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1) Explain analog and digital transmission.

- Analog Transmission

To send the digital data over an analog media, it needs to be converted into analog signal. There can be two cases according to data formatting.

Bandpass :- The filters are used to filter & pass frequencies of interest. A bandpass is a band of frequencies which can pass the filter

Lowpass :- Low-pass is a filter that passes low frequencies signals.

When digital data is converted into a bandpass analog signal, it is called digital-to-analog conversion. When low-pass analog signal is converted into bandpass analog signal, it is called analog-to-analog conversion.

- Digital-to-Analog Conversion

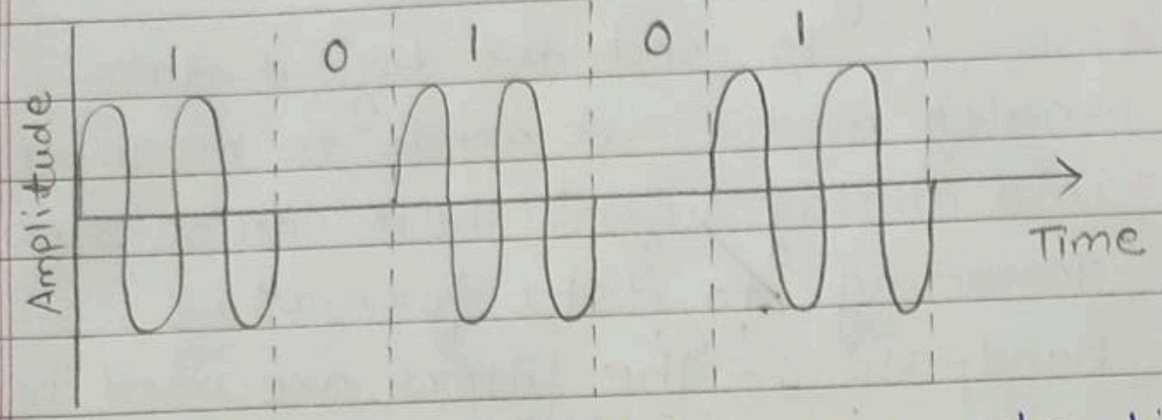
When data from one computer is sent to another via some analog carrier, it is first converted into analog signals. Analog signals are modified to reflect digital data.

An analog signal is characterized by its amplitude, frequency & phase. There are three kinds of digital-to-analog conversions:

1) Amplitude Shift Keying

In this conversion technique, the amplitude of analog carrier signal is

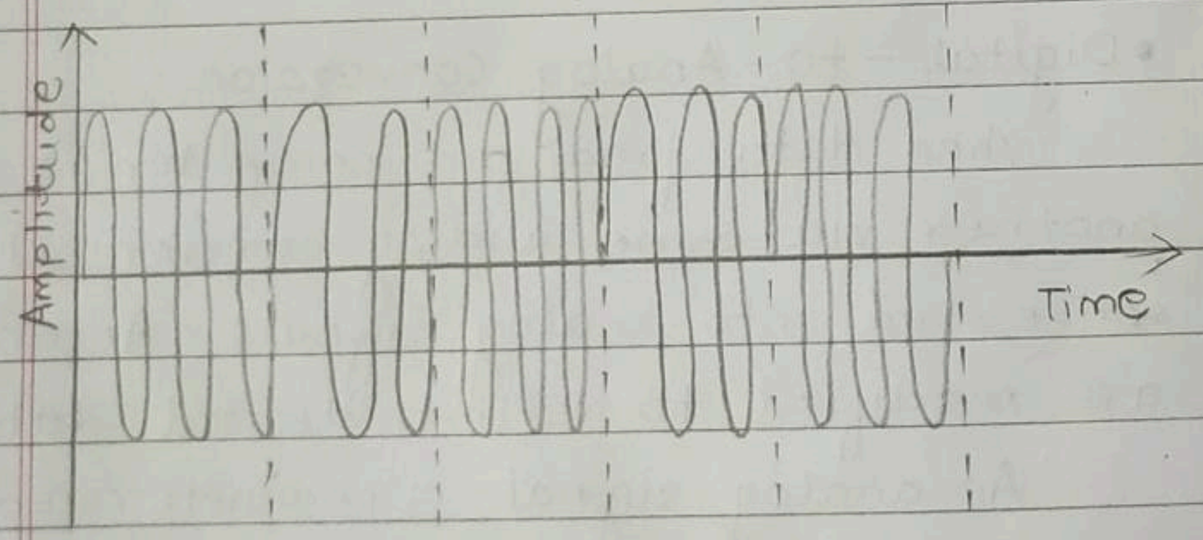
modified to reflect binary data.



When binary data represents digit 1, the amplitude is held; otherwise it is set to 0. Both frequency and phase remain same as in the original carrier signal.

