Important Instructions to examiners:

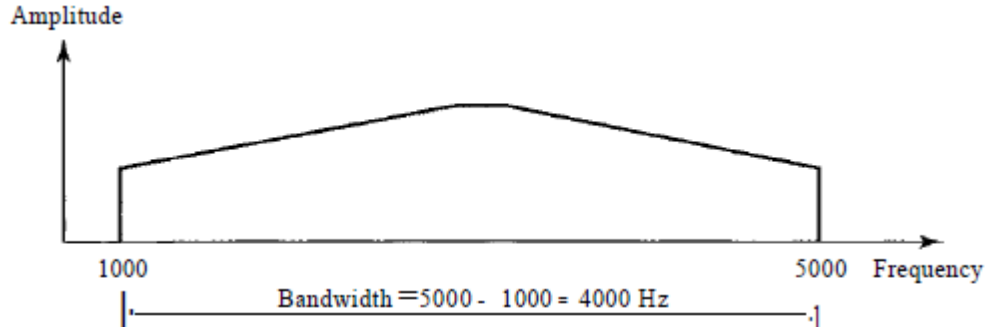
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q.1.

A. Attempt any six of the following:

i. Define the term Bandwidth with an example.
(Definition -1 M, Example 1 M)

Note: figure may also be considered as an example.
Bandwidth: it is a measure of the width of a range of frequencies over which the signal can pass.
OR
The range of frequencies contained in a composite signal is its **bandwidth**.
For example, if a composite signal contains frequencies between 1000Hz and 5000Hz, its bandwidth is 5000 - 1000, or 4000.



ii. List different types of communication.
(Any Two types each 1 mark)
Different types of communication are

1. Parallel and serial communication
2. Asynchronous, synchronous and isochronous communication
3. Simplex, half duplex and full duplex communication

iii. What is error? Enlist different type of errors.
(Definition 1M, types 1M)

Any distortion or noise occurred during the process of transmission or reception can be termed as error.

Types of errors

1. Delay distortion
2. Attenuation
3. Noise

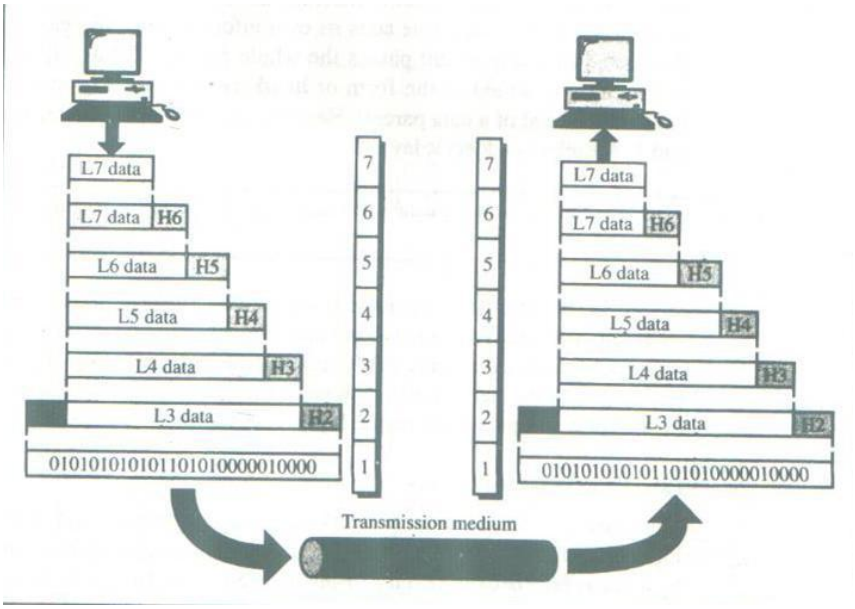
iv. What is Encapsulation?
(Definition – 2M)
Note: Any explanation or diagram may also be considered.

The protocols operating at the various layers work together to supply a unified quality of service. Each protocol layer provides a service to the layers directly above and below it. The process of adding the **headers and trailers** to the data is called as **data encapsulation**.

OR

A packet(header and data) at level 7 is encapsulated in a packet at level 6.The whole packet at level 6 is encapsulated in a packet at level 5, and so on. In other words, the data portion of a packet at level N-1 carries the whole packet (data and header and maybe trailer) from level N. The concept is called **encapsulation.**

OR



v. What are the advantages of DSL?

(Any two – each 1M)

Advantages

i. DSL provides higher-speed access to the Internet.
ii. DSL makes use of existing wire setup for the transmission of data.
iii. It provides higher data rates and a useful facility for a home user.
iv. It has higher download speed than the upstream when compare to ordinary dial up connection.

vi. What is IP address? Why it is required?
(Definition – 1M, Needs (any one) – 1M)

IP address is a logical address, 32 bit address having netid & hostid that uniquely & universally identified over TCP/IP network or local network or to internet. Messages are routed in a TCP/IP network based on destination IP address.

OR

IP Address: IP Address is used in the source & destination address fields of the IP header it is 32 bit long. Each device has a unique IP Address.

Need:

1. In order to communicate with other devices in the network, there needs a global addressing scheme. IP addresses are used for logically addressing the computers.
2. It provides a unique identification of the computer in the network.

vii. List different network connecting devices. (any four)
(Any 4 devices, ½ mark each device)

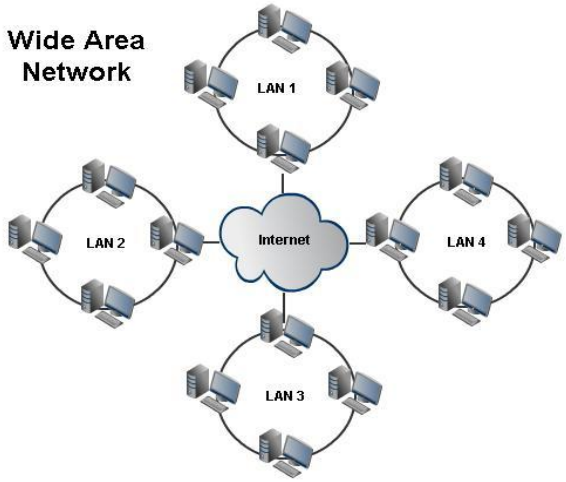
List of Network Control Device

1. Hub
2. Switch
3. Router
4. Bridge
5. Repeater
6. Gateway
7. Modem

viii. Draw & define Wide Area Network.
(Diagram 1M; Definition 1M)
(Note: Any other diagram connecting multiple networks can be considered)

Definition:

WAN is a wide area network which spans across city, state, country or even continent boundaries. A simple example of WAN is internet.

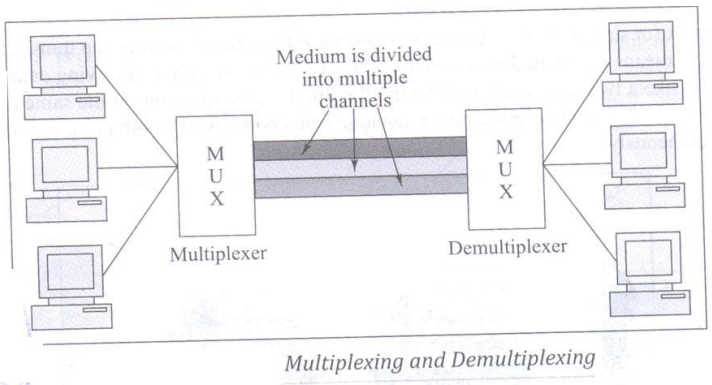


B. Attempt any TWO of the following: (8 M)

i. **What is Multiplexing? Give its types.**

(Explanation 3M, types 1M)

Multiplexing divides the physical line or a medium into logical segments called channels. In multiplexing, different channels carry data simultaneously over the same physical medium. Hardware equipment called multiplexer (or mux in short) combines (or multiplexes) the inputs from different sources, and loads them on different channels of a medium. The combined data traverses over the medium simultaneously. At the destination, a demultiplexer (also called demux) separates (or demultiplexes) the signals meant for different destinations. The demultiplexer sends these separated signals appropriately to the different destinations. This is depicted in fig. This is cheaper than having three separate lines.



