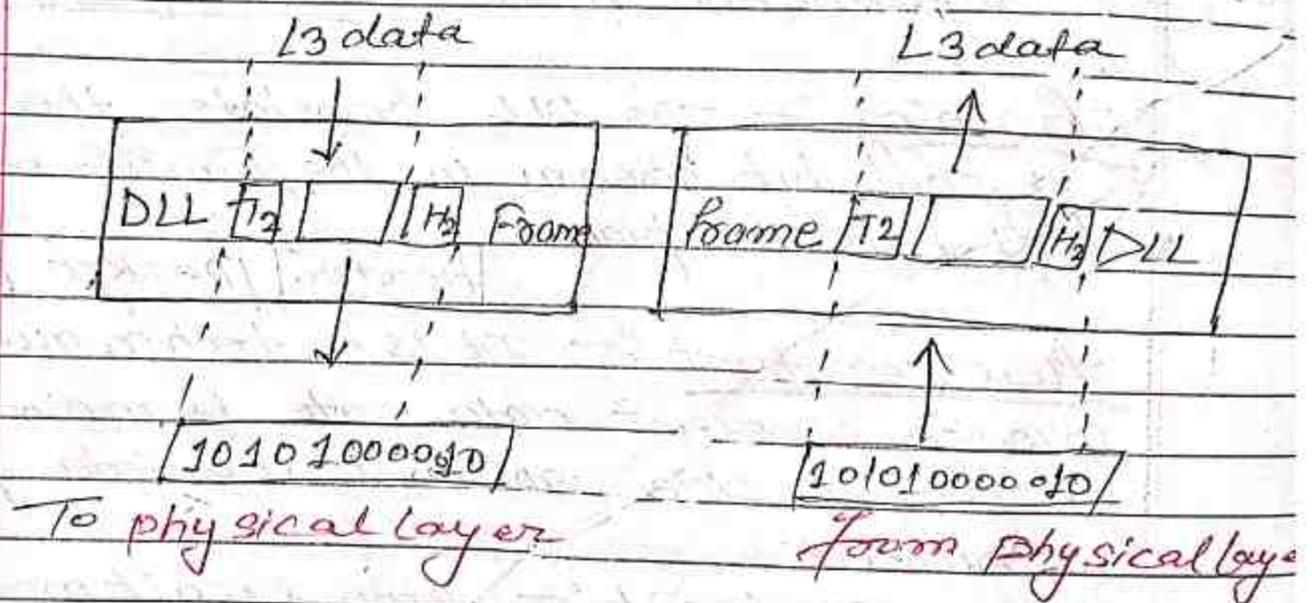
protocol :- stop & wait protocal, Go back protocal, Selective repeat protocals are used to control the flow of data in DLL.

Error control :-

It control by achieved by adding a calculated value CRC cyclic Redundancy check).

Access control :-

when two or more devices are connected to the same network that data link layer to the protocols are used to determine which device has control over the link at a given time.

L3 data   L3 data

| DLL | T2 | | H3 | Frame | | Frame | T2 | | H3 | DLL |

| 1010100000010 | | 101010000010 |

To physical layer   from Physical layer

③ Network layer

→ It delivered the data from host-to-host/source to destination delivery in network layer.

→ It also take care of package routing that is selection of shortest path with the available segment.

→ Router and switches are used in networking layer

→ Im ICI Protocals are used in networks layer —

ICMP = Internet control Message Protocol.

ARP = Address Resolution Protocol.

RARP = Reverse Address Resolution "

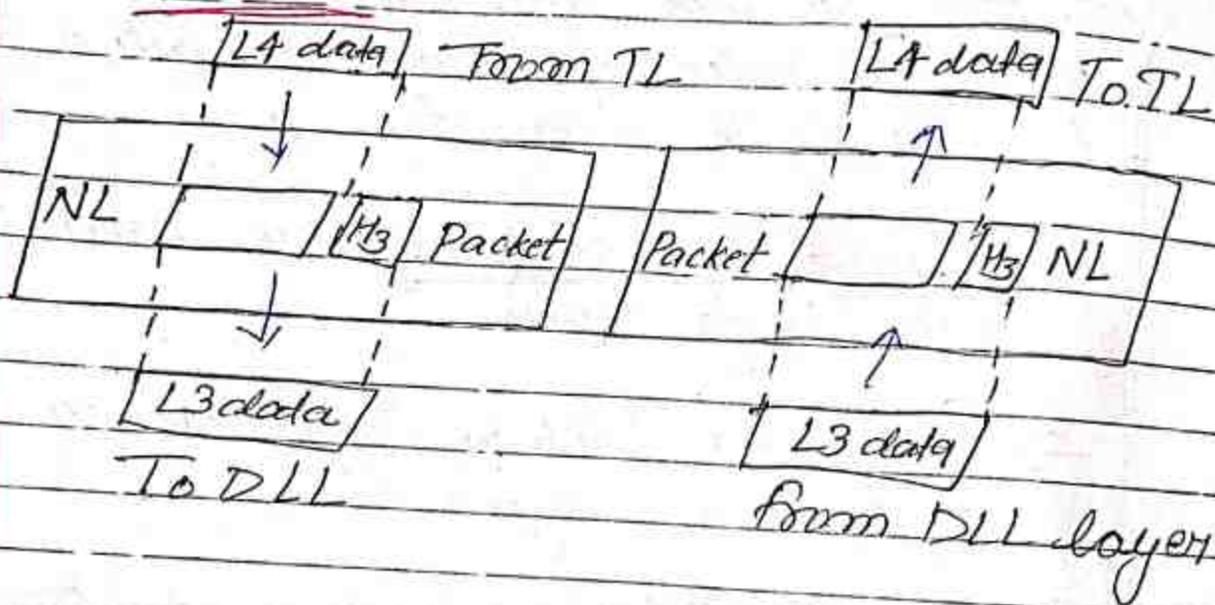IGMP = Internet Group Management Protocol.

function :—

→ It acts as a network controller and manages traffic.