2) Frequency Shift Keying

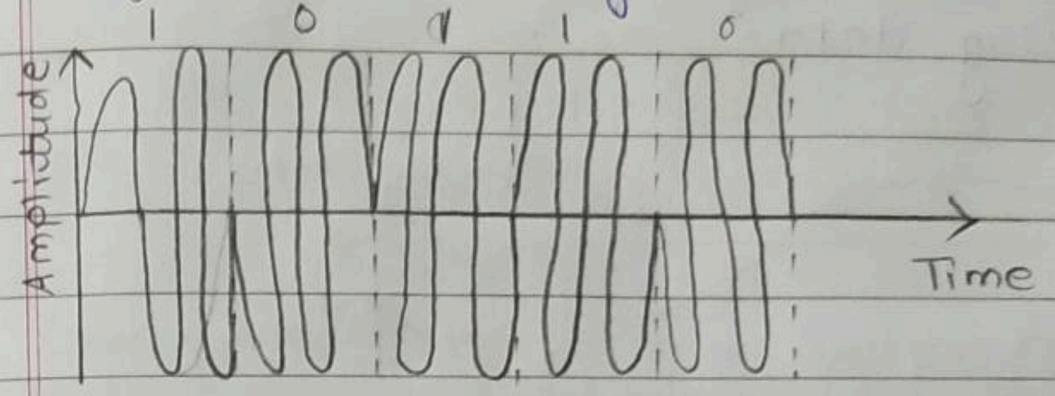
In this conversion technique, the frequency of the analog carrier signal is modified to reflect binary data.



This technique uses two frequencies, f1 and f2. One of them, for example f1, is chosen to represent binary digit 1 and the other one is used to represent binary digit 0. Both amplitude and phase of the carrier wave are kept intact.

3) Phase shift Keying

In this conversion scheme, the phase of the original carrier signal is altered to reflect the binary data.



When a new binary symbol is encountered, the phase of the signal is altered. Amplitude and frequency of the original carrier signal is kept intact.

4) Quadrature Phase Shift Keying

QPSK alters the phase to reflect two binary digits at once. This is done in two different phases. The main stream of binary data is divided equally into two sub-streams. The serial data is converted in to parallel in both sub-stream and then each stream is converted to digital signal using NRZ technique. Later, both the digital signals are merged together.

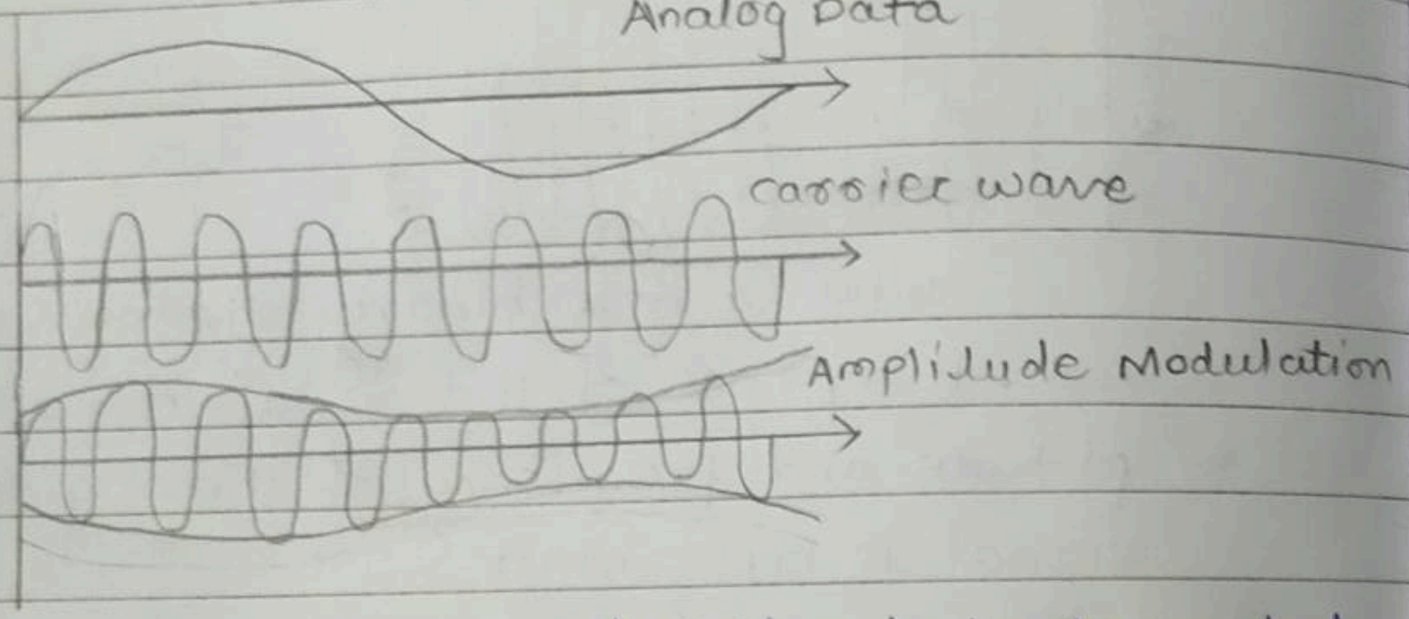
- Analog-to-Analog Conversion

Analog signals are modified to represent analog data. This converted is also known as Analog Modulation. Analog-to-

analog conversion can be done in three ways

1) Amplitude Modulation

In this modulation, the amplitude of the carrier signal is modified to reflect the analog data.

