

Computer Network :-

Unit-1 Introduction

Important Questions :-

Q1 :- Define CN. {2 marks}

Ans :- A computer networks is a system that connects numerous independent computers in order to share information (data) and resources. A network connection can be established using either cable or wireless media. Hardware and software are used to connect computers and tools in any networks.

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

Q2 :- Short notes on history of CN {7 marks}

Ans :- ARPANET - the first network :-

ARPANET - Advanced Research Projects Agency Network - the granddad of Internet was a network established by the US Department of Defense (DOD).

The work for establishing the network started in the early 1960s and DOD sponsored major research work, which resulted in development of initial protocols, languages and frameworks for network communications.

It had four nodes at University of

California at Los Angeles (UCLA), Stanford Research Institute (SRI), University of California at Santa Barbara (UCSB) and University of Utah. On October 29, 1969, the first message was exchanged between UCLA and SRI. E-mail was created in 1972 at Bolt Beranek and Newman, Inc. (BBN) after UCLA was connected to BBN.

Internet :-

ARPANET expanded to connect DOD with those universities of the US that were carrying out defense-related research.

The term internet was coined by Vinton Cerf, Yogen Dalal and Carl Sunshine of Stanford University to describe this network of networks. Together they also developed protocols to facilitate information exchange over the internet. Transmission Control Protocol (TCP) still forms the backbone of networking.

Telenet :-

Telenet was the first commercial adaptation of ARPANET introduced in 1974. With this the concept of Internet Service Provider (ISP) was also introduced. The main function of an ISP is to provide uninterrupted Internet connection to its customers at affordable rates.

World Wide Web :-

With commercialization of internet, more and more networks were developed in different part of the world. Each network used different protocols for communicating over the network. This prevented different networks from connecting together seamlessly. In the 1980s, Tim Berners-Lee led a group of computer scientists at CERN, Switzerland, to create a seamless network of varied networks, called world wide web. It is a complex web of websites and web pages connected together through hypertexts.

Q3 : What are the application areas of CN.

Ans : (i) Business Application :-

Computer networks allow organizations having units which are placed apart from each other, to share information in a very effective manner. Programs and software in any computer can be accessed by other computers linked to the network. The information is stored in remote databases to which the users gains access through information systems like World Wide Web.

Previously, it was imperative for organizations to set up expensive mainframes for computation and storage.

With advent of networks, it is sufficient to set up interconnected personal computers (PCs) for the same purpose. And through VoIP, telephone calls are made digitally using internet protocols.

(2) Home Applications:

Internet access provide home users with connectivity to remote computers. As with companies, home users can access information, communicate with other people, and buy products and services with e-commerce.

The main benefit now comes from connecting outside of the home. It's now easier to instant messaging, peer to peer

(3) Communication etc.

(3) Mobile Users:

Mobile computers, such as laptop and handheld computers, are one of the fastest growing segments of the computer industry. Connectivity to the Internet enables many of these mobile users. Wireless hotspots based on the 802.11 standard are another kind of wireless network for mobile computer users.

GPS (Global positioning system)

are used for mobile maps and directions when equipped with NFC (near field communication) technology the mobile can

act as an RFID Smartcard and interact with nearby devices for payments.

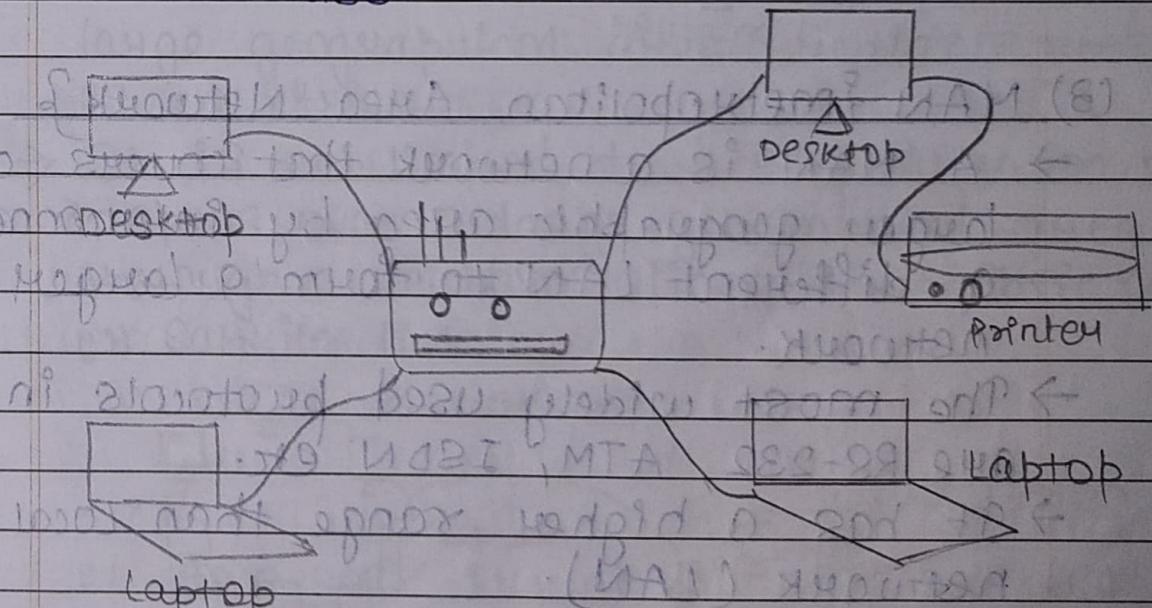
Q4 :- Discuss network topologies like WAN, LAN, MAN, PAN using suitable diagram.