→ It decides by which route data should take.

→ It select the shortest path to transmit the packet from the number of routes available.

→ The Network layer contain information in the form of Packet.

④ Transport layer
→ It is responsible for end-to-end delivery of complete message /data/ information.

→ It also provides by acknowledgement of successful data transmission and retransmit the data if error is found.

→ Firewall is used for transport layer.

functions

→ Port-to-port, end to-end, process to - process delivery of data/information/ message possible for TCP protocol.

→ Error control :- The transport layer is also responsible for error control.

→ Flow control :- The transport layer also responsible for flow control but it is performed end-to-end rather than across a single line.

→ Connection control :- TL provides two Services connection oriented service and connectionless.

From SL — LS Data — To SL — LS Data

TL — H4 — H4 — H4 — H4 — H4 — TL

L4 Data — L4 data

To NL — from NL
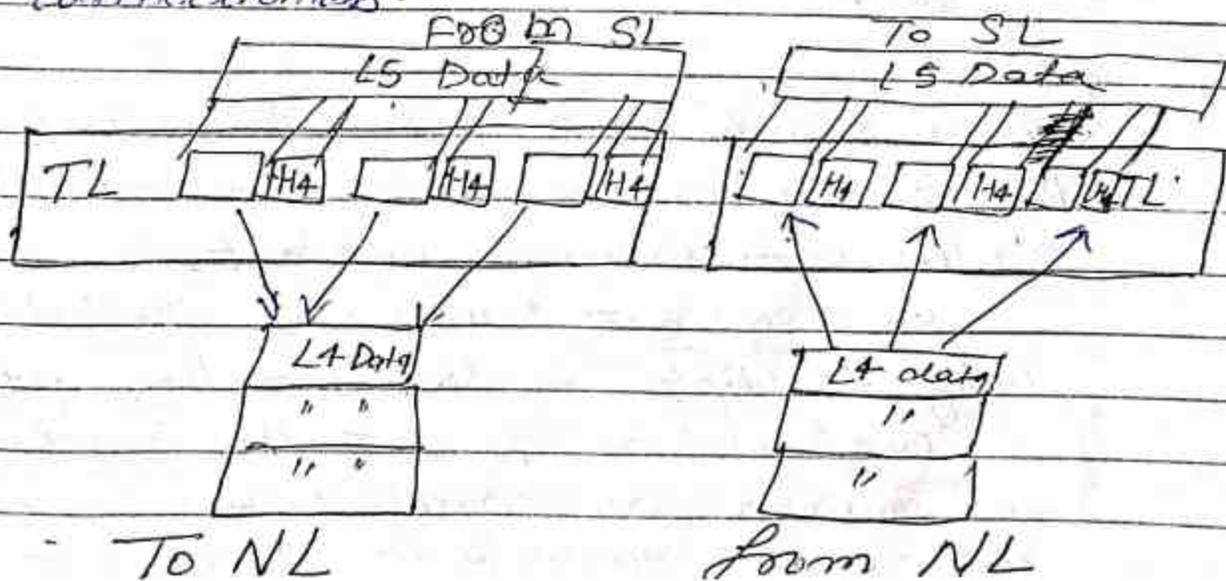
The two protocal used in this layer are :—

① Transmission Control Protocal (TCP)

⑪ User Data gram protocal (USD)

① TCP :—

→ TCP stands for Transmission Control Protocol.

→ It provide reliability.

→ It establishes and maintains a connection b/w hosts

→ It is standard protocal that allows the systems to communicate over the Internet.

→ It is responsible for in order delivery of messege

→ There should not be possible in data loss.

→ when data is sent over the TCP connection then the TCP protocal divides the data into smaller units known as segments.

Each segment travels over the internet using multiple routes, and they arrive in different orders at the destination. The transmission control protocol reorders the packets in the correct order at the receiving end.

(11) UDP →

→ UDP stands for user Data-gram Protocol.

→ It is un yil reliability transport protocal reciver don't send any acknowlegment when packet is recived and sender doesn't wait for the acknowlegment.

(3) Session layer :-

→ This session layer is used to establish, maintain and synchronizes the interaction b/w communication devices.
→ Gateway device is used in session layer.
→ functions :-

→ Authentication. → Authorization
→ Audio & visual (video) should be maintain at same time.
→ Synchronization :- Session layer and some check point when transmitting a data in sequence. If some error occurs in the middle of the transmission of data, then the transmission will take place again from the checkpoint. This process is know as synchronization & recovery.
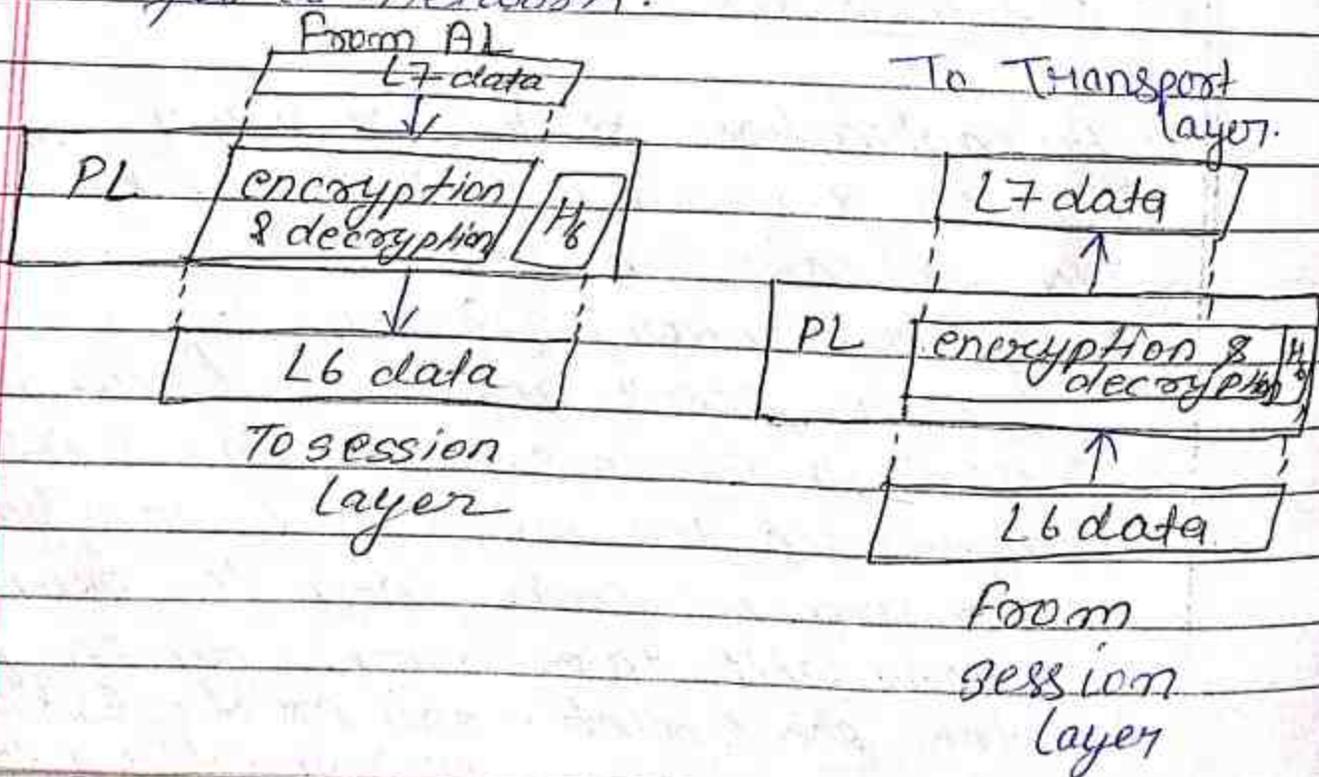
(6) Presentation layer :-