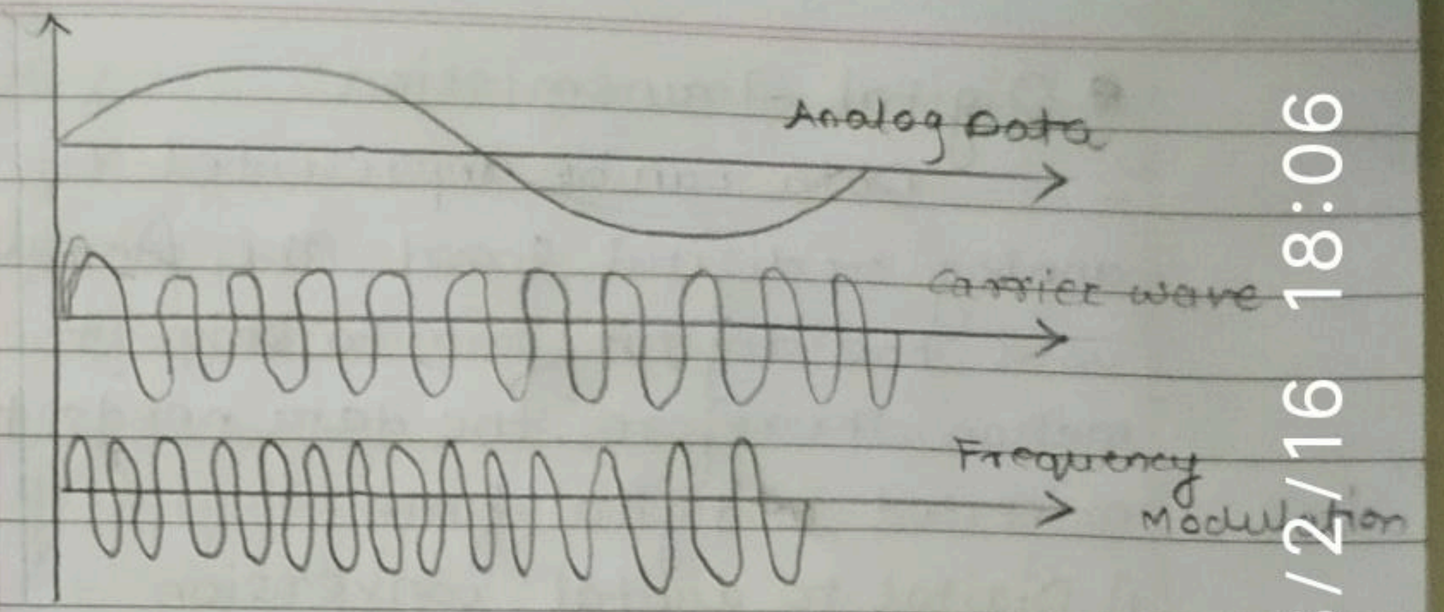


Amplitude modulation is implemented by means of a multiplier. The amplitude of modulating signal (analog data) is multiplied by the amplitude of carrier frequency, which then reflects analog data. The frequency & phase of carrier signal remain unchanged.

2) Frequency Modulation

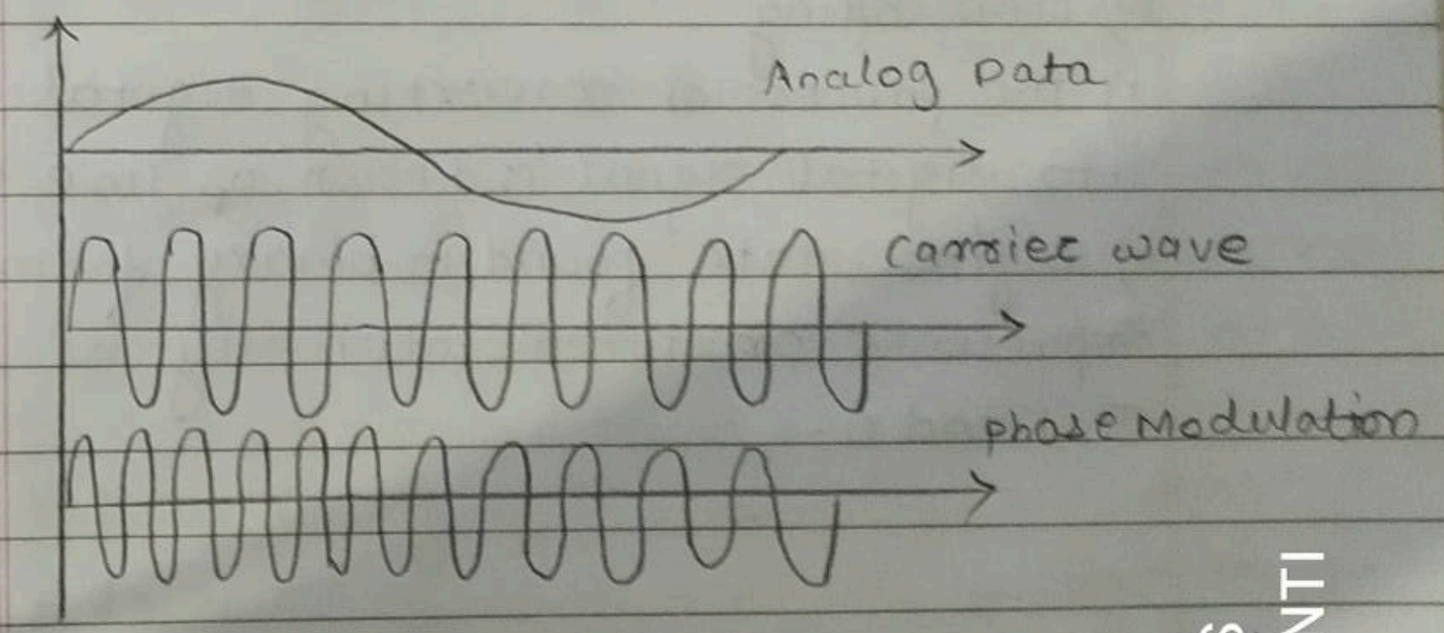
In this modulation technique, the frequency of the carrier signal is modified to reflect the change in the voltage levels of the modulating signal (analog data).

The amplitude and phase of the carrier signal are not altered.



