

1) Explain components of data communication.
Which are the type of connection?

Ans Components of data communication:-

Set
of
Rules

Set
of
Rules

Sender

Receiver

Message

Transmission Medium

1. Message

Message is the information to be communicated by the sender to receiver.

2. Receiver

The receiver is a device that the sender wants to communicate the data.

3. Sender

The sender is any device that is capable of sending the data.

4. Transmission Medium

- It is the path by which the message travel from sender to receiver. It can be wired or wireless and many subtypes in both.

5. Protocol

- It is an agreed upon set of rules used by the sender and receiver to communicate data.
- A protocol is set of rules that governs data communication.
- A protocol is necessary in data communications without which communicating entities are like two persons trying to talk to each other in different language who without know the real language.

Types of connection

a) Point - to - Point

- Point - to - point connections provide a direct link between two devices connect to a single cable or segment of transmission media: for example, a computer connected

directly to printer or a modem to a mainframe

b) Multi-point

- Multi-point connections provide a link between three or more devices on a network. All computer networks rely upon point-to-point and multi-point connections.

Q) What is data communication? Explain its characteristics.

Ans Data communication:

- Data communication is a process of exchanging data or information.
- In case of computer networks this exchange is done between two devices over a transmission medium.
- This process involves communication system which is made up of software and hardware. The hardware parts involves the sender and receiver devices and the intermediate devices through which the data passes. The software part

involves certain rules which specify what is to be communicated, how is it to be communicated and when. It is also called as a protocol.

Characteristics of data communication

- **Delivery**

The data should be delivered to the correct destination and correct user.

- **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.

- **Timeliness**

Audio and video data has to be delivered in a timely manner without delay; such data delivery is called real time transmission of data.

- **Jitter**

It is the variation in the packet arrival time. Uneven jitter may affect the timeliness of data being transmitted.

- 3) What are the different types of data flow? How can data be represented?

Ans Data flow:

- a) Simplex

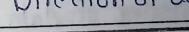
- In simplex, communication is unidirectional. Only one of the devices sends the data and the other one receives the data.

- Example:

A CPU sends the data while monitor only receives the data.

Direction of data

CPU



Monitor

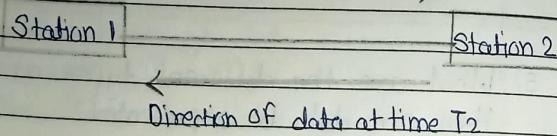
- b) Half Duplex

- In half duplex both the stations can transmit as well as receive but not at the same time.

- When one device is sending other can only receive and vice-versa.
 - Example: A Walkie-Talkie

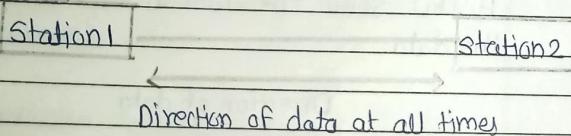
Example: A Walkie-Talkie

Direction of data at time T_1



- c) Full Duplex

 - In full duplex mode, both stations can transmit and receive at the same time.
 - Example: Mobile Phones.



= Data Representation

- a) Text:

 - Text includes combination of alphabets in small case as well as upper case.

- It is stored as pattern of bits. Prevalent encoding system: ASCII, Unicode.

b) Numbers:

- Numbers include combination of digits from 0 to 9.
 - It is sorted as a pattern of bits. Prevalent encoding system: ASCII, Unicode.

c) Image

- "An image is worth of thousand words" is a very famous saying. In computers images are digitally stored.

- A pixel is the smallest element of an image.
To put in simple terms a picture or image is a matrix of pixel elements.

- The size of an image is depends upon the number of pixels and the bit pattern used to indicate the value of each pixel.

d) Audio

- Data can also be in the form of sound which can be recorded and broadcasted.
 - Audio data is continuous, not discrete.

e) Video

- Video refers to broadcasting of data in form of picture or movie.

4) Define.

a) Data and signals

Data:

- Data refers to the raw facts that are collected.

b) Signal

A signal is an electromagnetic or electrical current that carries data from one system or network to another.

b) Periodic analog signal

- A periodic analog signal is a sine wave that cannot be further decomposed into simpler signals.

c) Digital signal

A digital signal is a signal that has discrete values which are not continuous.

d) Transmission impairment

- Data is transmitted through transmission medium which are not perfect.
- The imperfection causes signal impairment.
- Due to the imperfection error is introduced in the transmitted data, i.e. the original state at the beginning of the transmission is not the same as the signal at the receiver.

e) data rate limits

- The maximum data rate also known as the channel capacity, is the theoretical limit of the amount of information that can be transmitted over a communication channel.