→ It ensure the messege is presented to upper layer in Standaries method.

→ It deals with syntax and symmetric of messege.

→ The presentation layer is also known as syntax layer.

→ This layer is a part of the OS that converts the data from one presentation formate to another formate.

→ It act as a data translator for a network.

From AL
┌──────────┐
│ L7 data │
└──────────┘
      ↓
PL ┌─────────────────┬────┐   To Transport layer.
   │ encryption   │ H6 │
   │ & decryption   │   │   ┌──────────┐
   └─────────────────┴────┘   │ L7 data │
      ↓   └──────────┘
   ┌──────────────┐   ↑
   │ L6 data   │   PL ┌─────────────────┬────┐
   └──────────────┘   │ encryption &   │ H6 │
   To session   │ decryption   │   │
   layer   └─────────────────┴────┘
                                     ↑
                              ┌──────────────┐
                              │ L6 data   │
                              └──────────────┘
                              from
                              session
                              layer

function :-

→ It perform encryption and decryption (decode of data) etc.

→ It imports the message b/w two system in form of character strings, numbers and so on.

→ It is also responsible for data compression.

Data compression is done at the source to reduce the no. of bits to be transmitted.

→ It reduce the storage space and ↑es the files transfer rate.

Some protocol follow in the presentation layer which are —

MIME :- Multipurpose Internet Mail Extension

SSH :- Secure socket shell.

Application layer :-

→ It help to in identifying the client ang synchronizies the message.

→ This layer provides the network services to end users.

→ This layer is used by end software such as web browser & email.

→ It handle issue such as network transparency, resource allocation etc.

→ It provide protocol that allow software to send & receive information and present meaningful data user.
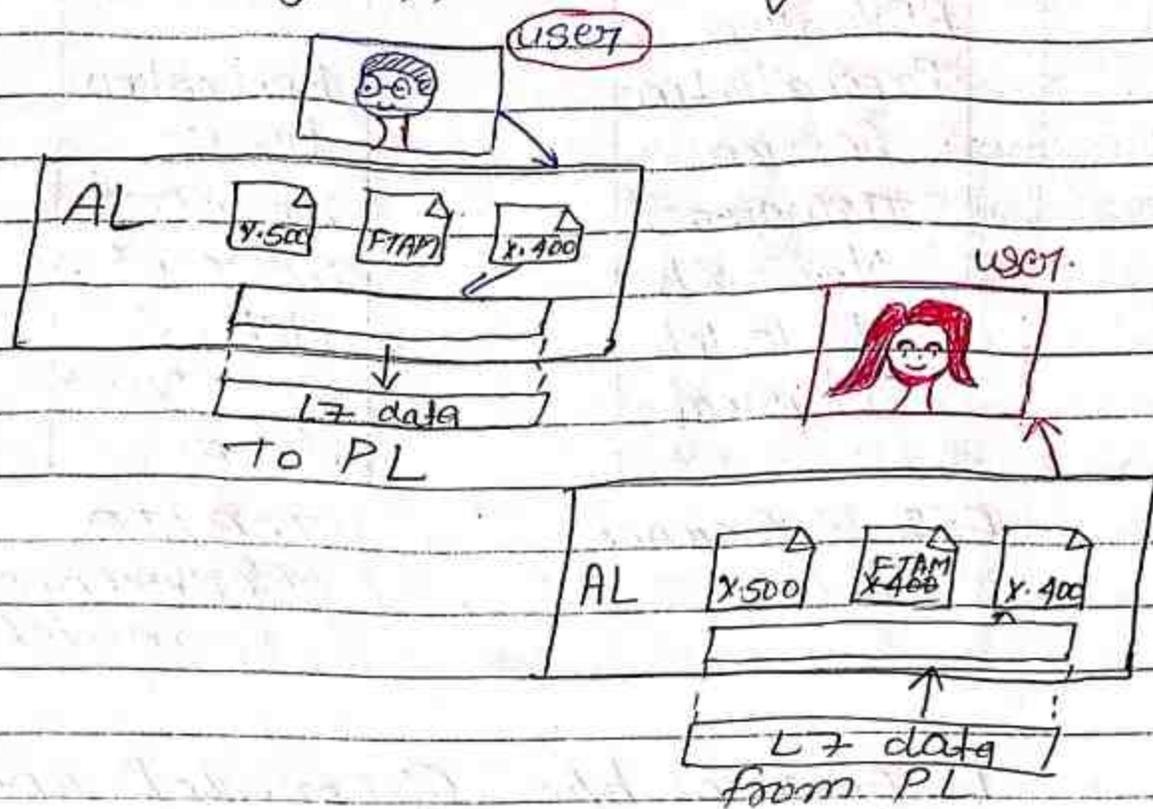
Protocal are :—

(I) SMTP - Simple mail transfer Protocal.