Ans :- PAN { Personal Area Network }

→ Personal Area Network is arranged within an individual person, typically within a range of 10 meters.

→ There are two types of PAN :-

- Wireless PAN : It can be developed by simply using wireless technologies such as WiFi, Bluetooth. It is a low range network.
- Wired PAN : It is created by using the USB.

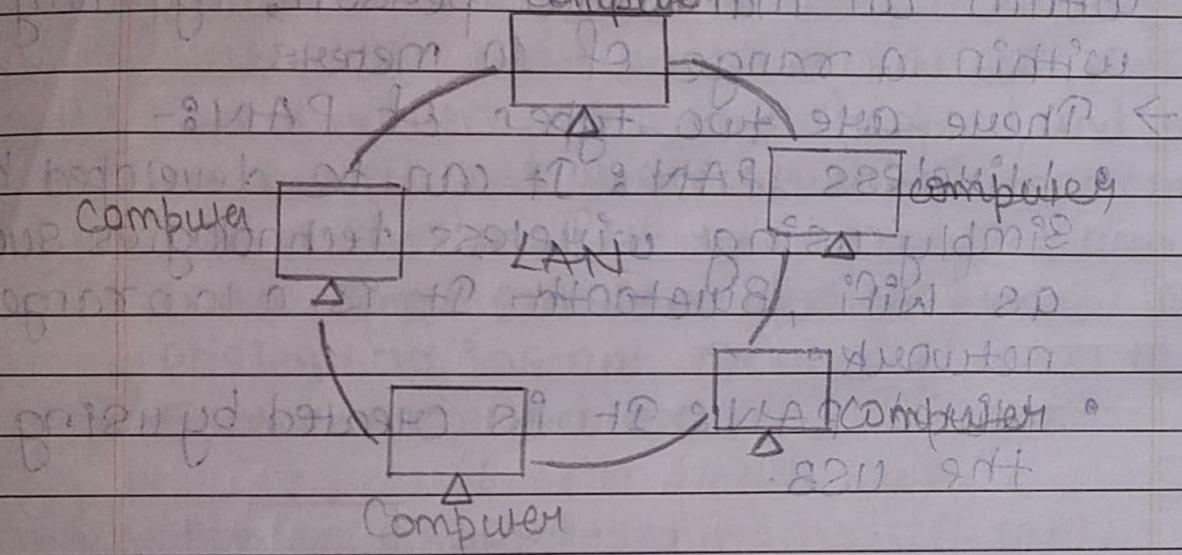


LAN { Local Area Network }

→ LAN is a group of computers connected to

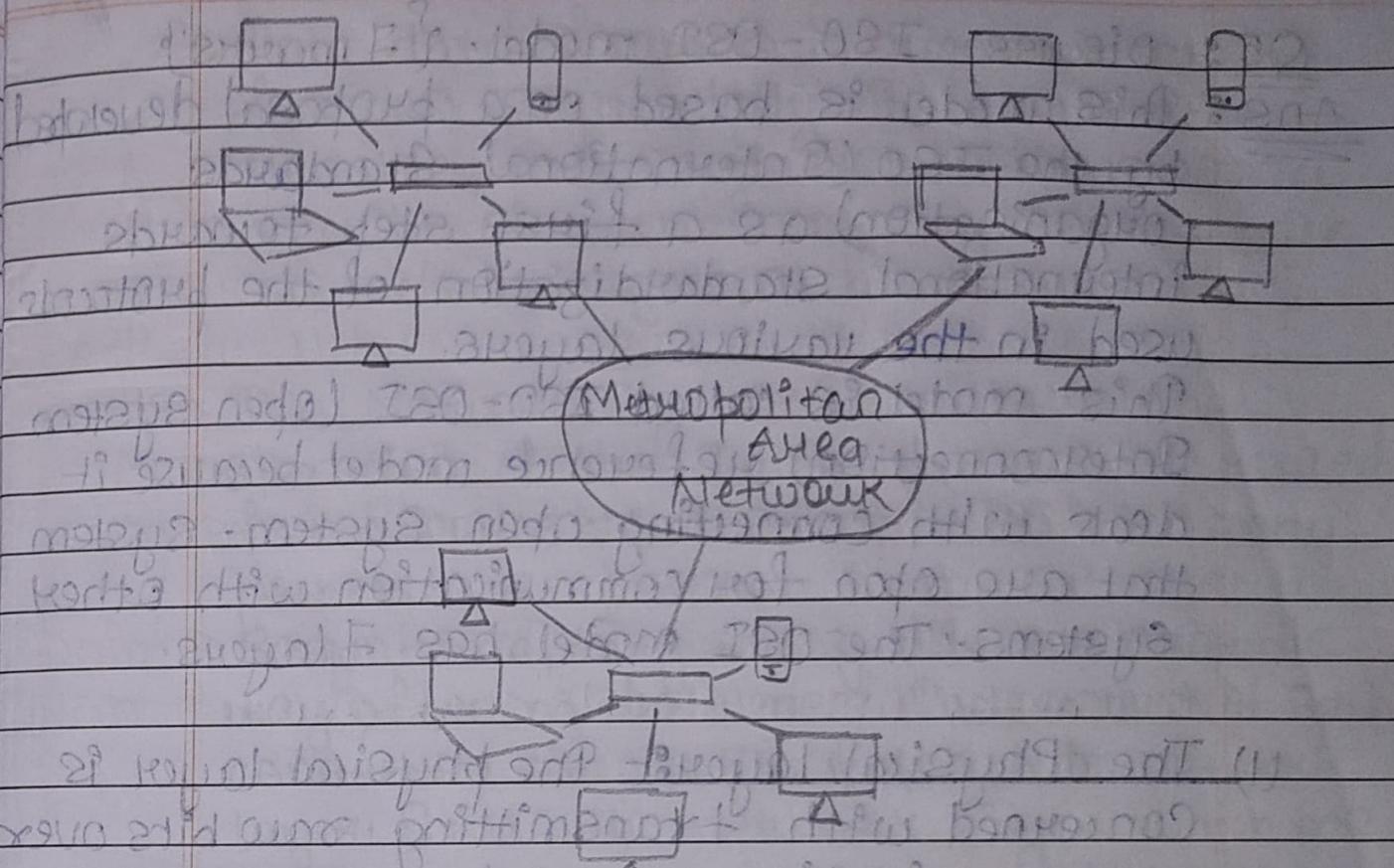
each other in a small area such as building, office.