Multiplexing and Demultiplexing

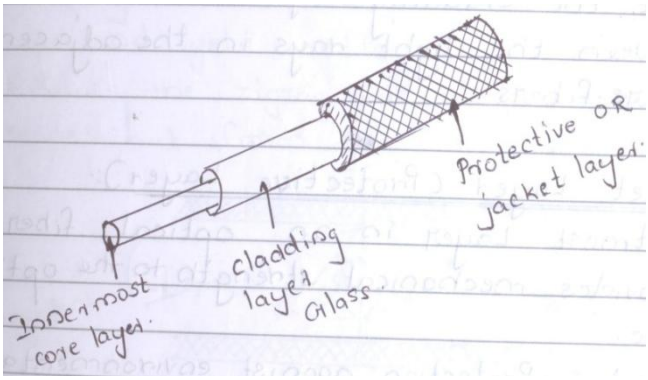
Thus, the mux is responsible for both multiplexing and demultiplexing.

Types of Multiplexing

There are basically two ways in which multiplexing and demultiplexing can be achieved. They are **Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM).**

ii. Explain the construction of Optical Fiber with neat diagram.
(Explain 2M; diagram 2M)

An optical fiber is like a wire but it is very thin as compared to wire and it is made of glass. An optical fiber cable consists of a group of optical fibers packed together.
Structure of Optical Fiber:



The optical fiber consists of three parts.

1. **Glass core**: - The innermost layer in an optical fiber cable is the glass core. The light rays pass through this innermost glass core.

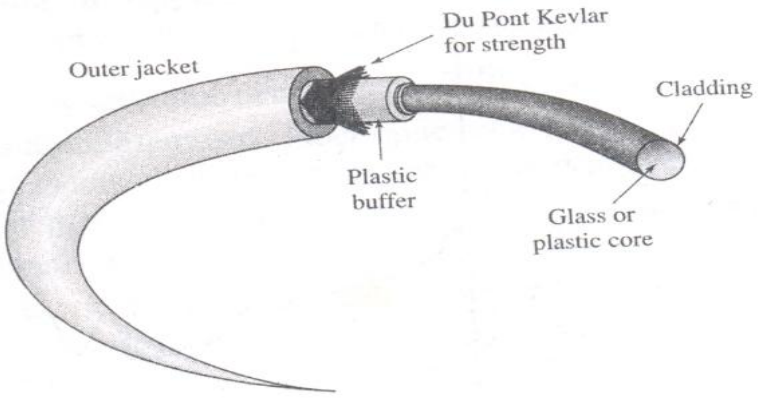
2. **Cladding layer**: - The innermost glass layer is covered by the cladding layer. This layer is also made up of glass. But the refractive index of this layer is less than that of core layer.
The cladding layer performs the following functions:
1.It provides strength to the optical fiber cable.
2.The cladding layer acts like a mirror. It will reflect the light rays and will not allow them to escape outside the fiber.
3.When many optical fibers are packed in one cable the cladding layer avoids the interference between the light rays in the adjacent fibers.

3. Jacket layer or Protective layer :-

i. Outmost layer in an optical fiber.
ii. Provides mechanical strength to the optical cable.
iii. Provides protection against environmental factors

OR

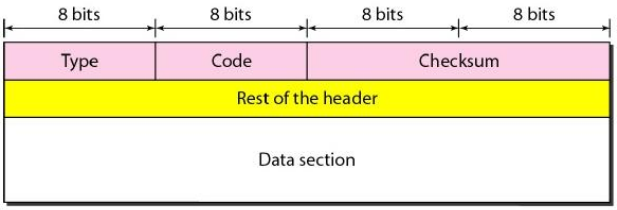
A highly refined quartz tube that is filled with combination of gases (silica tetra chloride germanium tetra chloride etc) is selected to start the process. This tube about 4 ft long 1 inch diameter is placed in a lathe and these gases are injected into the hollow tube. The tube is rotated over a flame and subjected to temp of about 1600° F. The burning of the gases produces a deposit on the inside of the tube. The quartz tube is said to have undergone modified chemical vapor deposition MCVD. This performed quartz is then heated to about 2100°F melting and collapsing the tube to about 13 mm. This preformed quartz is now ready to be placed in vertical drawing tower where it is further heated to 2200°F and drawn downward by means of a computer controlled melting and drawing process which produces fine, high quality fiber thread having 125 micrometer diameter and about 6.25 km in length. The optically pure center called core is surrounded by leas optically pure quartz called cladding.



iii. Write a note on ICMP.

(4M for explanation: If diagram drawn, marks may be awarded)

1. One of the main responsibilities of ICMP is to report errors. Five types of errors are handled: destination unreachable, packet too big, time exceeded parameter problems, and redirection.
2. The checksum for ICMP is calculated by using both the header and the data fields of the ICMP message.
3. Packet InterNet Groper (ping) is an application program that uses the services of ICMP to test the reachability of a host.
4. ICMP messages are divided into two broad categories: error reporting messages and query messages
5. The error reporting messages report problems that router or a host may encounter when it processes an IP packet.
6. The query messages, which occur in pairs, help a host or a network manager get specific information from a router or another host.
7. Host can discover and learn about routers on their network.
8. The message format of ICMP is as given below.

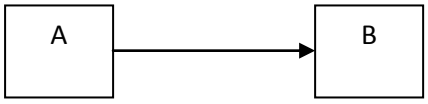


Q.2. Attempt any FOUR of the following: (16M)

a) Explain Simplex, half duplex, Full duplex communication with examples. (Explanation 2M; examples 2M|)

Simplex:

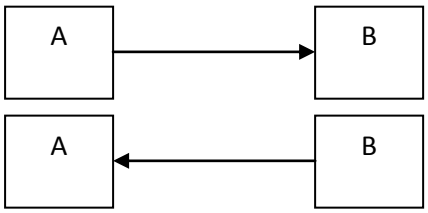
In these systems, the information is communicated only in one direction, called as simplex system eg. TV broadcasting or radio.



Half duplex:

In these systems, the information is communicated only by one party in one direction, & another party can not transmit until current sender releases transmission link called as simplex system eg. Walky-Talky,FAX

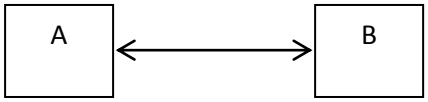
Transmission one at a time but both way



Full duplex:

In these systems, both parties involved in communication can send and receive data simultaneously eg. Mobile communication, telephone, Computer Communication

Transmission both way



b) State the meaning of following:

i. Amplitude
ii. Frequency
iii. Bit Rate
iv. Baud Rate

(Each definition 1M)

i. **Amplitude**: The amplitude of a signal is the absolute value of its highest intensity, proportional to the energy it carries. It is the maximum voltage a signal attains. For electric signals, peak amplitude is normally measured in *volts.*

ii. **Frequency***:* Frequency is the rate of change with respect to time.
OR
Frequency is also defined as the number of cycles per second, which is the inverse of Period.

iii. Bit rate:
Bit rate is the number of bits transmitted during one second in the data communication system and it is expressed in bits per second.

iv. Baud rate:

It is the rate of change of a signal on the transmission medium after the encoding and modulation in a data communication system.