(II) FTP - File transfer Protocal

(III) HTTP - Hyper text transfer Protocal

(IV) ICMP - Internet Control message protocal.

- function
→ It is the topmost layer.
→ Mail services, directory services,

network resource etc. are services provided by application layer.

FTAM stands for File transfer access and management.

TCP/IP model?

→ The TCP stands for Transmission Control protocal, where as IP stands for Interent Protocal.

→ The TCP/IP model is concise more version of the OSI model.

Developed by ARPANET :- (Advanced (1960) Research Project Agency Network)

→ This model consists of 4 layer.

Application Presentation Session Transport Network Datalink Physical		Application Layer Transport Internet Network access/Link layer

OSI Reference model

TCP/IP Reference model.

Difference b/w OSI model and TCP/IP model.

OSI	TCP
→ OSI model stand for open system Interconnection	TCP/IP stand Transmission control protocol / Internet Protocol.
→ Session and presentation are used this differently and seperatly at each layer.	Session & presentation are used both in application layer.

→ OSI model has 7 layer

TCP/IP model has 4 layer.

→ In OSI, transport layer is responsible for assurance delivery of Packets

In TCP, transport layer does'nt respon-sible for assurance delivery of Packets.

→ Network layer of OSI model provide both connection oriented and connectionless service.

Network layer of TCP/IP model provides only connectionless service.

→ In OSI model, Protocol are better covered and are easy to replace as the technology changes
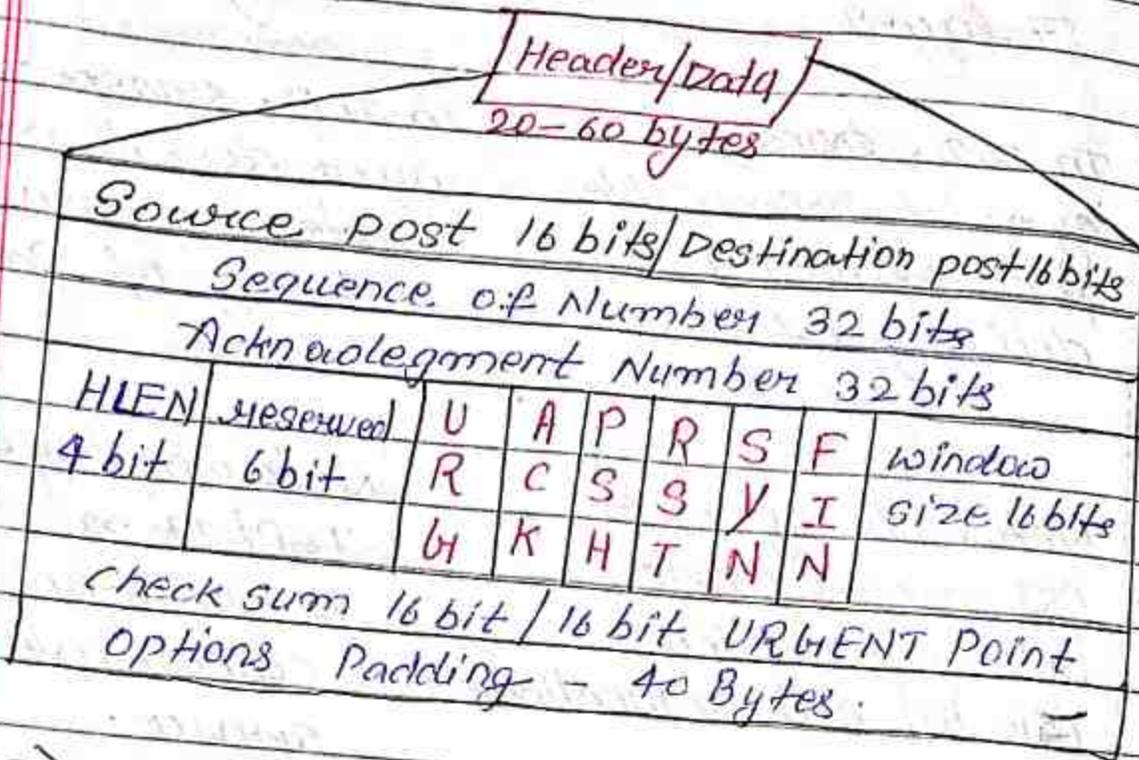
In @TCP/IP model Protocol can't be covered.

→ OSI model has been develop by ISO

It was develop by ARPANET

→ The smallest size of the OSI model is 5 bytes header

The smallest size of TCP/IP header is 20 bytes.

TCP Header formate —

Header/Data
20-60 bytes

Source post 16 bits	Destination post 16 bits						
Sequence of Number 32 bits							
Acknaolegment Number 32 bits							
HLEN 4 bit	Reserved 6 bit	URG	ACK	PSH	RST	SYN	FIN	window Size 16 bits
Check sum 16 bit / 16 bit URGENT Point							
Options Padding — 40 Bytes.							

→ The header of TCP segment can range from 20-60 bytes.

→ 40 bytes are option if there are no options in Header is of ile of 20 bytes.

Header field consists of —

Source Port :— It defines the port of the application, which is sending the data. Source port address hold 16 bytes for sending the data.

Destination Port :-

It defines the port of the application on the receiving side.
Destination port address hold the 16 bytes for receiving the data.

Sequence number :-

→ The field contain the sequence number of data bytes in a particular session.