- It is used for connecting two or more PCs through a communication medium such as twisted pair, coaxial cable etc.
- The data is transferred at an extremely fast rate.
- It provides higher security.



(3) MAN {metropolitan Area Network}

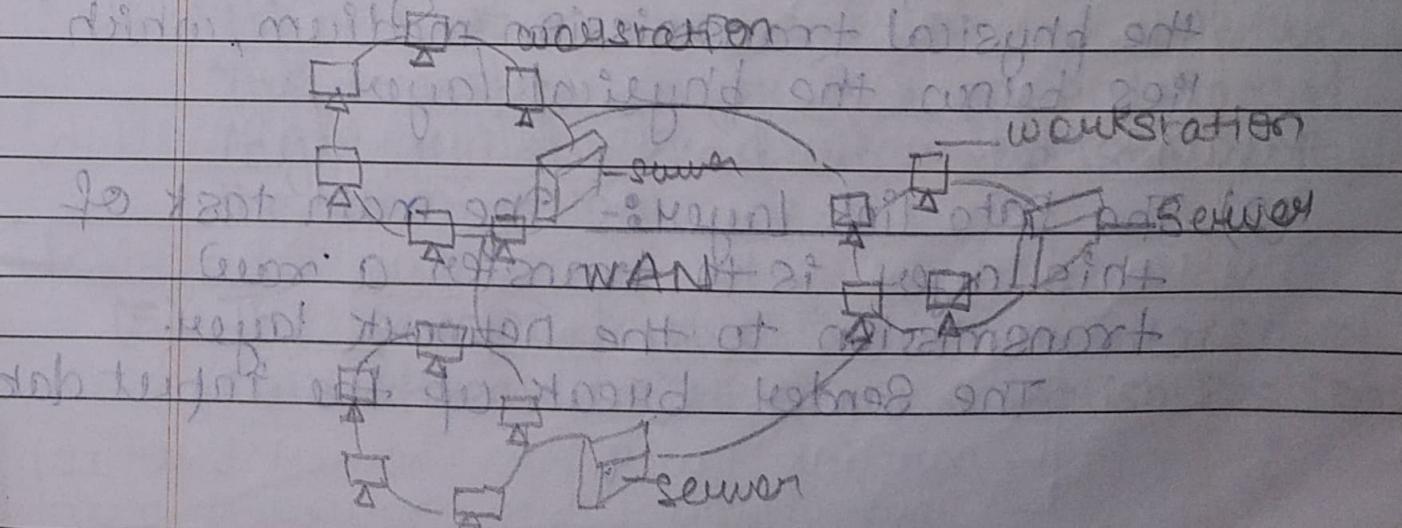
- A MAN is a network that covers a larger geographic area by interconnecting different LAN to form a larger network.
- The most widely used protocols in MAN are RS-232, ATM, ISDN etc.
- It has a higher range than Local Area network (LAN).
- Government agencies use MAN to connect to the citizens and private industries.