OR

Baud Rate is the number of Signal Units / Sec

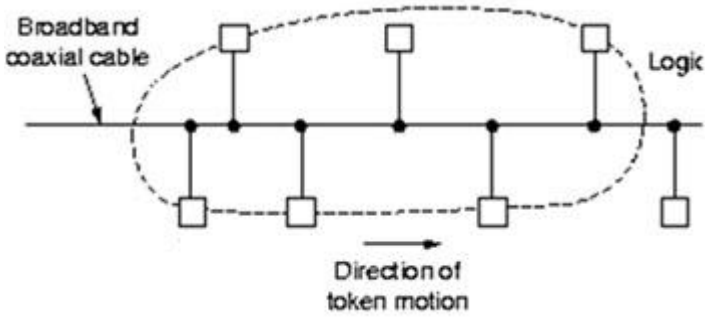
c) Explain the following IEEE standards:

i. 802.4

ii. 802.5

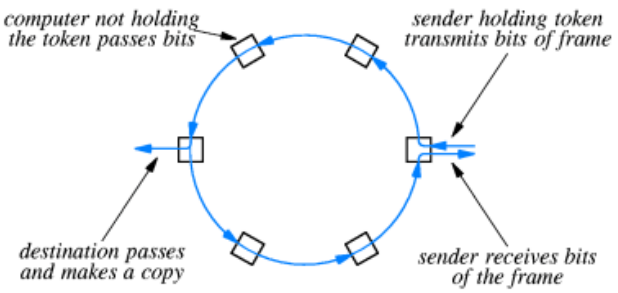
(each explanation 1M, each diagram 1M)

i. **The IEEE 802.4** standard covers Token Bus. Token Bus is nothing but an implementation of Token Ring protocol, over a virtual ring over a coaxial cable. The principle of the network is quite simple. A token keeps getting circulated over the network. Only the host that processes the token has a right to transmit. Of course, if a host possessing the token does not have anything to transmit, it simply forwards the token, i.e. the right to transmit, to the next host. For this to be possible, each host needs to know the address of its immediate neighbors. Protocols are designed to handle this, a new addition of hosts, as well as disconnections. All of this comes under IEEE 802.4 standard.



ii. IEEE 802.5

The **IEEE 802.5** standard is nothing but the Token Ring mechanism. The Token Ring standard is based on the idea of a circulating token. A host that processes the token can transmit, others cannot. This avoids contentions and collisions in the network. A host that does not possess the token must wait even if it has data to be sent out. A host that gets the token either can send a frame and forward the token to the next host. If it has nothing to send, it simply forwards the token to the next host.



d) What are the standards? Name any four standard organizations.

(Definition -2 M, List (Any 4) – 2M)

Standards are rules and guidelines provided to manufacturers, vendors, government agencies, and other service providers to ensure the standard kind of interconnectivity in communications.

Standard Organizations:

a. International Organization for Standardization (ISO).
b. International Telecommunication Union-Telecommunication Standards Sector (ITU-T).
c. American National Standards Institute (ANSI).
d. Institute of Electrical and Electronics Engineers (IEEE).
e. Electronic Industries Association (EIA).

e) Explain Gigabit Ethernet in detail.

(Explanation 4M)

Gigabit Ethernet access methods include half-duplex mode using traditional *CSMA/*CD (not common) and full-duplex mode (most popular method). The common Gigabit Ethernet implementations are 1000Base-SX (two optical fibers and a short-wave laser source), 1000Base-LX (two optical fibers and a long-wave laser source), and 1000Base-T (four twisted pairs). The latest Ethernet standard is Ten-Gigabit Ethernet that operates at 10 Gbps. The three common implementations are lOGBase-S, 10GBase-L, and 10GBase-E. These implementations use fiber-optic cables in full-duplex mode.

The goals of the Gigabit Ethernet design can be summarized as follows:

- Upgrade the data rate to 1 Gbps.
- Make it compatible with Standard or Fast Ethernet.
- Use the same 48-bit address.
- Use the same frame format.
- Keep the same minimum and maximum frame lengths.
- To support auto-negotiation as defined in Fast Ethernet.

f) Explain Distributed Queue Dual Bus (DQDB)

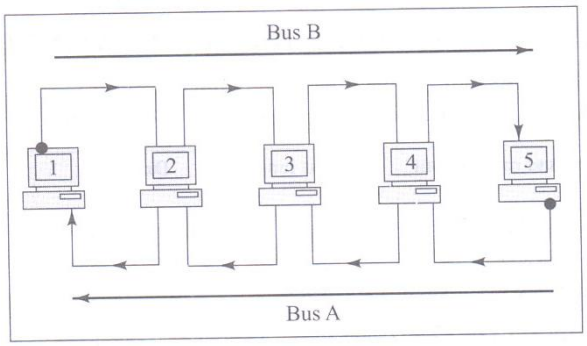
(Explanation 3M, Diagram 1M)

Basics of DQDB

The Distributed Queue Dual Bus (DQDB) protocol is a dual bus configuration. This means that each host in the network connects to two backbone network lines. The hosts get an access to the transmission medium with an approach that is different from LANs.

In case of DQDB , a mechanism called distributed queue is used and hence the name Distributed queue Dual Bus (DQDB).

Figure shows sample DQDB architecture with two unidirectional buses, called bus A and B. In the fig. five hosts numbered 1 to 5 connect to these buses. Each bus connects to the hosts on their and input and output ports.



DQDB architecture

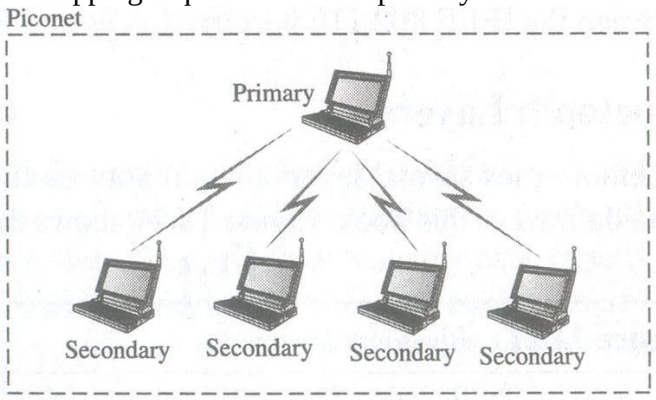
Distributed Queue Dual Bus (DQDB) is an example of MAN. IT uses the mechanism of a dual queue. There are two buses connecting all the computers on a DQDB network. Each bus allows traffic in a single direction only. To transmit data, the sending host must select one of the two buses. A host reserves the slot before transmitting its data. At any point of time, every host knows how many reservations are pending to be served.

Q.3. Attempt any FOUR of the following: (16 M)

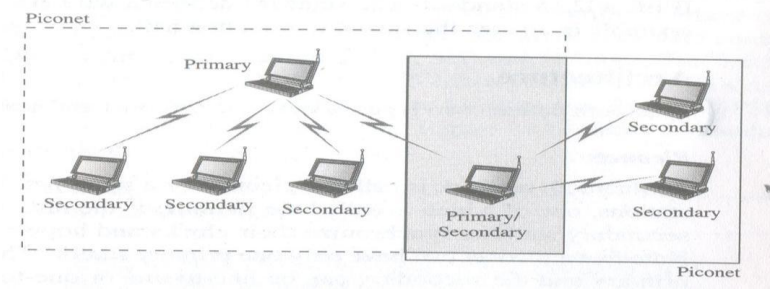
a) Explain the architecture of Bluetooth.

(Piconet -2M, Scatternet- 2M with diagrams)

Bluetooth Defines two types of networks: piconet and scatternet. **Piconets** A Bluetooth network is called a piconet, or a small net. A piconet can have up to eight stations, one of which is called the primary; the rest are called secondaries. All the secondary stations synchronize their clocks and hopping sequence with the primary.



Scatternet Piconets can be combined to form what is called a scatternet. A secondary station in one piconet can be the primary in another piconet. This station can receive messages from the primary in the piconet (as a secondary) and, acting as a primary, deliver them to secondaries in the second piconet. A station can be member of two piconets. **Bluetooth Layers** Bluetooth uses several layers that do not exactly match those of the internet model we have defined in this fig.



b) Describe the leased line connection. Give its needs.
(Leased line explanation -2 M, Any 2 needs- 1M each)

Many medium and large organizations generally need a high bandwidth for connecting to the Internet, because the number of users is very high.

Suppose 100 users in an office need Internet access at the same time. In such situations, the simplest option of obtaining 100 dial-up accounts from an ISP is not very attractive. This is because; having 100 ISP accounts is not good enough. To connect these 100 users to the ISP, the organization would also need 100 telephone lines! Clearly, this is not acceptable for reasons of cost and maintenance. Also, the moment a new user is added, a new Internet connection and telephone line would be required for the user.