3) Phase Modulation

In the modulation technique, the phase of carrier signal is modulated in order to reflect the change in voltage (amplitude) of analog data signal.



phase modulation is practically similar to Frequency Modulation, but in Phase modulation frequency of the carrier signal is not increased. Frequency of carrier signal is changed to reflect voltage change in the amplitude of modulating signal.

- 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.

1) Digital to digital conversion.

It can be done in two ways.

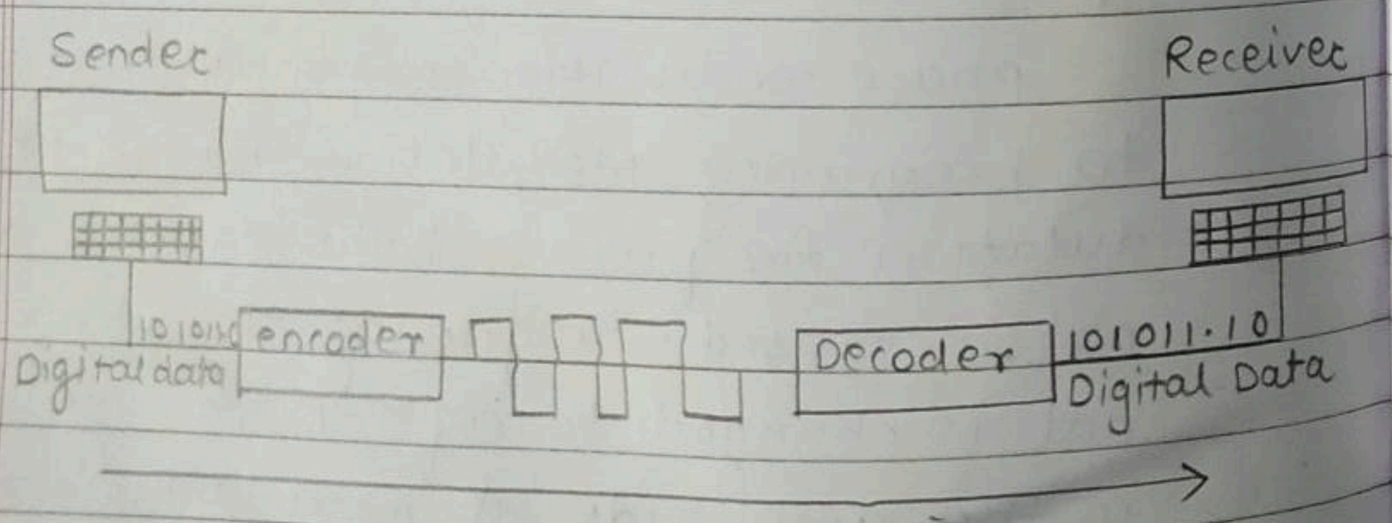
a) Line coding
b) Block coding

For all the communication, line coding is necessary where as, block coding is optional.

A) Line coding

i) The process of converting digital data into digital signal is known as line coding.

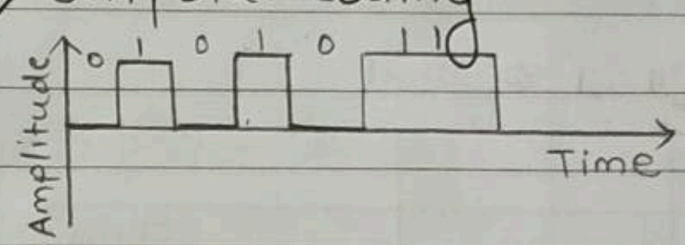
ii) Digital data found in binary formate it represents or stored internally as series of 1 and 0.



Digital line coding has three type.

a) Unipolar coding
b) Polar coding
c) Bipolar coding

a) Unipolar Coding



i) Unipolar encoding scheme use single voltage level to represent data.

ii) In this case, to present binary 1 high voltage is transmitted, and to represent zeco no voltage is transmitted.

iii) It is also called as unipolar Non-Return-to-zeco encoding because there is no rest condition that is it either represent 1 or 0.

b) Polar Coding

i) Polar coding uses multiple voltage levels to represent binary values.

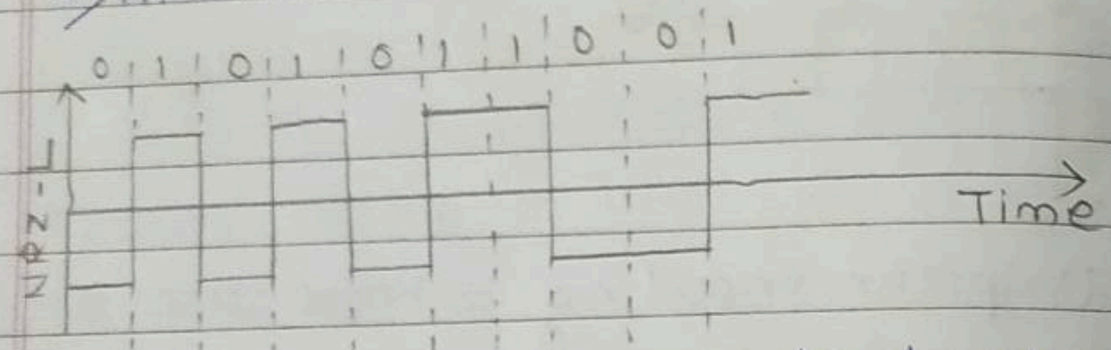
ii) Polar coding is of four types
- Polar non return to zeco.
- Return to zeco
- Manchester
- Differential Manchester