(4) Wide Area Network (WAN)

→ It is a network that extends over a large geographical area such as states or countries.

→ It is not limited to a single location, but spans over a large geographical area through a telephone line, fibre optic cable or satellite links.



Q5: Discuss ISO - OSI model. {7 marks}

Ans: This model is based on a proposal developed by the ISO (International Standards Organisation) as a first step towards international standardization of the protocols used in the various layers.

This model is called ISO - OSI (Open System Interconnection) reference model because it deals with connecting open system - system that are open for communication with other systems. The OSI model has 7 layers.

(1) The Physical layer: - The physical layer is concerned with transmitting raw bits over a communication channel.

Issues here are :-

- Make sure that 1 bit sent is received as 1 bit & not a 0 bit or more than 1 bit.
- How many volts should be used to represent 1 & how many for 0.
- How initial connection is established.
- The design issues here largely deal with mechanical, electrical & timing interfaces & the physical transmission medium, which lies below the physical layer.

(2) The Data link layer: - The main task of this layer is to transfer a raw transmission to the network layer.

The Sender break up the input data

into data frames & transmit the frames sequentially. If the service is reliable, the receivers confirms correct receipt of each frame by sending back an acknowledgement frames.

(3) The Network layer :- It controls the operation of the Subnet packets are routed from source to destination. If too many packets are present in the subnet at the same time, they will get in one another's way, forming bottlenecks. The control of such connection congestion belongs to network layer. It is the network layer which has to overcome the problem of heterogeneous network to be intern connected.

(4) The Transport layer :- The basic function of the transport layer is to ensure that the pieces all arrive correctly at the other end.

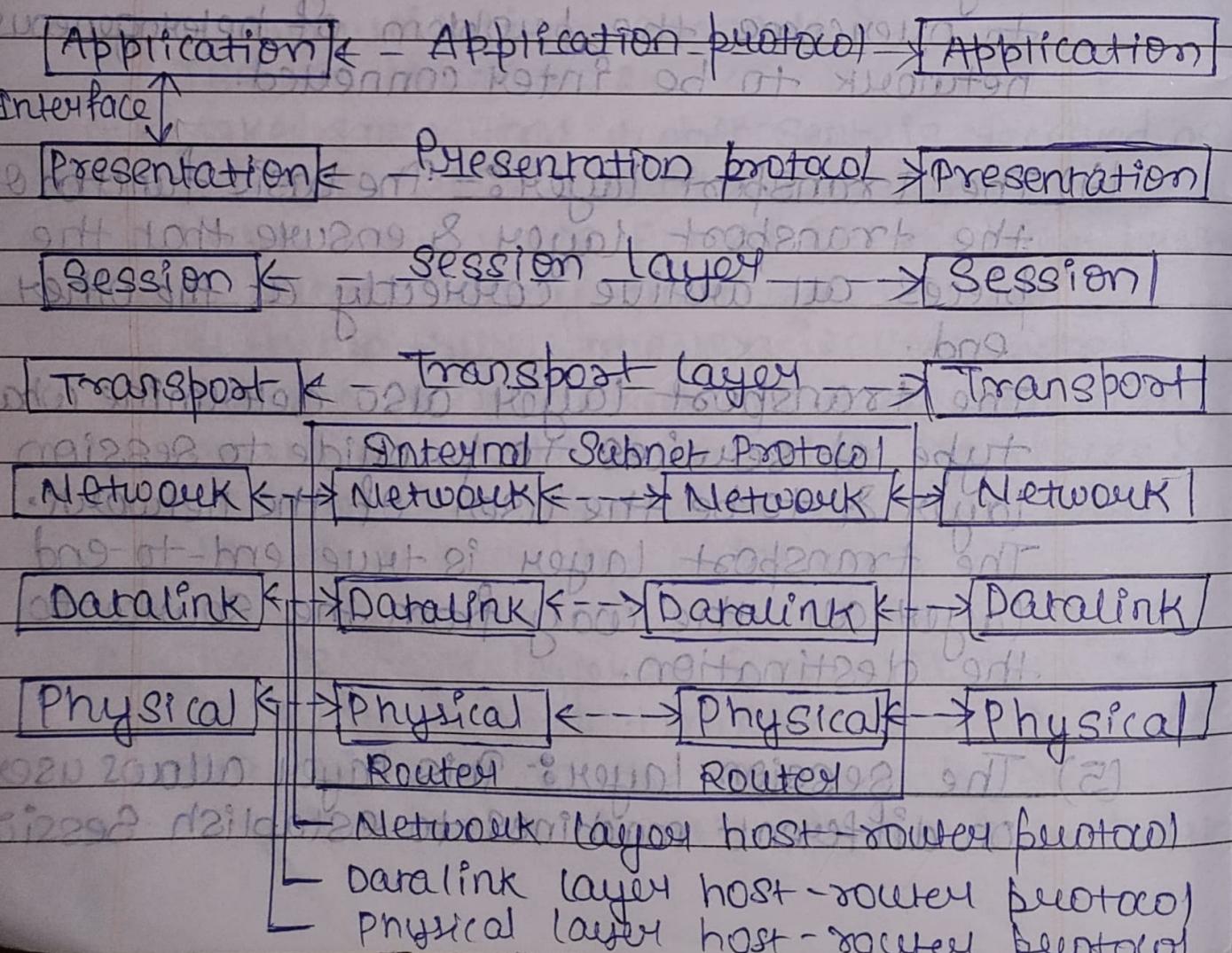
The transport layer also determine what type of services to provide to session layer & to be the user of the network. The transport layer is true end-to-end layer all the way from the source to the destination.