→ This field hold 32 bytes

→ It is used to reassemble the message at the receiving end of the Segment that are connected received out of order.

Acknowledgment number :-

A 32-byte field that hold the acknowledgment number.

→ when the ACK flag is set, then this contains the next sequence number of the data byte and works as an acknowledgment for the previous data received.

Example :- If the receiver receives the segment number 'x', then it responds 'x+1' as an acknowledgment number.

HLEN :-

It specifies the length of the header indicated by the 4-byte words in the header.

→ The size of the header lies b/w 20-60 bytes.

Reserved :-

It is a 4-bit field reserved for future use, and by default, all are set to zero.

Control flag :-

There are 6, 1-bit control flag that control. Connection establishment connection terimation, connection absortion, flaw control etc.

There are six control bits or flags :-

① URb
* It represents an urgent pointer.
→ If it is set, then the data is processed urgently.

⑪ ACK
* Acknowledgment number
* If the ACK is set to 0, then it means that the data packet does not contain an acknowledgment.

(III) PSH :-   * Request for push
* If this field is set, then it requests the receiving device to push the data to the receiving application without buffering it.

(IV) RST :- * request for connection
* If it is set, then it requests to restart a connection.

(V) SYN :- * Synchronies the sequence.
* It is used to establish a connection b/w hosts.

(VI) FIN :- Terimate the connection
* It is used to release connection and no further data exchange will happen.

Window Size :-
* It is a 16-bit field.
* It contains the size of data that the receiver can accept.

* This field is used for the flow control between the sender and receiver and also determines the amount of buffer allocated by the receiver for a segment.

* The value of this field is determined by the receiver.

Check sum :-

* It is a 16-bit field.
* It use for error control.
* this field is optional in UPD, but in the case of TCP/IP, this field is mandatory.

Urgent pointer

* It is a pointer than points to the urgent data byte if the URG Flag is set to 1.

* It defines a value that will be added to the sequence number to get the sequence number of the last urgent byte.

Options

* It provides additional options.

* The optional field is represented in 32-bits.

* If this field contains the data less than 32-bit, then padding is required to obtain the remaining bits.

Network Topology :—

→ Physical arrangement of computer device is called network topology.

→ The arrangement or structure of nodes and links is called network topology.

→ Another, The arrangment of number network that compriesies via sender and receiver called network topology.

→ There are five types of network topolgies :   → Point - to - point
  → Bus
  → Ring
  → Star
  → Mesh
  → Hybrid
  → Tree

→ Point - to - point
→ It is the simplest communication b/w two nodes which one of the sender and other another one is receiver and it provide high boundant.

| S | ← Request → | R |

Response
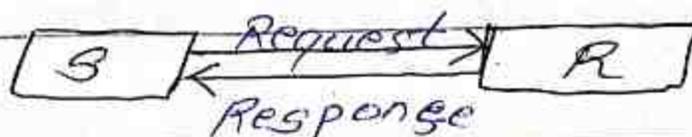
(11) **Mesh topology :-**

→ every device is connected to another device via dedicated channel. this channels are called link.

→ It is a network topology in which all the nodes are individually connected to the other nodes.

n = no. of nodes

no. of cable $\Rightarrow nC_2 \Rightarrow \dfrac{n(n-1)}{2}$

let $n = 4$

no. of cable $= {}^4C_2 = \dfrac{4(4-1)}{2} = \dfrac{\cancel{4}^2 \times 3}{\cancel{2}}$

$= 6$

no. of port $= n-1 = (4-1) = 3$

total no. of port $= n(n-1)$

$\qquad = 4(4-1) = 4 \vee 3 = 12$

Advantages :-

→ communication is very fast b/w the nodes.

→ It provide security and privacy.

→ It is mainly used in military, aircraft etc.

→ Cost depent no. of cable.

→ Data is reliable because data is transfer among the devices through dedicated channel.

→ fault is can diagonosistic.

⚫ Disadvantage :-
→ Installation and configuration are difficult.

→ the amount of cabling is increased so it is very expansive.

→ The high of cable is high as bulk wirling is required hence, it is suitable less devices.
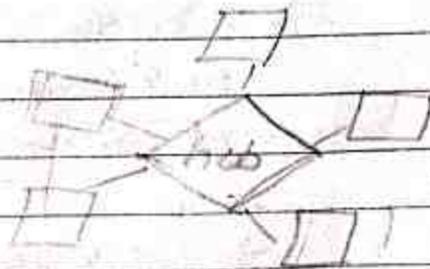
⑪ Star Topology :-

→ All devices are connected to a single hub through a cable.

No. of cable = n
No. of post = 1
total no. of part = $n \times 1$

→ The hub is the central node and all other nodes are connected to central node.

→ The star topology is considered the easiest topology to design and implement.

Advantage —

→ fault identification and isolating is very easily.
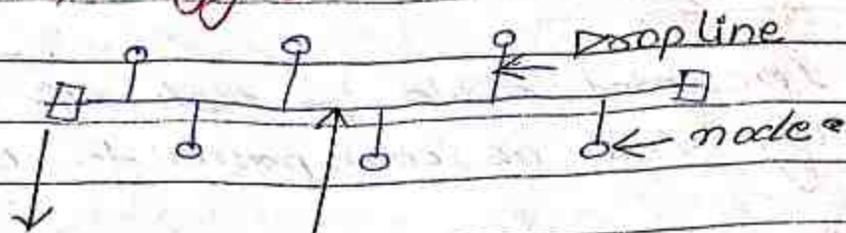
→ Easy to install and configure.

Disadvantages

→ Perform is based on central hub. if there is any problem in a hub the whole topology will affected.

→ Nodes attached to the hub, switche, concentrator is failed it they fail.

→ More cable required compared to bus or ring.

(IV)

Bus Topology :-

Terminator
(Repeater)

Backbone cable

Dropline

node

→ In Bus topology each computer is connected to the single bus cable.

→ It is a type of network in which every computer & network device is connected to single cable.

→ It is bidirectional device.

→ If the backbone fail the whole topology will get fail / affected.