- Polar non return to zeco

i) It uses two differential voltage

to represent binary values.
ii) Generally positive voltage represents 1 & negative value represents 0.
iii) It is also NRZ because two varients.
a) NRZ-L b) NRZ-I

a) NRL-L



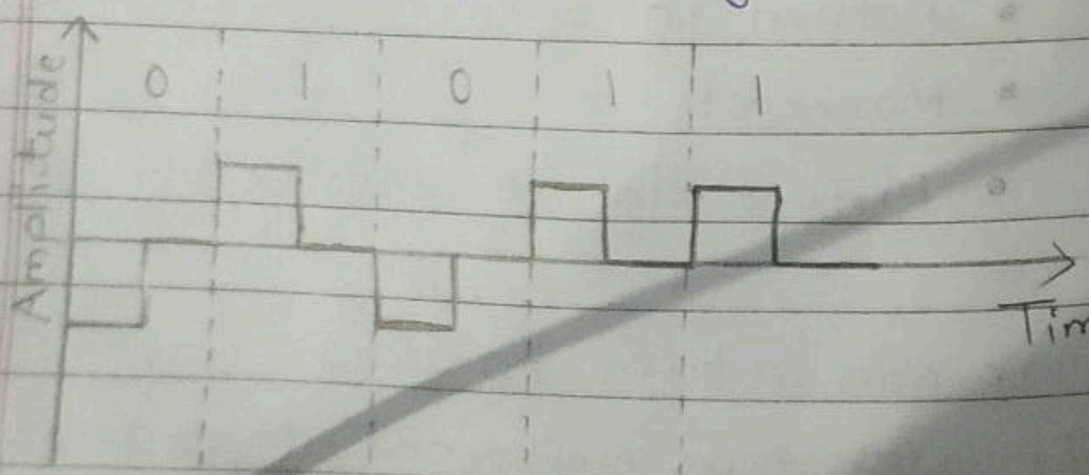
NRZ-L changes voltage level when different bit incouter i.e 1 to 0 and 0 → 1.

b) NRZ-I

In NRZ-I voltage change when 1 is encounter.

- Return to zero (RZ)

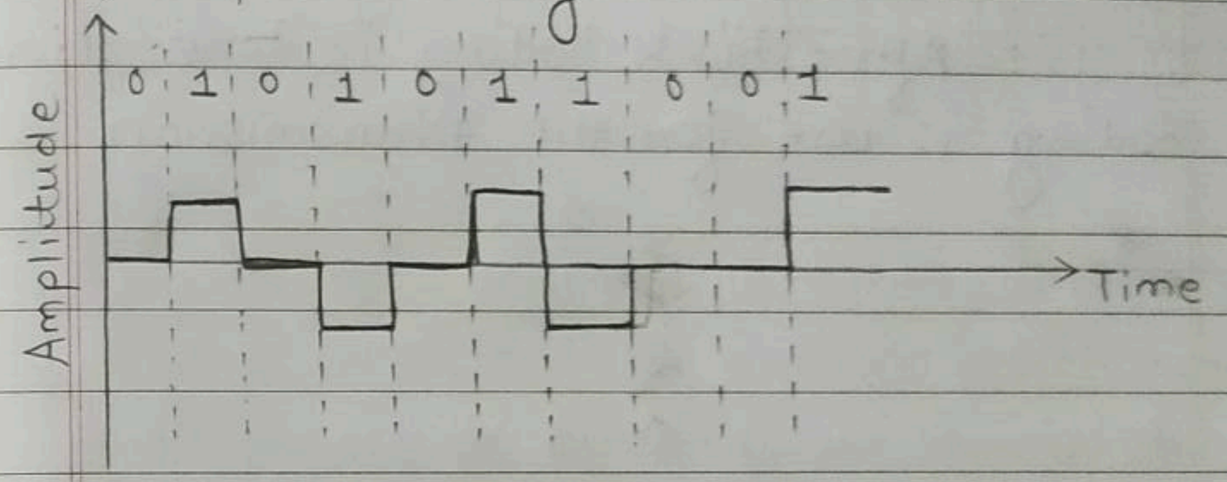
Rz uses three voltage levels positive negative or zero.
i) Positive voltage to represent 1 and negative voltage to represent 0.
ii) Zero voltage represent none.
iii) Signal change during bits.



- Manchester

i) This encoding scheme is combination of RZ and NRZ-L.
ii) Bit time is divided into 2 halves it transitte in the middle of the bit and change phase when one is encounteced.

c) Bipolar Coding



i) Bipolar encoding used three voltage level
a) Positive
b) Negative
c) zero
ii) Zero voltage represent binary zero and one represented by altecing positive and negative voltage.

B) Block coding

To ensure accuracy of received data frame redundant bits are used. For example :- In even parity, one parity bit is added to make the count of 1's in the frame even by this way no. of bits in frame is increase this is called

block coding.

Block coding is represented by 'y' notation mB/nB, m bit block is substituded with m block bit where as n > m block coding envolves three steps.

a) Division
b) Substitution
c) Combination

After block coding is done line coding is use for the transmission.