(5) The Session layer :- This layer allows user on different machines to establish Session

between them. Session offers various services, including dialog control, token management & synchronization layer.

(6) The presentation layer- This layer is concerned with syntax, semantics of the information transmitted. The presentation layer communicates & allow higher-level of data structures to define & exchanged.

(7) The application layer- This layer contains a variety of protocols that are commonly needed by users.



Q6 :- Discuss TCP-IP ? [7marks]

Ans: The ARPANET connected hundreds of universities and government installation using leased telephone line, when satellite & radio networks were added to the existing protocols has trouble inter working with them so a new reference architecture was needed.

Thus the ability to connect multiple networks in a seamless way, was one of major design goals from the very beginning. This architecture later becomes known as the TCP/IP Reference model.

It has 4 layers:-

(1) The Internet Layer:- The internet layer is the linchpin that holds the whole architecture together. Its job is to permit hosts to inject packets into any network & have them travel independently to the destination.

The internet layer defines an official packet format & protocol called Internet protocol (IP), where they are supposed to go. TCP/IP maximum internet layer has similar functionality to the OSI network layer.

(2) The Transport Layer:- This layer is designed to allow peer entities on the source & destination hosts to carry on a

conversation. Two end-to-end transport protocols have defined, i.e. Transmission control protocol & user datagram protocol (UDP).

(3) The Application Layer:- This layer contains all the higher level protocols, they includes virtual terminal (TELNET), file transfer (FTP), electronic mail (SMTP).

(4) The Host-to-network layer:- The host has to connect to the network using some protocol so it can send IP packets to it. This protocol is not defined & varies from host to host & network to network.