Telephone companies and ISPs have come up with the option of offering more bandwidth from their premises, and then let the organization divide it internally the way it wants. For this, an ISP provides an option of leasing lines to these kinds of organizations. In simple terms, a leased line can be thought of as a very thick pipe connecting the office of an organization with the internet via the ISP. A medium-to-big organization obtains a digital line from an ISP for a fixed charge per month, regardless of its actual use. That is organization may or may not use the complete bandwidth of the leased line, but it would still pay a fixed charge. In return, the organization gets larger bandwidth from the ISP, shared by multiple users mostly through a LAN.

Need of leased line (Any TWO points)

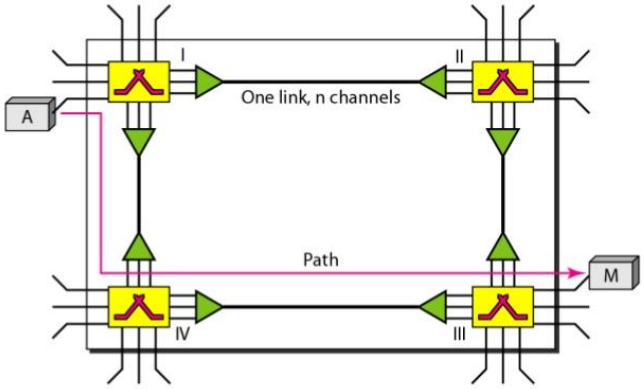
1. To provide high speed/ band width dedicated internet line.
2. It provides bandwidth on demand for a specified duration of time.
3. More nodes can be added to the network without much modification.

c) Draw the neat diagram of circuit switching. Explain in brief.
(Diagram -1M, Explanation -3M)

A circuit switched network consists of a set of switches connected by physical links. A connection between two stations is a dedicated path made of one or more links. However, each connection uses only one dedicated channel on each link. Each link is normally divided into n channels by using FDM or TDM

A circuit-switched network is made of a set of switches connected by physical links, in which each link is divided into n channels.

- Circuit switching takes place at the physical layer.
- Before starting communication. This station must take a reservation for the resources to be used during the communication. These resources, such as channels (bandwidth in FDM and time slots in TDM), switch buffers, switch processing time, and switch input/output ports, must remain dedicated during the entire duration of data transfer until the teardown phase.
- Data transferred between the two stations are not packetized (physical layer transfer of the signal). The data are a continuous flow sent by the source station and received by the destination station, although there may be periods of silence.
- There is no addressing involved during data transfer. The switches route the data based on their occupied band (FDM) or time slot (TDM). Of course, there is end-to-end addressing used during the setup phase, as we will see shortly.



d) What is DNS server? Describe the concept of DNS.
(Definition-1M, concept -2M, diagram -1M)

A domain name server is simply a computer that contains the database and the software of mapping between domain names and IP addresses.

Every domain has a domain name server. It handles request coming to computers owned by it and also maintains the various domain entries.

The DNS is completely distributed throughout the world on millions of computers.

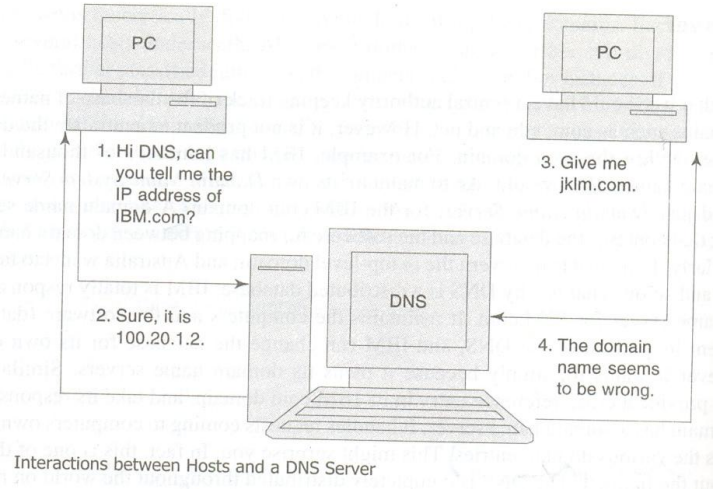
The DNS works very similar to a telephone directory inquiry service.

Basically, DNS server does two things tirelessly:

- Accept request from programs for converting domain names into IP addresses.
- Accept request from other DNS servers to convert domain names into IP addresses

When such request comes in, a DNS server has the following options:

- It can supply the IP address because it already knows the IP address for the domain.
- It can contact another DSN server and try to locate the IP address for the name requested. It may have to do this more than once. Every DNS server has an entry called alternate DNS server, which is the DNS server it should get in touch with for unresolved domains. The DNS hierarchy specifies how the chains between the various DNS servers should be established for this purpose. That discussion is beyond the scope of the current text.
- It can simple say, “I do not know the IP addresses for the domains name you have requested, but here is the IP addresses for a name server that knows more than I do”. In other word, it suggests the name of another DNS server.
- It can return an error message because the requested domain name is invalid or does not exist.



Interactions between Hosts and a DNS Server

e) What is topology? List various topologies.
(Definition: 2 M; Topology List 2M)

The topology of a network is the geometric representation of the relationship of all the links and linking devices (usually called nodes) to one another.

List:

Mesh topology
Bus topology
Star Topology
Ring topology

f) Explain brief history and growth of Internet.
(History -2M, Growth-2M, diagram –optional, if drawn marks may be given)

A network is a group of connected communication devices such as computers and printers. An internet (note the lowercase letter i) is two or more networks that can communicate with each other. The most notable internet is called the Internet (uppercase letter I). A collaboration of more than hundreds of thousands of interconnected networks.

In mid-1960s, mainframe computers in research organizations were stand alone devices. Computers from different manufactures were unable to communicate with one another. The Advanced Research Project Agency (ARPA) in the department of defense (DoD) was interested in finding a way to connect computers so that the researchers they funded could share their findings, thereby reducing costs and eliminating duplication of effort.

In 1967, at an Association for computing Machinery (ACM) meeting, ARPA presented its ideas do ARPANET, a small network of connected computers. The idea was that each host computer (not necessarily from the same manufacture) would be attached to a specialized computer, called an interface message processor (IMP). The IMPs, in turn, would be connected to one another. Each IMP had to be able to communicate with other IMPs as well as with its own attached host.

By 1969, ARPANET was reality. Four nodes, at the University of California at Los Angeles (UCLA), the University of California at Santa Barbara (UCSB, Stanford Research Institute (SRI), and the University of Utah, were connected via the IMPs to form a network. Software called the network control protocol (NCP) provided communication between the hosts.

In 1972, Vint Cerf and BobKahn, both of whom were part of the core ARPANET group, collaborated on what they called the internetting project. Cerf and Kahn's landmark 1973 paper outlined the protocols to achieve end-to-end delivery of packets. This paper on

Transmission Control Protocol (TCP) included concepts such as encapsulation, the datagram, and the functions of a gateway.

Shortly thereafter, authorities made a decision to split TCP into two protocols: Transmission Control Protocol (TCP) and Internetworking Protocol (IP). IP would handle datagram routing while TCP would be responsible for higher-level functions such as segmentation, reassembly, and error detection. The internetworking protocol became known as TCP/IP.

Today most end users who want internet connection use the services of Internet service Providers (ISPs). There are international service providers, national service provides, regional service providers, and local service providers. The internet today is run by private companies, not the government. Shows a conceptual (not geographic) view of the internet.