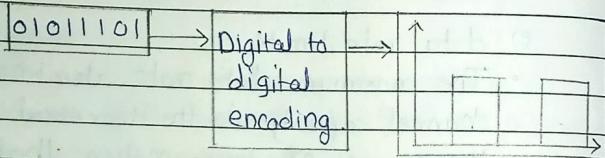
f) Performance

- The performance of network pertains to the measure of service quality of a network as perceived by the user.

- 5) Explain Digital-to-digital conversion and digital-to-analog conversion.

Ans Digital - to - digital conversion:

- Digital-to-digital encoding is the representation 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.



Digital-to-digital encoding is divided into three categories.

- Unipolar
- Polar
- Bipolar

- Unipolar.

- Digital transmission system sends the voltage pulses over the medium link such as wires or cable.
- In most types of encoding one voltage level represents 0 and another voltage level represents 1.
- The polarity of each pulse determines whether it is positive or negative. This type of encoding is known as unipolar encoding.

b) Polar

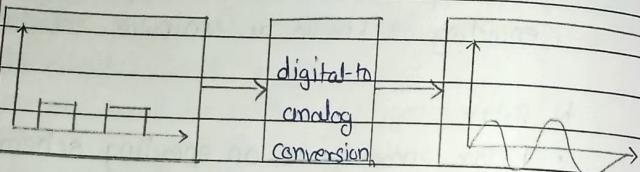
- Polar encoding is an encoding scheme that uses two voltage levels: one is positive and another one is negative.
- By using the voltage levels, an average voltage level is reduced and the DC component problem of unipolar encoding scheme is alleviated.

c) Bipolar

- Bipolar encoding scheme represents three voltage levels: positive, negative, zero.
- In bipolar encoding scheme, zero level represents binary 0 and binary 1 represented by altering positive and negative voltages.

= Analog Digital-to-analog conversion.

- digital-to-analog conversion modulation is the phase of converting one of the features of an analog signal depending on the data in a digital signal (0s and 1s) when we communicate information from one system to another. ~~atmos~~.



- A sine wave is described by three features:
 - Amplitude
 - Frequency
 - Phase
- When we alter one of these features, we generate a second form of that wave. Otherwise we can say that the original waves describes binary 1, the variation can describe binary 0 and vice-versa.
- Two binary issues must be defined in digital-to-analog conversion.

a) Bit rate and baud rate.

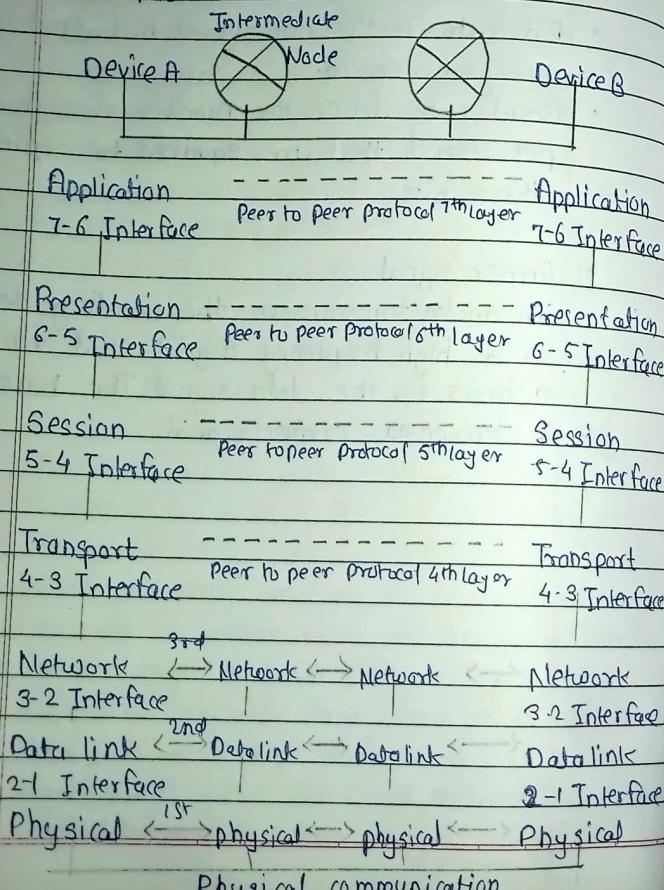
- The two methods generally used in data communication are bit rate and baud rate.
- Bit rate is the number of bits that are sent during one second.
- Baud rate defines the number of signal units per second that are squared to represent those bits.

b) Carrier signal

- In analog transmission the sending device makes a high-frequency signal that facilitates a basis for the data signal. This base signal is known as carrier signal.

- 6) Write a short note on The OSI model and TCP/IP protocol suite.