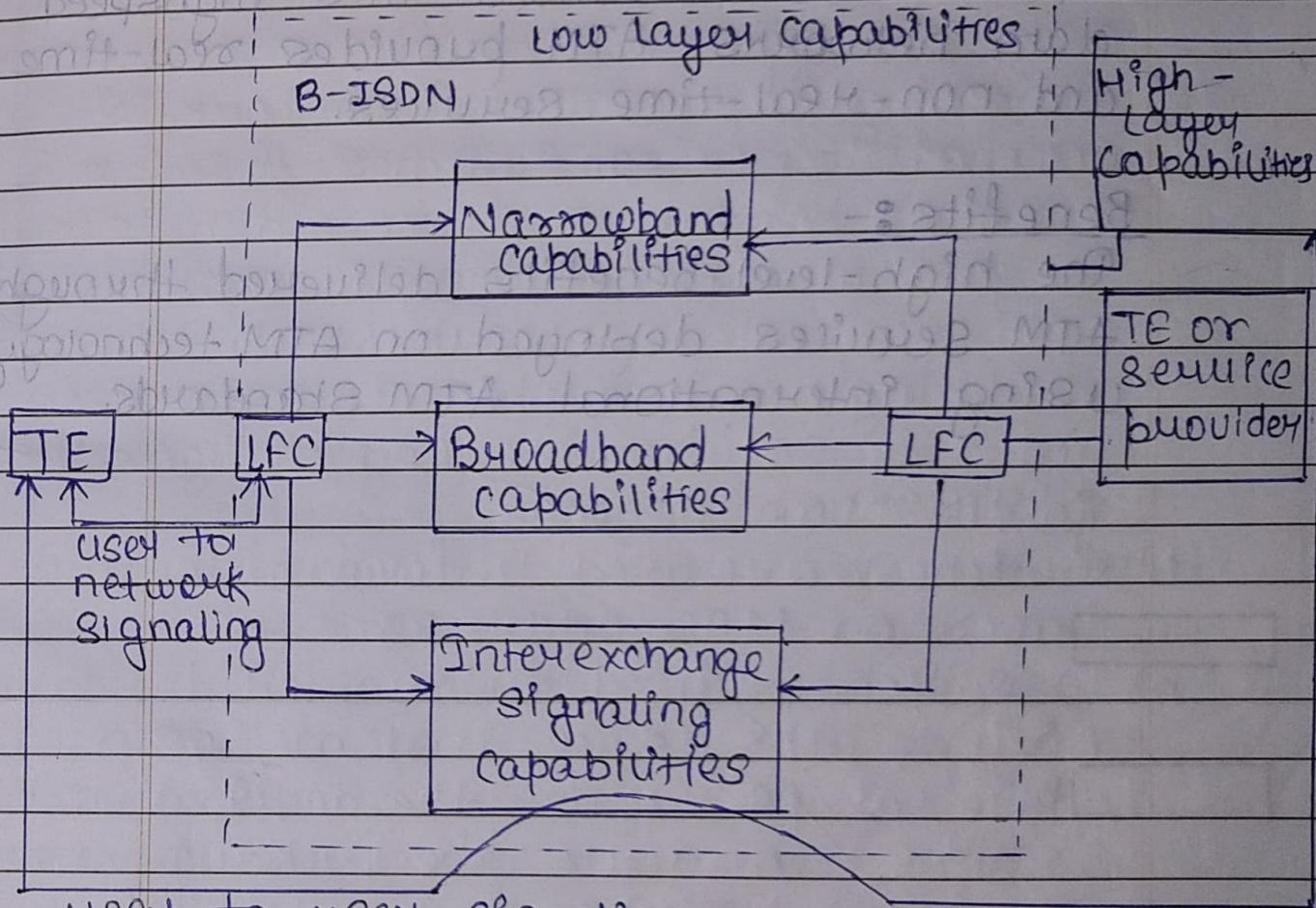
Q7 Discuss Broadband ISDN. {7 marks}

Ans :- Broadband - ISDN is the broadband transmission counterpart of integrated Services Digital Network (ISDN). Broadband ISDN (B-ISDN) encompasses a set of International Telecommunication Union (ITU) standards and services designed to provide an integrated digital network for audio, video and data transmission.

Instead of using the copper media used in ordinary ISDN, broadband ISDN uses fiber-optic and radio-media. B-ISDN is designed to use the cell-switching transport

Mechanisms of Synchronous Optical Network (SONET).

B-ISDN Standards and technologies are an emerging option for high speed networking that promises the capabilities of high-speed digital connectivity for homes and businesses.



User to user signaling
 LFC :- Local function capabilities
 TE :- Terminal Equipment