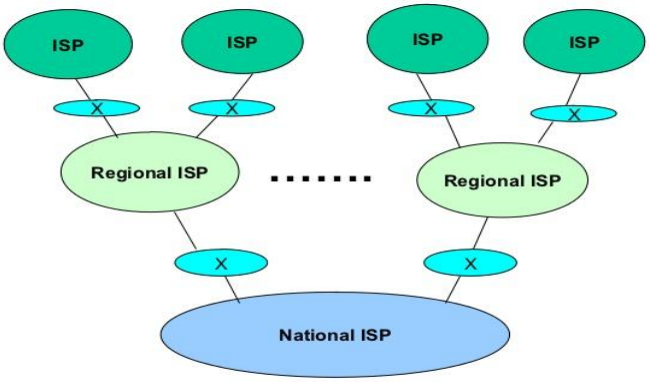


Fig 1.Structure of a national ISP

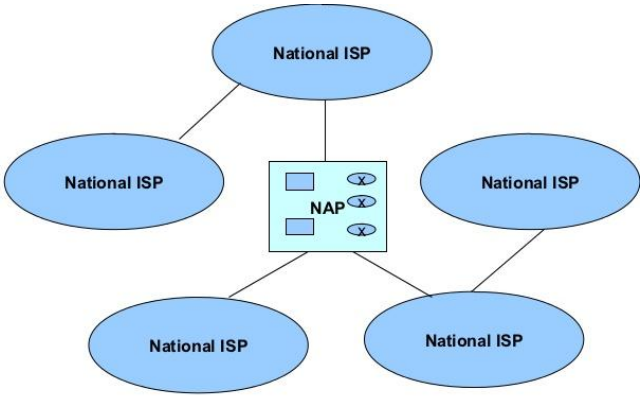


Fig.2.Interconnection of national ISPs

Q.4. Attempt any FOUR of the following: (16M)

a) Draw OSI Reference Model. Describe working of any two layers.
(Diagram of reference model- 2M, Each layer working- 1M)

- OSI model (open system interconnection) model was developed by ISO (international standard organization)
- **Function of OSI model:**
  i. It provides way to understand how internetwork operates.
  ii. It gives guideline for creating network standard.
- OSI model has 7 layers as shown in the figure.

Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data link Layer
Physical Layer

OSI model has following 7 layers as Physical layer, data link layer, Network layer, Transport layer, session layer, presentation layer, application layer.

1. **Physical layer:** It co-ordinates the functions required to transmit bit stream over physical medium. It deals with mechanical and electrical specifications of interface and transmission medium. For transmission it defines procedures and functions that devices and transmission medium has to perform

- Physical characteristics of interfaces and media.
- Representation of bits: Data rate(transmission rate).
- Synchronization of bits.
- Line configuration: Point to point or multipoint configuration should be used.

2. **Data link layer:** It is responsible for transmitting group of bits between the adjacent nodes. The group of bits is called as frame. The network layer passes a data unit to the data link layer. Header and trailer is added to the data unit by data link layer. This data unit is passed to the physical layer. Data link layer is responsible for moving frames from one node to the next.
   Functions of data link layer are:
   1) Framing
   2) Physical addressing
   3) Flow control
   4) Error control
   5) Media access control
   6) Node to node delivery

3. **Network layer: It is responsible for routing the packets within the subnet i.e. from source** to destination. It is responsible for source e to destination delivery of individual packets across multiple networks. It ensures that packet is delivered from point of origin to destination.
   Functions of network layer:
   1) Logical addressing

2) Routing.
3) Congestion control
4) Accounting and billing
5) Address transformation
6) Source host to destination host error free delivery of packet.

4. **Transport layer:** Responsibility of process to process delivery of message Ensure that whole message arrives in order.
   Functions of Transport layer:
   1) Service point addressing
   2) Segmentation and reassembly
   3) Connection control
   4) Flow control: Flow control is performed end to end 5) Error control

5. **Session layer:** Establishes, maintains, and synchronizes the interaction among communication systems It is responsible for dialog control and synchronization.
   Functions of Session layer:
   1) Dialog control
   2) Synchronization, session and sub session
   3) Session closure

6. **Presentation layer:** It is concerned with syntax, semantics of information exchanged between the two systems.
   Functions of Presentation layer:

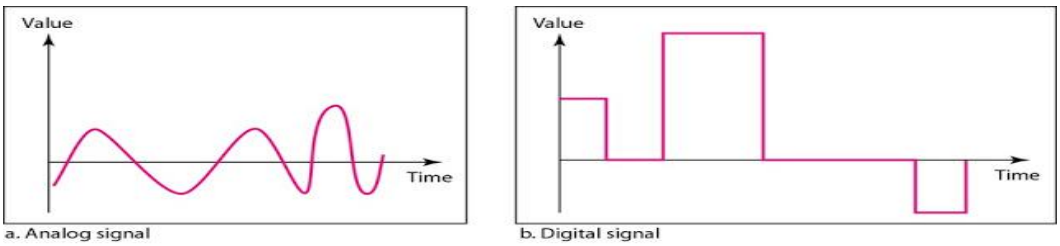
- Translation: presentation layer is responsible for converting various formats into required format of the recipient
- Encryption: Data encryption and decryption is done by presentation layer for security.
- Compression and Decompression: data to be transform compressed while sending and decompress while receiving for reducing time of transmission.

7. **Application layer:** It enables user to access the network. It provides user interfaces and support for services like email, remote file access.
   Functions of Application layer:

- Network virtual terminal
- file transfer access and management
- mail services and directory services

b) Compare Analog Signal and Digital Signal.(any 4 points)

Sr. NO.	Parameter	Analog Signals	Digital Signals
1	Number of value	Infinite	Finite(2,8,16 etc)
2	Nature	Continuous	Discrete
3	Source	Signal generators, transducers etc.	Computers, A to D converters
4	Examples	Sine wave, triangular wave	Binary signal



a. Analog signal b. Digital signal

c) What is LAN? Explain its advantages. (Definition 2M; Advantages 2M)

Definition: A local area network (LAN) is generally a privately owned within a single office, building or campus, covering a distance of few kilometers.

Advantages:

1. LAN is to share resources such as disk, printers, programs and data.
2. It also enables the exchange of information

d) Explain the FDDI system. (Explanation-4M)

The Fiber Distributed Data Interface (FDDI) network architecture is a LAN protocol standardized by ANSI and other organizations. It supports data transmission rates of up to 100 Mbps, and is an alternative to Ethernet and Ring architectures. Originally, FDDI was developed using optical fiber as the transmission medium because only optical fibre could support data rates of 100 Mbps. FDDI uses glass fibers for data transmission. And therefore, encodes data bits in the form of pulses of light.

The main properties of FDDI can be summarized as follows.

Token passing for Media Access Control- Like the Token Ring Protocol, FDDI also uses the concept of a token frame to regulate medium access. The same principles of token frame apply here. FDDI is also a ring-like structure where the network medium starts from a computer, passes through all the hosts in the network, and ends back at the original host.

Self mechanism- the hardware in FDDI provides mechanism for detecting and correcting problems on its own.

e) Explain persistent TCP connection. Give its importance.
(Persistent TCP connection -2M, Importance -2M

In persistent connections , the server serves the request, and does not terminate the connection. Instead, it keeps it open. Thus, the client can reuse the same connection for all forthcoming requests.

Persistent connections can be of two types. In persistent connections without pipelining, the client sends the next request within the same TCP connection to the server only after receiving a response to its previous request. In persistent connections with pipelining, the client can send multiple requests to the server within the same TCP connection without waiting for any responses from the server. Thus, multiple requests are possible in this case.

Importance

Persistent connections are expected to improve the throughput in case of web pages that contain many non-textual data such as images, audio and video because a single TCP connection can suffice all portions of the web page.

f) Describe the characteristics of data communication system.
(Each characteristic with explanation -1M)