Total no. of devices = n
no. of cables = $n+1$
number of ports = n

→ In LAN, bus topology is used.

Advantages :-

→ **low cost cable :-** cost of cabling is very low as compare to others.

✳ In bus topology, nodes are directly connected to the cable without passing through a hub.

→ **Modrate data speed :** Coaxial or twisted pair cables are maily used in bus-based network that support upto 10 MbPS.

→ **familiar technology :** Bus topology is a familiar technology as the installation and troubleshooting techniques are well known.

→ **limited failure** A failure in one node will not have any effect on other nodes.

Disadvantages :-

→ **Extensive cabling :-** A bus topology is quite simple, but still it requires a lot of cabling.

→ **Difficult troubleshooting :-**
Due to lot of cabling is required, if there is any issue in b/w back-bone cable, the entire nodes will disrupt the communication with it.
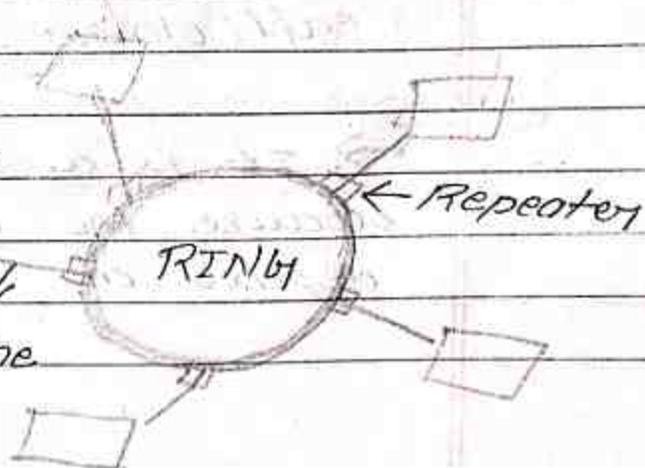
→ **Single interference :-**
If two nodes send the messages simultaneouly, then the singles signals of both side the nodes collide with each other.

→ **Reconfiguration difficult :-**
Adding a new devices to the new network would slow down the network.

(V) **Ring topology :-**

→ Ring topology is like bus topology, but with connected end.

← Repeater

RING

Drop line

No. of network = n
No. of port = n×1
Total no. of cable = n
no. of Roots = n terminator = n.

→ It forms ring connecting device.

→ A large no. of nodes attached to the ring.

→ Data is flow in ring topology is unidirectional.

→ The data in a ring topology flow in a clockwise direction.

Advantages :-

→ The speed of data transmission is high.

→ Twisted pair cabling is inexpensive and easily available. Therefore, the installation cost is very low.

→ If two nodes send the message simultaneously then the signal of both node will not collide with each other.

→ It is a more reliable network because, the communication system is not depend on the single host computer.

Disadvantages :—

→ Trouble shooting is difficult in this topology . because if any fault occurs in the occure then it disto disrupt the communcation for all the node.

→ The failure of single node in a network can cause entire network fail.

→ Adding a new devices to the network would slow down the network.

→ Communication delay is directly proportional to the number of nodes. Adding new devices ↑es the communic- ation delay.

Hybrid topology :—
→ The combination various different topologies is known as Hybrid topology .

→ A hybrid topology is a connection b/w different links and nodes to transfer the data.

→ when two or more different topologies are combined is termed as Hybrid topology and if similar topologies are connected with each other will not result in Hybrid topology.

Example :-

if there exist a ring topology in one branch of ICIC bank and bus topology in oth another branch of ICIC banks, connecting these two topologies will result in Hybrid topology.

Tree topology :-
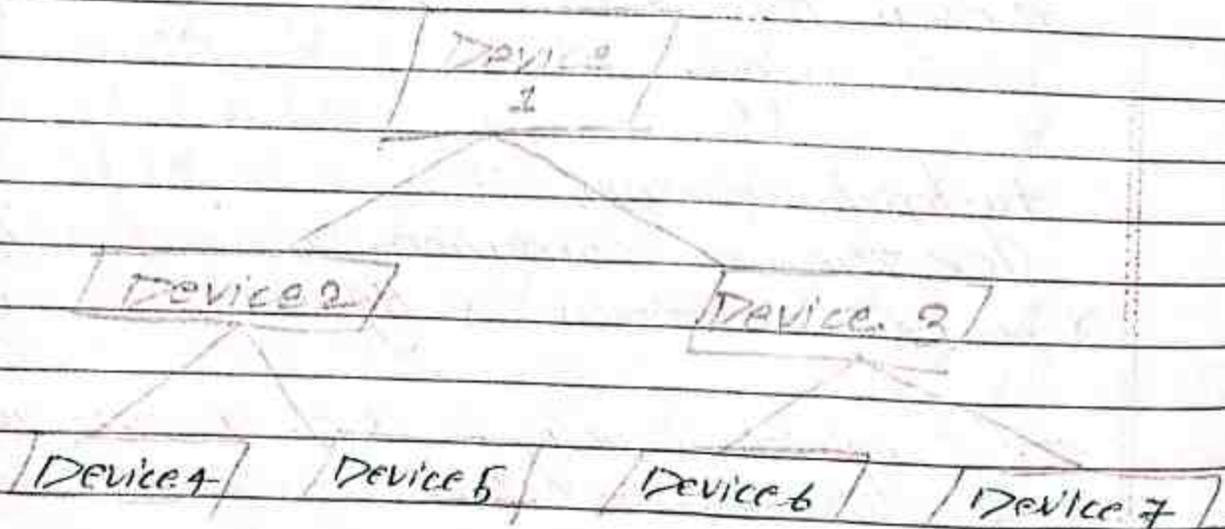
→ A tree topology combines several star topologies by connecting several components to the centre node.

→ Another, tree topology is a combination of bus and star topologies in which all nodes are attached with the help of a single central node.