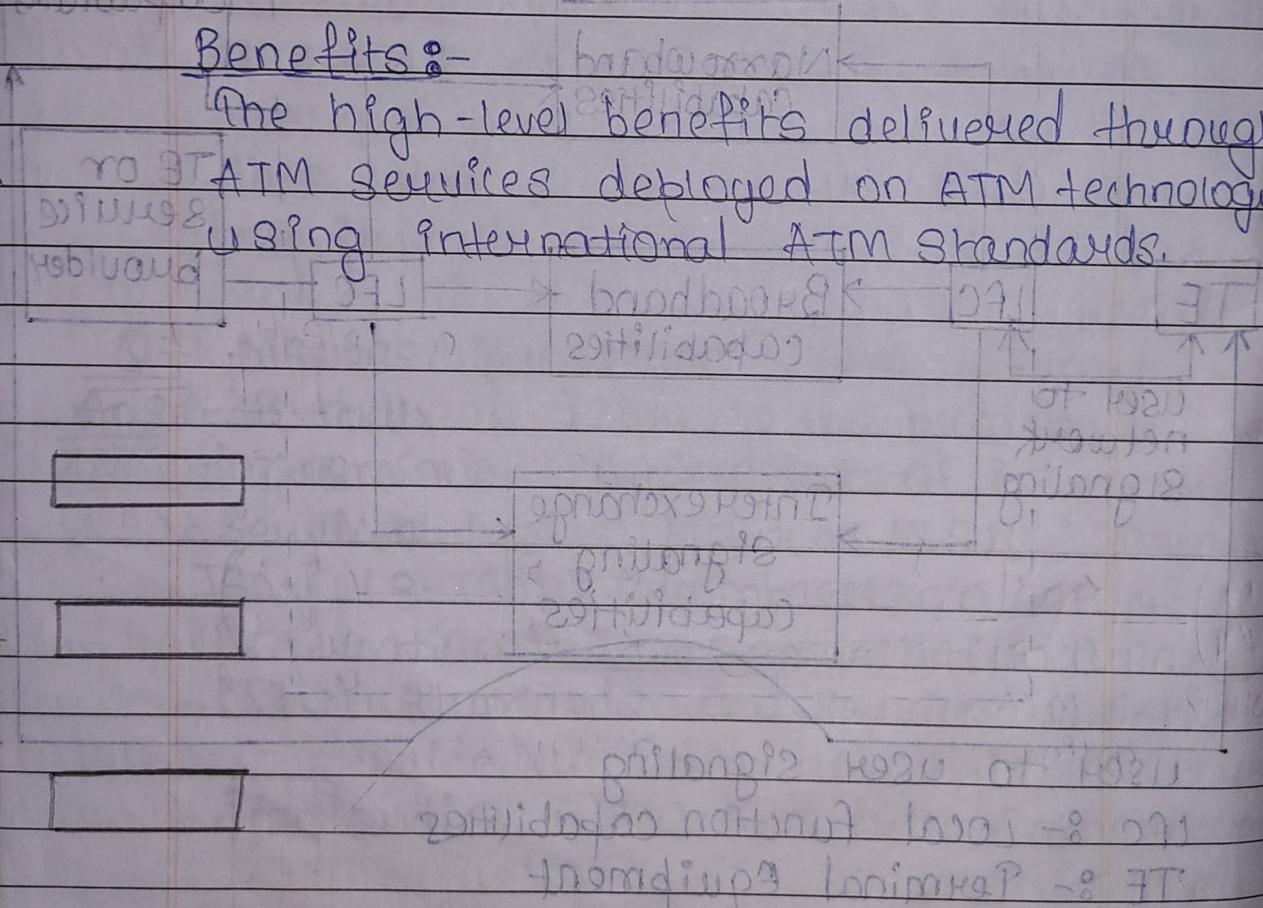
Fig: Functional architecture of B-ISDN.

Q8 :- Explain ATM using suitable diagram.

Ans :- ATM stands for Asynchronous Transfer Mode. It is a switching technique used by telecommunication networks that uses a synchronous time-division multiplexing to encode data into small, fixed-sized cells. ATMs can be used for efficient data transfer over high-speed data networks. ATM provides real-time and non-real-time services.

Benefits :-

The high-level benefits delivered through ATM services deployed on ATM technology using international ATM standards.



for question no 9 :-

Q9 :-

Q10:- Discuss Switching and its types.

Ans:- (1) When a user accesses the internet or another computer network outside their immediate location, messages are sent through the network of transmission media. This technique of transferring the information from one computer network to another network is known as switching.

- (2) Switching in a computer network is achieved by using switches. A switch is a small hardware device which is used to join multiple computers together with one local area network (LAN).
- (3) Switching is transparent to the user and does not require any configuration in the home network.
- (4) Switches are used to forward the packets based on MAC addresses.
- (5) A switch is used to transfer the data only to the device that has been addressed. It verifies the destination address to route the packet appropriately.
- (6) It is operated in full duplex mode.
- (7) Packets collision is minimum as it directly communicates between source and destination.

Network switches operate at layer 2 (Data Link layer) in the OSI model. Switching is

transparent to the user and does not require any configuration in the home network.

	Frame Header	Network Header	Transport header	Data Fcs
Preamble	Destination MAC address	Source MAC address	Ether type	Checksum based on CRC

Types of Switching :-

(1) Store and forward switching :-

It is a technique in which intermediate nodes store the received frame and then check for errors before forwarding the packets to the next node.

- Store and forward technique ensures a high level of security as the destination network will not be affected by the corrupted frames.

Store and forward switches are highly reliable as it does not forward the collided frames.