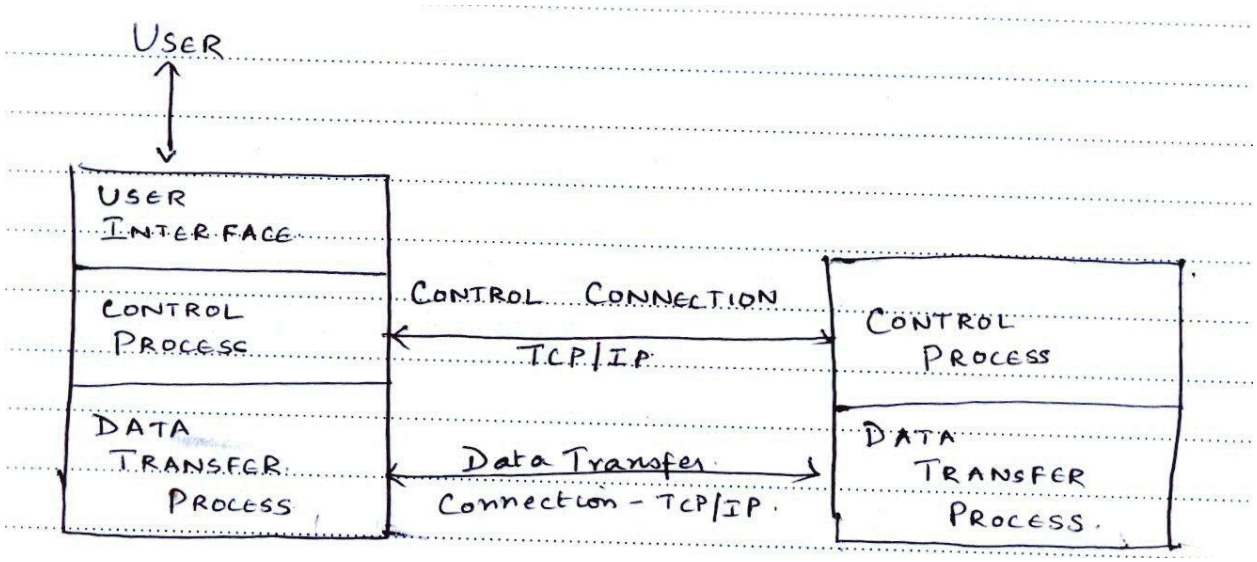
The effectiveness of any data communications system depends upon the following four fundamental characteristics:

1. **Delivery**: The data should be delivered to the correct destination and correct user.
2. **Accuracy**: The communication system should deliver the data accurately, without introducing any errors. The data may get corrupted during transmission affecting the accuracy of the delivered data.
3. **Timeliness**: Audio and Video data has to be delivered in a timely manner without any delay; such a data delivery is called real time transmission of data.
4. **Jitter**: It is the variation in the packet arrival time. Uneven Jitter may affect the timeliness of data being transmitted.

Q.5. Attempt any FOUR of the following: (16 M)

a) Describe FTP & TFTP (2M each)

FTP is a high level application layer protocol that is aimed at providing a very simple interface for any user of the internet to transfer files.



FTP presents the user with a prompt and allows entering of various commands for accessing and downloading files that physically exists on a remote compute. The user identifies a remote computer and instructs FTP to establish a connection with it. FTP contacts the remote computer using the TCP/IP software.

Once the connection is established, the user can choose to download a file from the remote computer or the user can send the file from the user end to be stored on remote computer.

FTP uses two connections between a client and server.

1. Data transfer
2. Control information – for commands and responses

This makes FTP more efficient

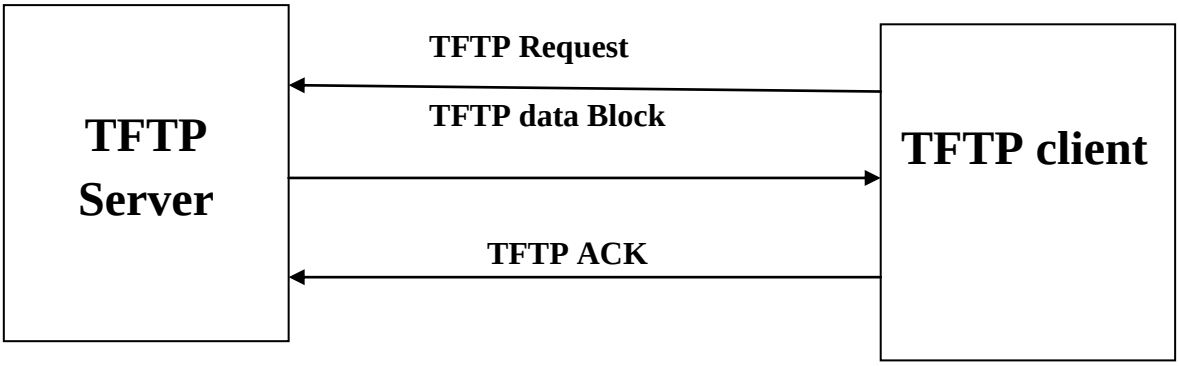
The client has three components

i. User interface

ii. Client control process

iii. Client data transfer process

TFTP:-TFTP is used for file transfer similar to FTP but it uses UDP for data transfer .This protocol is purely designed for data transfer i.e. it does not permits changing or accessing directory of remote computer .TFTP is used in situations where simply file transfer is require likewise diskless station .TFTP requires TFTP client software for downloading file from server . This software will download file from server .TFTP doses not provides facility of authentication .Sender sends data in size of 512 byte & receiver needs to authenticate each block until sender will not send next block



b) Describe the following:

i. Routers

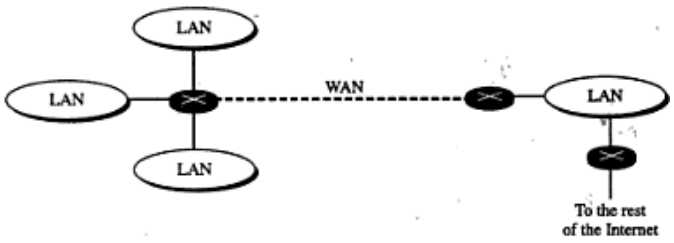
ii. Gateways

(2M each)

i. Router:

Router is layer three device that routes packets based on their logical address (host to host address) Router normally connects LAN and WANS in the internet using route information stored in routing table

Routing table of router is tabular database which stores information about destination and path (next Hop address through with to reach) information routing table is updated dynamically depending on changes in network

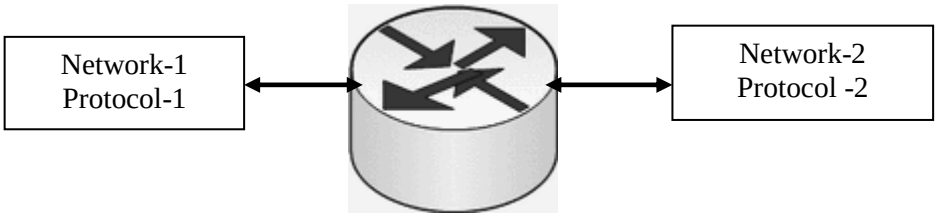


ii. **Gateway**

Gateway is device which operates on all layers of OSI model & TCP/IP

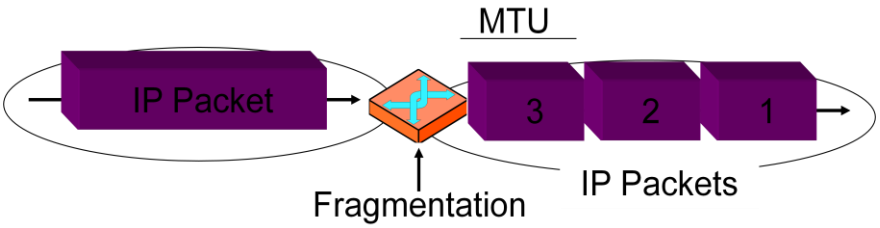
Gateway is protocol converter. Gateway enables communication between different network architecture and environments. Gateway connects two systems that do not use the same protocol, data format, language and architecture.