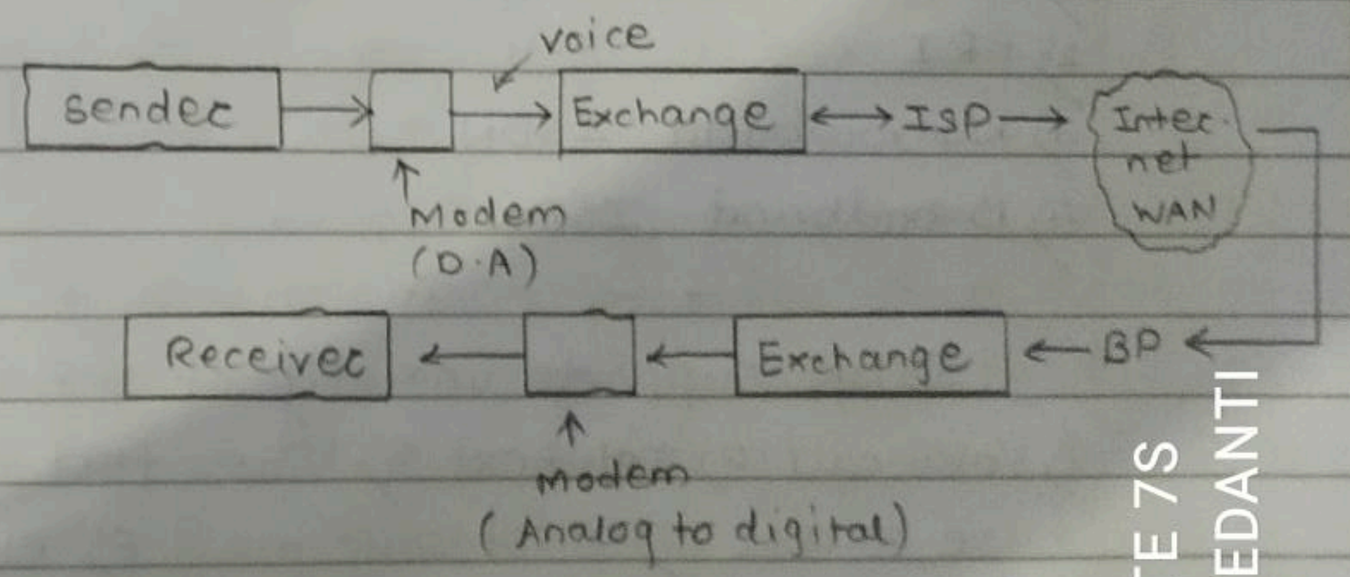
2) What is ISDN. Explain in detail.

Integrated Service of Digital Network.

i) ISDN was first define in the CCITT Red Book in 1988. In short ISDN is telephone network based infrastructure that allows the transmission of voice and data simultaneously and a high speed with greater efficiency.

ii) This is circuit switch telephone network system which also provides access to packet switch network.

iii) Before ISDN the internet service uses a device called as modem which was essential thing to establish the connection to the internet.

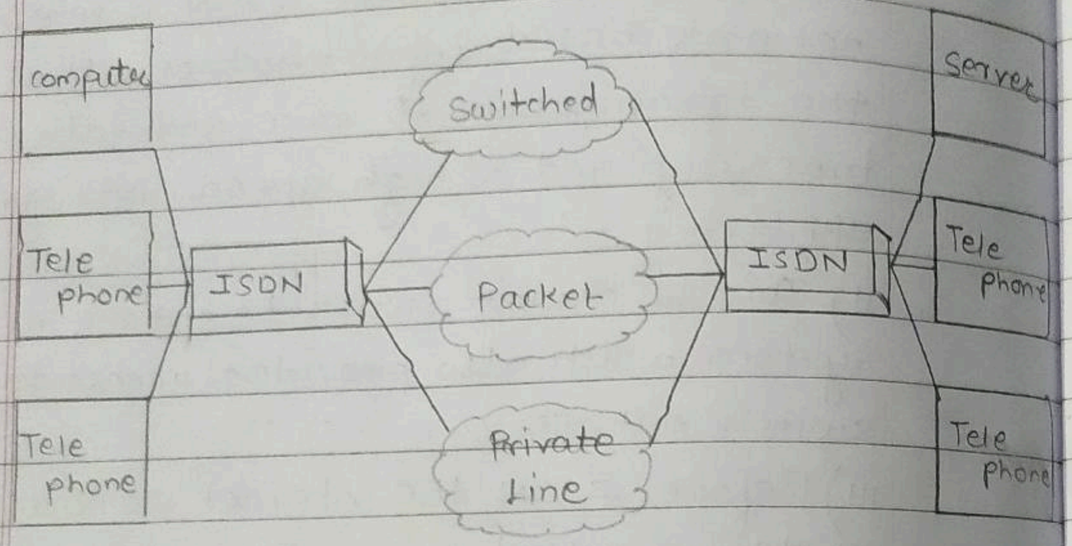


iv) Modem performs the process of modulation and demodulation where as inmodulation the convesion of digital signal into analog was perform this process executes at the senders end.

v) Demodulation is the process of conversion of analog signal into digital signal which perform

at receivers end.

vi) Thats why moden stands for modulator and demodulator.



Access Interface of ISDN

1) BRI
2) PRI
3) Narrowband ISDN
4) Broadband ISDN

ISDN supports variety of services.

1) Voice call 2) Teletext 3) Video text 4) data-base access 5) electronic mail 6) electronic fund transfer 7) Audio-video conferencing 8) document storage transfer 9) image and graphic exchange 10) connection to the intee-net 11) facsimile machine.

* Types of ISDN

1) Among the types of several interfaces present, some of them contains channels such as B-channels and D-channels.

11) B-channels stands for bearer channels whereas meaning of D-channels can be represents as delta channels. The use of B-channel is to transmit voice and data simultaneously whereas the use of D-channel is used to setup communication between the nodes.