Ans. OSI model.



- OSI model stands for Open system interconnection model.
 - The OSI model was developed by ISO (International standardization organization for standardization).
 - OSI was developed to allow systems with different platforms to communicate with each other. Platform could mean hardware, software or OS.
 - It is hierarchical model that groups its process into 7 layers.
- a) Application layer
Human computer interaction layer where applications can access the network services.
 - b) Presentation layer
Ensures that data is in a usable format and is where data encryption occurs.
 - c) Session layer
Maintains connection and is responsible for controlling ports and sessions.
 - d) Transport layer
Transmit the data using transmission.

e) Network layer

Decide which physical path the data will take.

f) Data-link layer

Defines the format of data on networks

g) Physical layer

Transmit the raw bits stream over the physical medium.

= TCP/IP protocol suite.

Application

Transport

Network or IP

Host to network

- It is collection of protocols.

- It is hierarchical model, i.e. There are multiple layers and higher layer protocols are supported by lower layer protocols.

- It existed even before the OSI model was developed.

- Originally had four layers (bottom to top)

- 1 Host to network layer.

- 2 Internet layer

- 3 Transport layer

- 4 Application layer!

- The structure TCP/IP model is very similar to structure of OSI reference model. The OSI model has seven layers whereas the TCP/IP model has four layers.

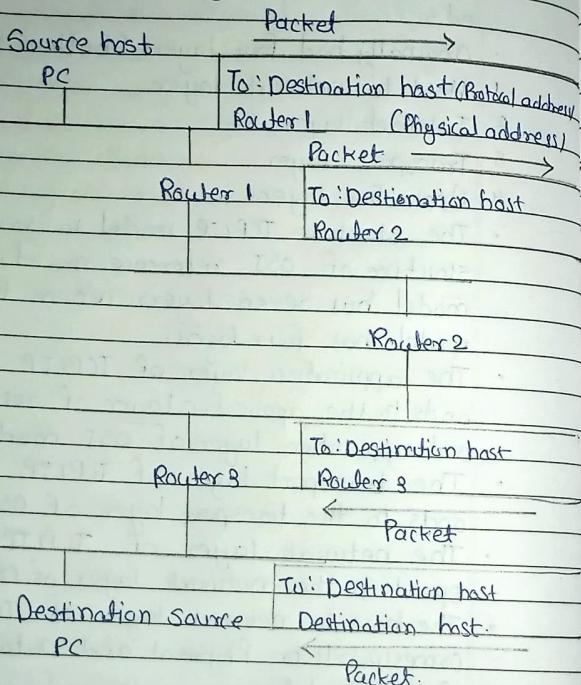
- The application layer of TCP/IP model corresponds to the application layer of session, presentation and application layer of OSI model.

- The transport layer of TCP/IP model corresponds to the transport layer of OSI model.

- The network layer of TCP/IP model corresponds to the network layer of OSI model.

- The host to network layer of TCP/IP model corresponds to Physical and data link layer of OSI model.

7) Explain switching.



- Switching algorithms is relatively simple; it is the same for most routing protocols.
- In most cases, a host determines that it must send a packet to another host. Having acquired a router's address by some means, the ~~source~~ source host send a packet addressed specifically to a router's physical (media access control [MAC]-layer) address (this time with the protocol (network layer) address of destination host).
- As it examines the packet's destination protocol address, the router determines that it either knows or does not know how to forward the packet to the next hop.
- If the router does not know how to forward the packet, it typically drops the packet — changes the destination physical address to that of the next hop, which execute same switching.
- The preceding switching describes switching between a source and destination end system. The Ica has developed a hierarchical terminology that is useful in describing this process.

- A routing domain generally is considered a portion of an internetwork under common administrative authority that is regulated by particular set of administrative guideline.
- Routing domains are also called autonomy systems. With certain protocols, routing domains can be divided into routing areas but intradomain routing protocols are still used for switching both within and between areas.

- Q) Which are the types of Transmission media?
- Ans There are two types of transmission media:
- Guided media
 - Unguided media

= Guided Media

- Guided transmission media uses a cabling system that guides the data signals along a specific path.
- Guided media also known as bounded media, which are those that provide a conduit from one device to another.

= Types:

- Twisted-pair cable
- Coaxial cable

3 Fiber-optic cable.

- Out-of-these twisted-pair and coaxial cable transport signals in the form of light and fiber optic cable transport signals in the form of light.

= Unguided Media

- Unguided media transport the signal data

without using a physical conductor. This type of communication is often referred to as wireless communication.

- If we use wireless electromagnetic signals to send the data.
- There are three types of unguided media
 - 1) Radio waves
 - 2) Micro waves
 - 3) Infrared.