Convert commonly used protocols (e.g. TCP/IP) to a specialized protocol (for example, an SNA: System Network Architecture). Convert message formats from one format to another. Translate different addressing schemes



c) Explain Data Fragmentation and Reassembly in detail.
(2marks fragmentation ,2 marks reassembly)

For transferring data over network each transfer protocol applies upper limit to size of data in PDU (packet) .If size of datagram is larger than MTU then it is divided into small units of size supported called fragment & this activity of dividing datagram into small unit is called as fragmentation



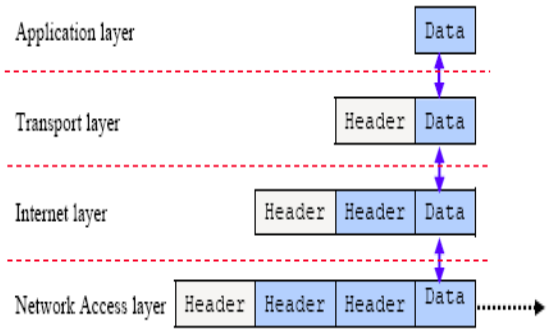


Fig process of fragmentation

Reassembly:- When a datagram is fragmented, either by the originating device or by one or more routers transmitting the datagram, it becomes multiple fragment datagrams. The destination of the overall message must collect these fragments and then *reassemble* them into the original message. Reassembly is accomplished by using the special information in the fields we saw in the preceding topic to help us "put the jigsaw puzzle back together again".

d) State the advantages and disadvantages of Star topology.
(1 mark per advantage & disadvantage, 2 advantage & 2 disadvantages)

Advantages:
1. Highly reliable
2. Adding new node is very easy
3. Failure of any node does not affect the network
4. Troubleshooting is very easy

Disadvantages:
1. cost is very high
2. central hub/switch fails entire network collapse

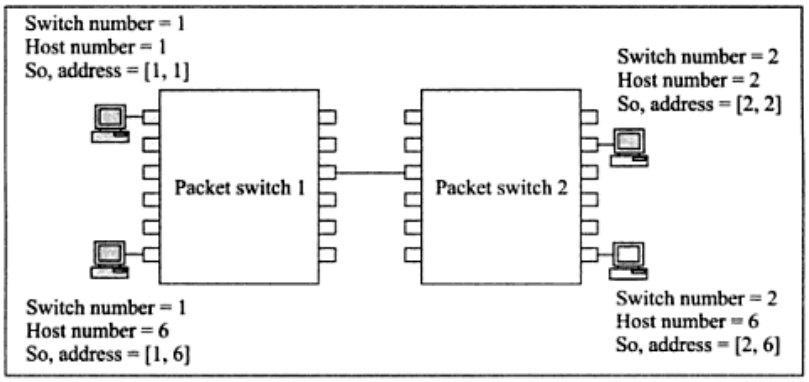
3. Speed of network completely dependent on capacity of networking device i.e. it may become bottle neck
4. Maximum no. of nodes depends completely on capacity of networking device

e) What is WAN addressing? Explain.
(2 marks WAN addressing with diagram, 2 marks explanation)

WAN Addressing: -WAN addressing is hierarchical addressing system .The address of a host on WAN is composed of two parts as follow
1. Switch no:-It identifies switch to which host is connected
2. Host no.:- It identifies Host which is attached to that switch
Overall address is made up of combination of switch no. & host no. as shown in following fig

switch no	.	Host no

Fig:-WAN Addressing scheme



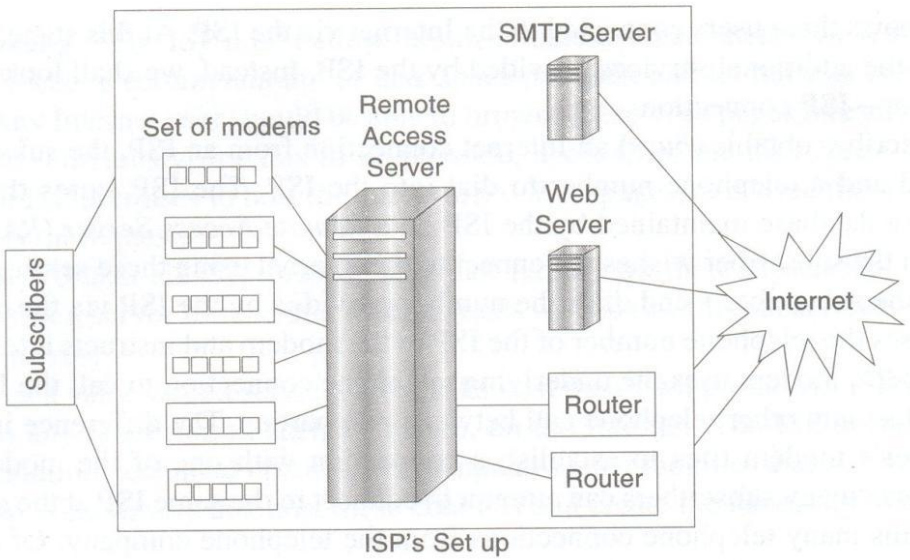
In given Example hosts are connected to WAN switches 1,2 The host in this example will be identified bits switch ID & its own ID relevant to that switch that means different host on different switch can have same Host id like host(2,1) &host (3,1) having same host id

f) Compare TCP and UDP.(4points)
(1mark per valid point)

Factors	TCP	UDP
i) Protocol connection s/w	It is connection oriented. Connection must be established before sending data.	It is connectionless. Data sent without connection setup.
ii) Data interface to application	Lost data is Retransmitted automatically.	Auto –retransmission is not performed. Application must detect lost of data and retransmit it by its own.
iii) Reliability	Reliable because data is delivered with acknowledgment	Unreliable because data is delivered without acknowledgement
iv) Overhead	Overhead is low, but higher than UDP	Overhead is Very low

Q.6. Attempt any FOUR of the following: (16M)

a) Draw the architecture of ISP.
(Correct diagram 4 M)

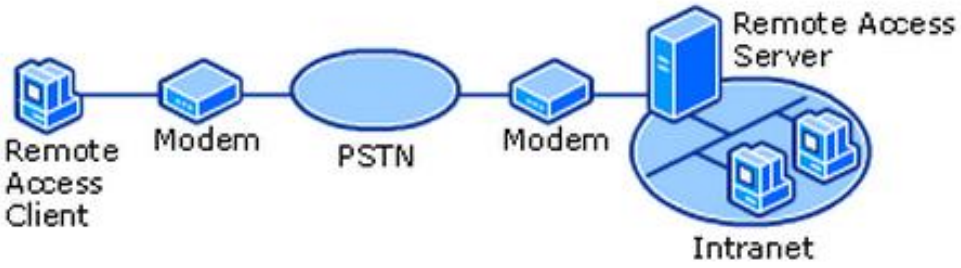


b) Describe dial-up network with its specification.
(Description 2M, Specification –any two-2M)

Dialup internet service is a service that allows connectivity to the internet through a standard telephone line. By connecting the telephone line to the modem in computer and inserting the other end into the phone jack, and configuring the computer to dial a specific number provided by internet service provider (ISP) to access the internet on your computer.
Dial up internet service is provided through several ISP. In order to get a dial up internet service a person must definitely have a computer and even more important a modem. There are different types of modems, to the modem.
A dial-up remote access connection contains the following components:

- Remote access client
- Remote access server
- WAN infrastructure

Dial-up equipment and the WAN infrastructure



The physical or logical connection between the remote access server and the remote access client is facilitated by dial-up equipment installed at the remote access client, the remote access server, and the WAN infrastructure. The nature of the dial-up equipment and WAN

infrastructure varies, depending on the type of connection. The most common methods for dial-up remote access include:

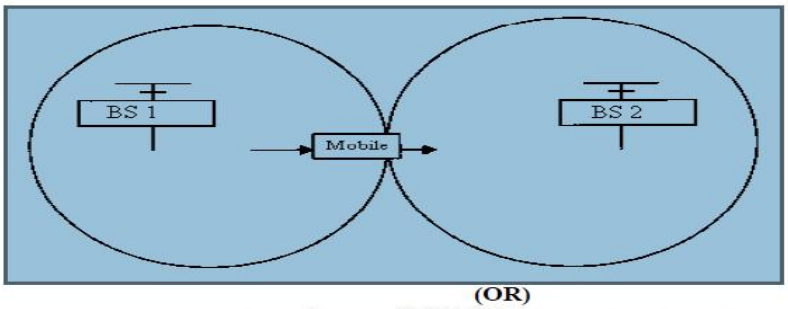
- Public Switched Telephone Network (PSTN)
- Integrated Services Digital Network (ISDN)

Specifications of Dial up connection:

1. Uses the facility of telephone lines(PSTN)
2. Requires modem of 56Kbps for conversion of digital to analog and vice versa.
3. Dial-up lines generally support speeds of 2,400 to 9,600 bps.
4. No dedicated path.

c) Explain Hands-off operation in Mobile phone.
(Diagram 1 mark, definition 1 mark & procedure 2 marks)

While call in prograss it may happen that user may move from one cell to another cell or in area where signal of current cell becomes too weak & call will drop to resovle this problem MSC checks level of signal in regular intevel and if it becomes bellow cetrain level it intiates allocating channels of another cell to that mobil;e user this process is called as Handoff