111) The ISDN has several kind of access interfaces such as

a) BRI - Basic Rate Interface
b) PRI - Primary Rate Interface
c) Narrow Band ISDN
d) Broad band ISDN

a) BRI

It uses existing telephone connection The configuration provides two data or bearee channels at 64Kbps and one control or Delta channel at 16Kbps. This is the standard rate of BRI.

11) The ISDN BRI was commonly used by smaller organization for home uses with limited access speed and smaller area.

b) PRI

The primary rate interface is also called as primary [illegible]

by interprizes and offices.

ii) The PRI configuration is based on T-carrier or T1 in the US, Canada and Japan consisting of 23 data or bearer channels and one control or Delta channel with 64 Kbps speed for a bandwidth of 1.544 Mbps.

iii) The PRI configuration is based on E-carrier or E-1 Europe, Australia and few Asian countries consisting of 30 data or bearer channels and two control or data channel with a speed of 64 Kbps for a bandwidth of 2.048 Mbps.

c) Narrowband ISDN

i) It also called as N-ISDN. This can be understood as telecommunication that carries voice information in narrow band of frequencies.

ii) This is actually an attempt to digitized the analog voice information. This uses 64 Kbps of circuit switching.

d) Broadband ISDN

i) B-ISDN integrates digital networking services and provides digital transmission over the ordinary telephone wires as well as over other media.

ii) The broadband speed 2 Mbps to 1 Gbps and transmission is related to ATM (Asynchronous Transfer Mode).

iii) The broadband ISDN communication is usually made using the fibre optic cables at the speed of B-ISDN is greater than 1.544 Mbps the communication based on this called as broadband communication.

iv) The broadband services provides a continuous flow of information which is distributed from a central source to an unlimited number of authorized receives connected to the network.

3) What are designing issues of datalink layer

The data link layer in the OSI (Open System Interconnections) Model, is in between the physical layer and the network layer. This layer converts the raw transmission facility provided by the physical layer to a reliable and error-free link.

The main functions and the design issues of this layer are

1) Providing service to the network layer
2) Framing
3) Error Control
4) Flow Control

Service to the Network Layer

In the OSI Model, each layer uses the services of the layer below it and provides services to the layer above it. The datalink layer uses the services offered by the physical layer. The primary function of this layer is to provide a well defined service interface to network layer above it.

The types of services provided can be of three types -

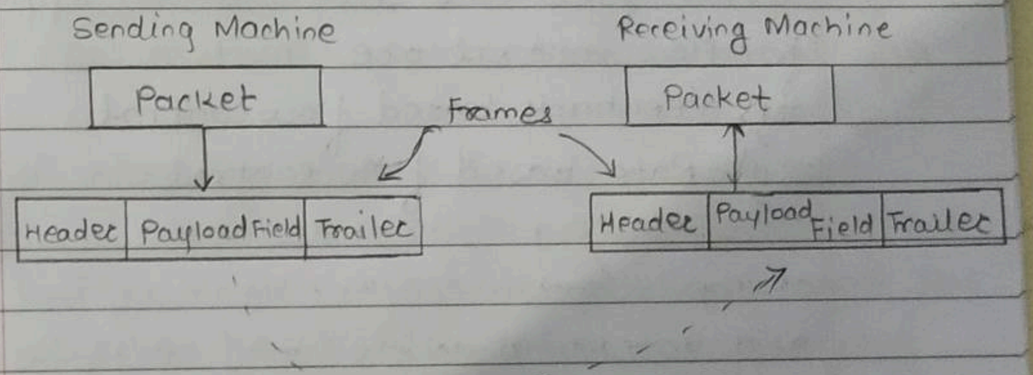
1) Unacknowledged connectionless service
2) Acknowleged connectionless service
3) Acknowledged connectionless-oriented service

1) Framing

The data link layer encapsulates each data packet from the network layer into frames that are then transmitted.

A frame has three parts, namely -

1) Frame Header
2) Payload field that contains the data packet from network layer.
3) Trailer



2) Error Control

The data link layer ensures error free link for data transmission. The issues it cater to with respect to error control are.

i) Dealing with transmission errors
ii) Sending acknowledgement frames in reliable connections.
iii) Retransmitting lost frames
iv) Identifying duplicate frames and deleting them
v) Controlling access to shared channel in

case of broadcasting.

3) Flow Control

The data link layer regulates flow control so that a fast sender does not drown a slow receiver. When the sender sends frames at very high speeds, a slow receiver may not be able to handle it. There will be frame losses even if the transmission is error-free. The two common approaches for flow control are

i) Feedback based flow control
ii) Rate based flow control

4) What are sliding window Protocol.

Sliding window protocols are data link layer protocols for reliable and sequential delivery of data frames. The sliding window is also used in Transmission Control Protocol.

In this protocol, multiple frames can be sent by a sender at a time before receiving an acknowledgment from the receiver. The term sliding window refers to the imaginary boxes to hold frames. Sliding window method is also known as windowing.

* Working Principle

In these protocols, the sender has a buffer called the sending window and the receiver has buffer called the receiving window.

The size of the sending window determines the sequence number of the outband frames. If the sequence of number of the frames is an n-bit field, then the range of sequence numbers that can be assigned is 0 to $2^n - 1$. Consequently, the size of the sending window size $2^n - 1$, a n-bit sequence number is chosen.