D

B

E

A

S1

S2

Connector (Hub)
concentrator

C Node

F

S3

Backbone
cable

G

Server
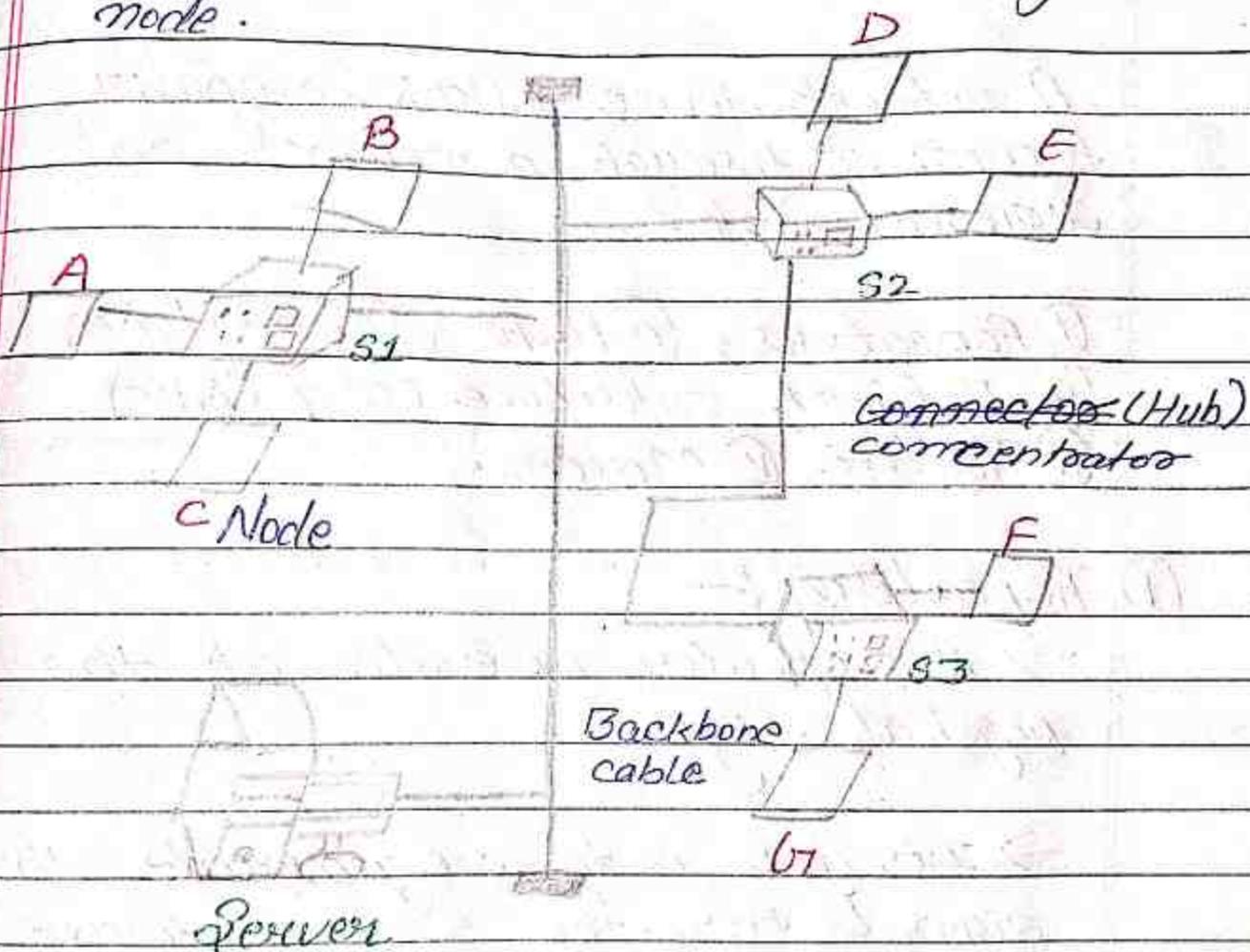
Tree topology.

Network Devices :-

→ Network devices, also known as networking hardware and physical devices that allowing allow hardware on a computer network to communicate and interact with one another.

A network device allows computer to connect through a network and transmit data.

(I) Repeaters, (II) Hubs, (III) Switches
(IV) Network Interface Card (NIC)
(IV) Router (V) Modem.

(I) Repeaters :-

→ A repeater operates at the physical layer.

→ Its job is to regenerate the signal over the same network before the signal becomes too weak or corrupted to extend the length to which the signal can be transmitted over the same network.

→ An important point to be noted about repeaters is that they not only amplify the signal repeaters but also regenerate it.

→ When the signal becomes weak, they copy it bit by bit and regenerate it at its star topology connectors connecting following the original strength.

→ It is a 2-port device.

→ It also help to nes tranfer rate of information.

→ It also help to ↓es the noise.

⑪ Hub:-

→ A hub is a basically multi-port repeater.

→ It is also known as multi-port repeater.

→ A hub connects multiple wires coming from different branches, for example. the connector in star topology which connects different stations.
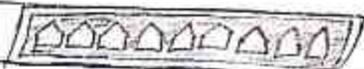
→ Hubs cannot filter data, so data packets are sent to all connected devices. it forward the Packet that have error an ineffencies and wastage.

Types of Hub

There are three types of Hub

(i) Active Hub
(ii) Passive Hub
(iii) Intelligent Hub

(iii) Switch :-

→ A switch is a multiport bridge with a buffer and a design that can boot its efficiency (a large no. of poots imply less traffic) and performance.

→ A switch is a data link layer device.

→ A switch can perform error checking before forwarding data, which makes it very efficient as it does not forward packets that have error and forward good packets that have errors and for good packets selectively to the correct port only.

There are various types of switches
- unmanaged switches
- managed switches
- Smart switches
- Layer 2 switches
- Layer 3 switches
- POE Switches
- Gigabit switches
- Rack mounted switches
- Desktop switches
- Modular switches

(iv) Routers —

→ A router is a device like a switch that routes data packets based on their IP address

→ The router is mainly a Network layer device.

→ Routers normally connect LANs and WANs and have a dynamically updating routing table based on which they make decision on routing the data packets.