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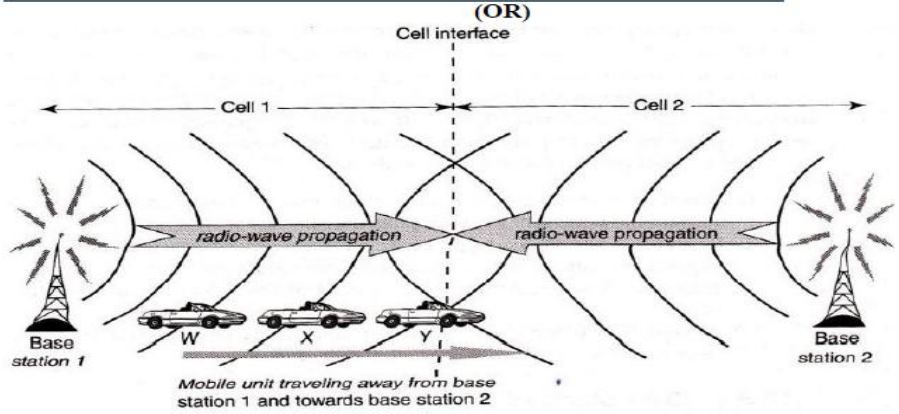


Following are various types of handoffs. Supported by a Mobile Station (MS):

1. Hard Hand Off
2. Soft Hand off
3. Queued hand off
4. Delayed hand off
5. Forced hand off

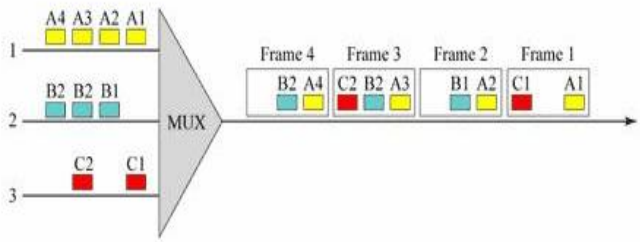
Hands Off Procedure

1. During a call, the serving base station monitors the signal strength (RSS) from the mobile on a reverse voice channel.
2. If the signal strength falls below a pre designated threshold, the base station sends a request to the MTSO for a hand off of the call.

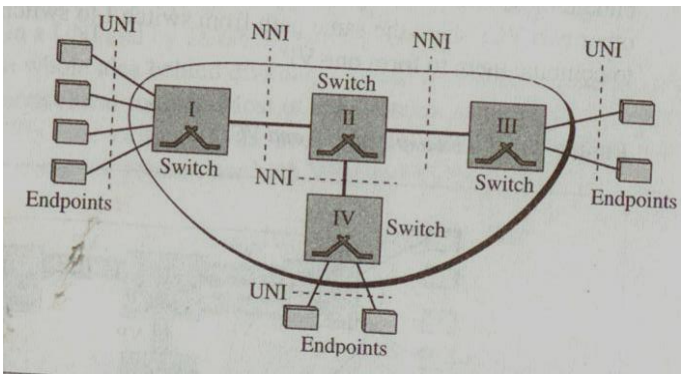
3. The MTSO then requests the location receivers of neighboring base stations to measure the signal strength (RSSI) from the mobile.
4. If another base station from one of the neighboring cells indicates better signal strength , than under instructions from the MTSO the serving base station sends a signaling message to the mobile on the speech channel asking the mobile to return to a free channel in the neighboring cell.
5. The mobile returns to the new call.

d) Draw & explain Asynchronous transmission mode.
(Diagram 2 marks explanation 2 marks)

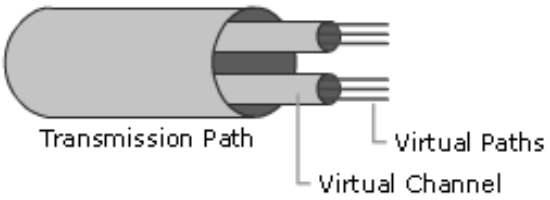
ATM: - IT is asynchronous transmission mode. It uses asynchronous TDM for data transfer .It means every sender is provided with fixed sized time quanta for data transfer & if sender is not having data for sending then that quanta is allocated to next sender in sequence It uses fixed sized cells to transfer data



User access device in ATM are called as endpoints. These endpoints are connected to ATM switch using UNI. The ATM switches are connected with each other using NNI.



Connection between two end points is accomplish trough transmission path ,virtual paths &virtual circuit. The TP is physical connection between two switches.TP is divided in VP & in turn VP is divided in VC. A transmission path is divided into several virtual paths .



Virtual path provide a connection between two switches.

e) With the help of diagram explain virtual network.

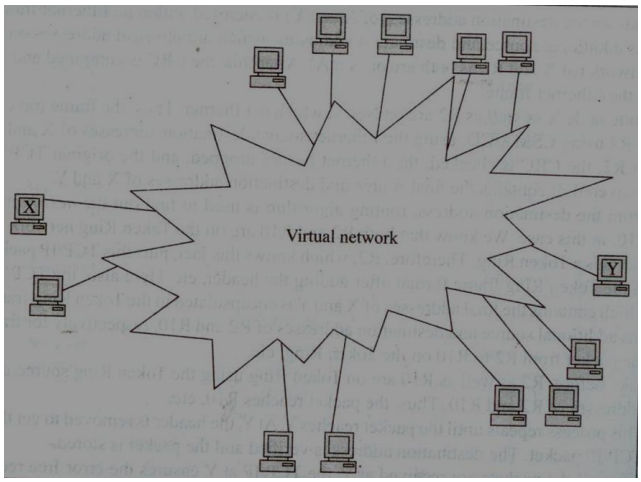
(Diagram 2marks 2 marks explanation)

Virtual Network:

1) A virtual network is a computer network that consists, at least in part, of virtual network links.

2) A virtual network link is a link that does not consist of a permanent physical (wired or wireless) connection between two computing devices but is implemented using methods of network virtualization. Only abstract view is available to user .user is not aware or bother about physical structure of network, interconnection, routing decision or presence of networking devices

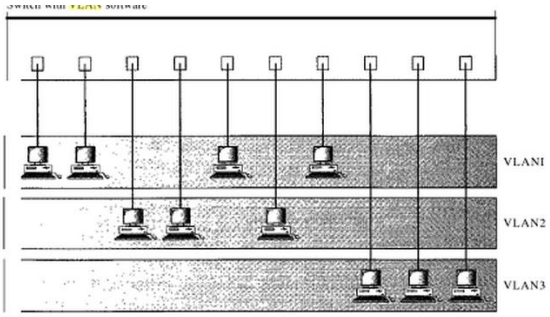
3) It ensures that different computer on different networks can be connected with each other and user can treat them as on single network



3) The two most common forms of network virtualization are protocol-based virtual networks

a. VLAN: Virtual LAN

Virtual LANs (VLANs) are logical local area networks (LANs) based on physical LANs. A VLAN can be created by partitioning a physical LAN into multiple logical LANs using a VLAN ID. Alternatively, several physical LANs can function as a single logical LAN. The partitioned network can be on a single router, or multiple VLAN's can be on multiple routers just as multiple physical LAN's would be. A VLAN can be on a VPN.



b. VPN: Virtual Private Network

A virtual private network (VPN) consists of multiple remote end-points joined by some sort of tunnel over another network, usually a third party network. Two such end points constitute a 'Point to Point Virtual Private Network'. Connecting more than two end points by putting in place a mesh of tunnels creates a 'Multipoint VPN.

f) Compare LAN and WAN considering following points:

i. Geographical area
ii. Speed
iii. Installation cost
iv. Communication medium
(1markfor each point)

Factor	WAN	LAN
Geographic area	It covers Much larger area comparing with LAN like country ,continent	It covers small larger area comparing with LAN like building network
Speed	Less speed compared to LAN	High Speed compared to WAN
Installation cost	High	low
Communication medium	Computers connected to a wide-area network are often connected through public networks, such as the telephone system. They can also be connected through leased lines or satellites.	Connected through Fiber Optic Cables