6	6 - 2	Variable (16-1024)
Preamble	Destination MAC address	Source MAC address

Store and Forward

(Q) Cut-through Switching :-

It is a technique in which the switch forwards the packets after the destination address has been identified without waiting for the entire frame to be received. Once the frame is received, it checks the first six bytes of frame following the preamble, the switch checks the destination in the switching table to determine the outgoing interface port and forwards the frame to the destination. A cut-through switching technique has low wait time as it forwards the packets as soon as it identifies the destination of MAC address.

Preamble	Destination MAC address	Source MAC address	Ethernet type	DATA	FCS
6	6	6	2	219 variable (46-500)	2

Cut-through

b(3) Fragment-free Switching :-

A fragment-free switching is an advanced technique of the cut-through switching. It is a technique that reads at least 64 bytes of a frame before forwarding to the next node to provide the error free transmission.

It combines the speed of the cut

through switching with the error checking functionality. This technique checks the 64 bytes of the ethernet frame where addressing information is available.

6	6	6	2	variable(46-1500)
Preamble	Destination MAC address	Source MAC address	Ether type	DATA FCS

↑
fragment free

Q11:- Discuss encoding and it's types.

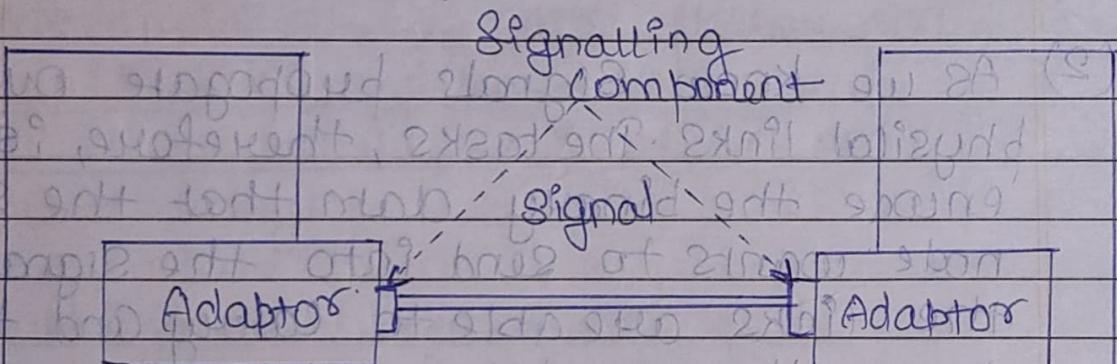
Ans:- (1) The first step in turning nodes and links into usable building blocks is to understand how to connect them in such a way that bits can be transmitted from one node to the other.

(2) As we know Signals propagate over physical links. The task, therefore, is to encode the binary data that the source node wants to send into the signals that these links are able to carry and then to decode the signal back into the corresponding binary data at the receiving node.

(3) We ignore the details of modulation and assume we are working with two discrete signals : high and low. In practice, these signals might correspond to two different

voltages on a copper-based link, two different power level on an optical link, or two different amplitudes on a radio transmission.

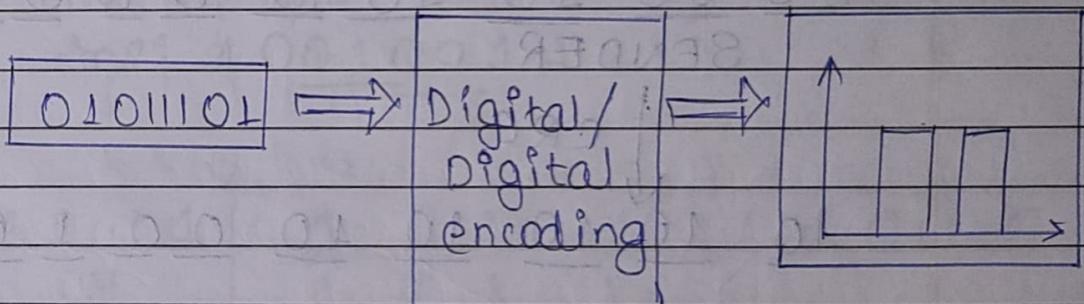
- (4) Most of the functions discussed in this chapter are performed by a network adaptor - a piece of hardware that connects a node to a link.
- (5) The network adaptor contains a signalling components that actually encodes bits into signals at the sending node and decodes signals into bits at the receiving node.
- (6) Thus, as illustrated in figure, signals travel over a link between two signalling components, and bits flow between network adaptors.



Bits

Digital Transmission:-

- Data can be represented either in analog or digital form. The computers used the digital form to store the information. Therefore, the data needs to be converted in digital form so that it can be used by a computer.
- Digital-to-digital encoding is the representation of digital information of digital information by a digital signal. When binary 1s and 0s generated by the computer are translated into a sequence of voltage pulses that can be propagated over a wire, this process is known as digital-to-digital-encoding.



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