→ The router divides the broadcast domains of hosts connected through it.

(V) NIC

→ NIC stands for network interface card.

→ NetNIC is a network card adapter that is used to connect the computer to the network.

→ It is installed in the computer to establish a LAN.

→ It has a unique ID that is written on the chip and it has a connector to connect the cable to it.

→ It act as an interface b/w computer and router (wireless) or modem (wired).

→ NIC card is a layer 2 device because it works on both physical and data link layer of the network layer.

(VI) Modem :—

→ modem stands for modulator or demodulator.

→ A modem is a box that connects your home network to your internet service provider and ISP.

→ It is a hardware device that allows a computer to send and receive the information over telephone lines.

→ The main function of the modem is convert the analog system to ditel digital signal. means (sign from)

Ethernet ?

→ Ethernet is a widely used networking technology that enables devices to communicate over a local area network.

Types of ethernet cables :-
Mainly there are three types of ethernet cable used in LAN.
① Coaxial cable
② Twisted cable
③ Fiber optic cables

① Twisted pair :—
                    cable

→ Twisted pair is a copper wire
   cable in which two insulated copper
   wires are twisted around each other
   to reduce interference or crosstalk.

→ On increasing the number of twins
   perfoot decreases the noise interfer—
   ence.

→ A twatte twisted pair cable is cheap
   as compared to other transmission
   media.

→ Installation of the twisted pair
   cable is easy, and it is a light weight
   cable.

→ Twisted pair cables are used in
   telephone line to provide data and
   voice channels.

→ RJ-45 is very common application
   of twisted pair cables.

                                    Bare wire

   Jacket   Twisted pair

There are two types of twisted pair cable :—

① shielded Twisted Pair Cable (STP)
② unshielded Twisted Pair cable (UTP)
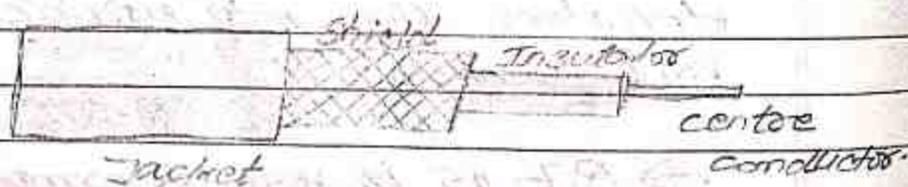
(II) ~~Twisted~~ Coaxial cable :—

→ A coaxial cable is an electrical cable with a copper conductor and an insulator shielding around it.

→ Coaxial cable is also known as coax.

→ It has a higher frequency as compared to twisted pair cable.

→ The coaxial cables are used in Ethernet LANs and also used in MANS.

→ It is used in Television, Internet, CCTV, video etc.

Jacket :— Protective Plastic layer

Shield :— Braided metal Conductor
centre conductor :— copper conductor

(111) Fibre optic :—

→ An optical fiber is a cylindrical fiber of glass which in hair thin size or any transparent dielectric medium.

→ Fiber optics provide faster data transmission than other media.

→ The plastic coating protects the optical fibers from heat, cold, electromagnetic interference etc.

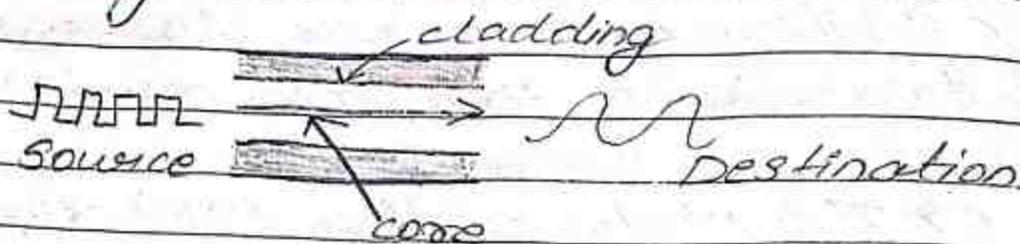→ It is used in long distance high speed data transmission, video transmission, broad services etc.
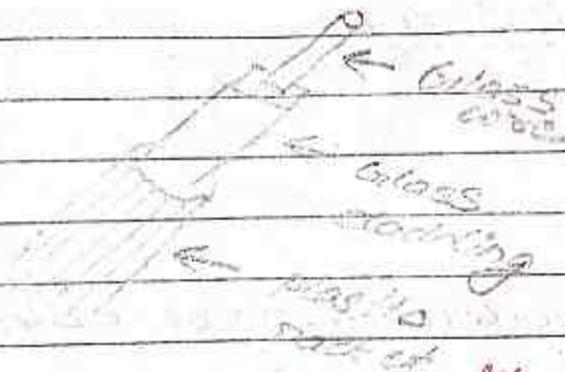
main element of fiber OPTICS:

- Core
- Cladding
- Plastic Packet (Buffer Coating)

Type of fibre optics
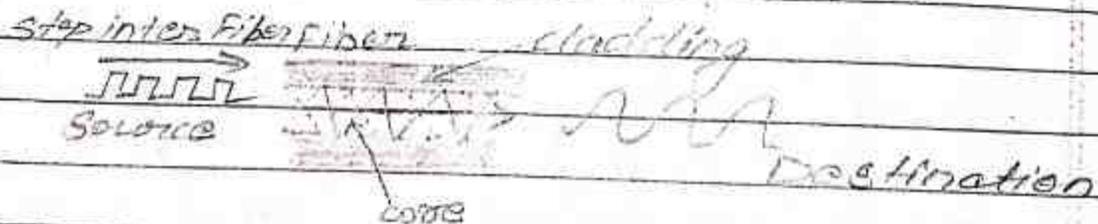
On the basis of the Number of modes :-

- Single - mode fiber :-

cladding

Source → Destination

core

- Multi - mode fiber :-

on the basis of Refractive Index :-

→ step - index optical fiber :

step index Fiber fiber   cladding

Source → Destination

core

→ braded index optical fiber :

source → Destination