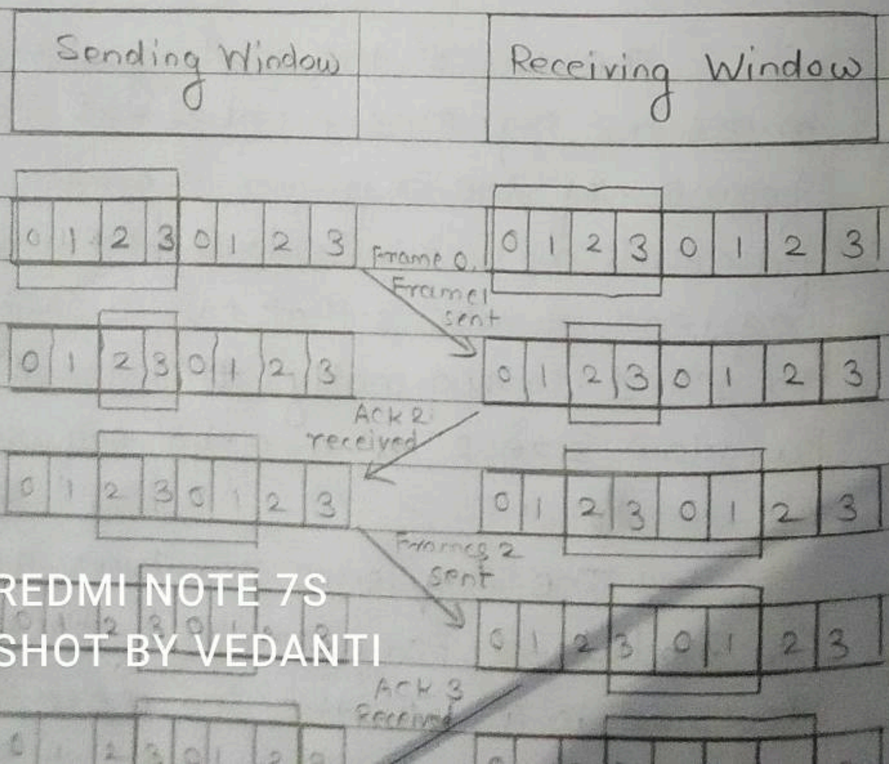
The sequence numbers are numbered as modulo-n. For example, if the sending window size is 4, then the sequence numbers will be 0, 1, 2, 3, 0, 1, 2, 3, 0, 1, and so on.

number of bits in the sequence number is 2 to generate the binary sequence 00, 01, 10, 11.

The size of the receiving window is the maximum number of frames that the receiver can accept at a time. It determines the maximum number of frames that the sender can send before receiving acknowledgment.

Example

Suppose that we have sender window and receiver window each of size 4. So the sequence numbering of both the windows will be 0, 1, 2, 3, 0, 1, 2 and so on. The following diagram shows the positions of the windows after sending the frames and receiving acknowledgments.



Types of Sliding Window Protocols

The sliding window ARQ (Automatic Repeat reQuest) protocols are of two categories -

1) Go-Back-N ARQ

Go-Back-N ARQ provides for sending multiple frames before receiving the acknowledgment for the first frame. It uses the concept of sliding window, and so is also sliding window protocol. The frames are sequentially numbered & a finite number of frames are sent. If the acknowledgment of a frame is not received within the time period, all frames starting from that frame are retransmitted.

2) Selective Repeat ARQ

This protocol also provides for sending multiple frames before receiving the acknowledgment for the first frame. However, here only the erroneous or lost frame are retransmitted, while the good frames are received and buffered.

5) Write about congestion control algorithms.

Congestion causes choking of the communication medium. when too many packets are displayed in a method of the subnet, the subnet's performance degrades. Hence, a network's communication channel is called congested if packets are traversing the path and experience delays mainly over the path's propagation delay.

There is two congestion control algorithm which is as follows:

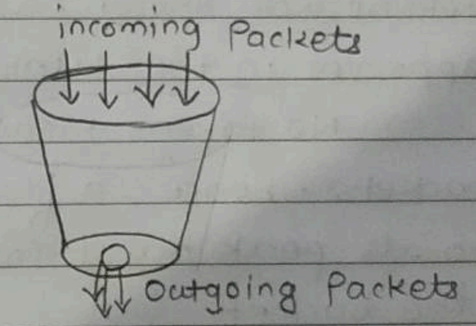
1) Leaky Bucket

The leaky bucket algorithm discovers its use in the context of network traffic shapping or ratelimiting. The algorithm allows controlling the rate at which a record is injected into a network and managing burstiness in the data rate.

A leaky bucket execution and a token bucket execution ace predominantly used for traffic shaping algorithms. This algorithm is used to control the rate at which traffic is sent to the network and shape the burst traffic to a steady traffic stream.

The figure shows the leaky bucket

In this algorithm, a bucket with a volume of, say b bytes and a hole in the Notes bottom is considered. If the bucket is null, it means b bytes are available as storage. A packet with a size smaller than b bytes arrives at the bucket and will forward it If the packet's size increases by more than b bytes, it will either be discarded or queued. It is also considered that the bucket leaks through the hole in its bottom at a constant rate of r bytes per second.



The outflow is consideced constant when there is any packet in the bucket and zero when it is empty. This defines that if data flows into the bucket faster than data flows out through the hole, the bucket overflows.

2) Token bucket Algorithm

The leaky bucket algorithm has a rigid output design at an average rate independent of the bursty traffic.

In some applications, when large bursts arrive, the output is allowed to speed up.

This calls for a more flexible algorithm, preferably one that never loses information. Therefore, a token bucket algorithm finds its uses in network traffic shaping or rate limiting.

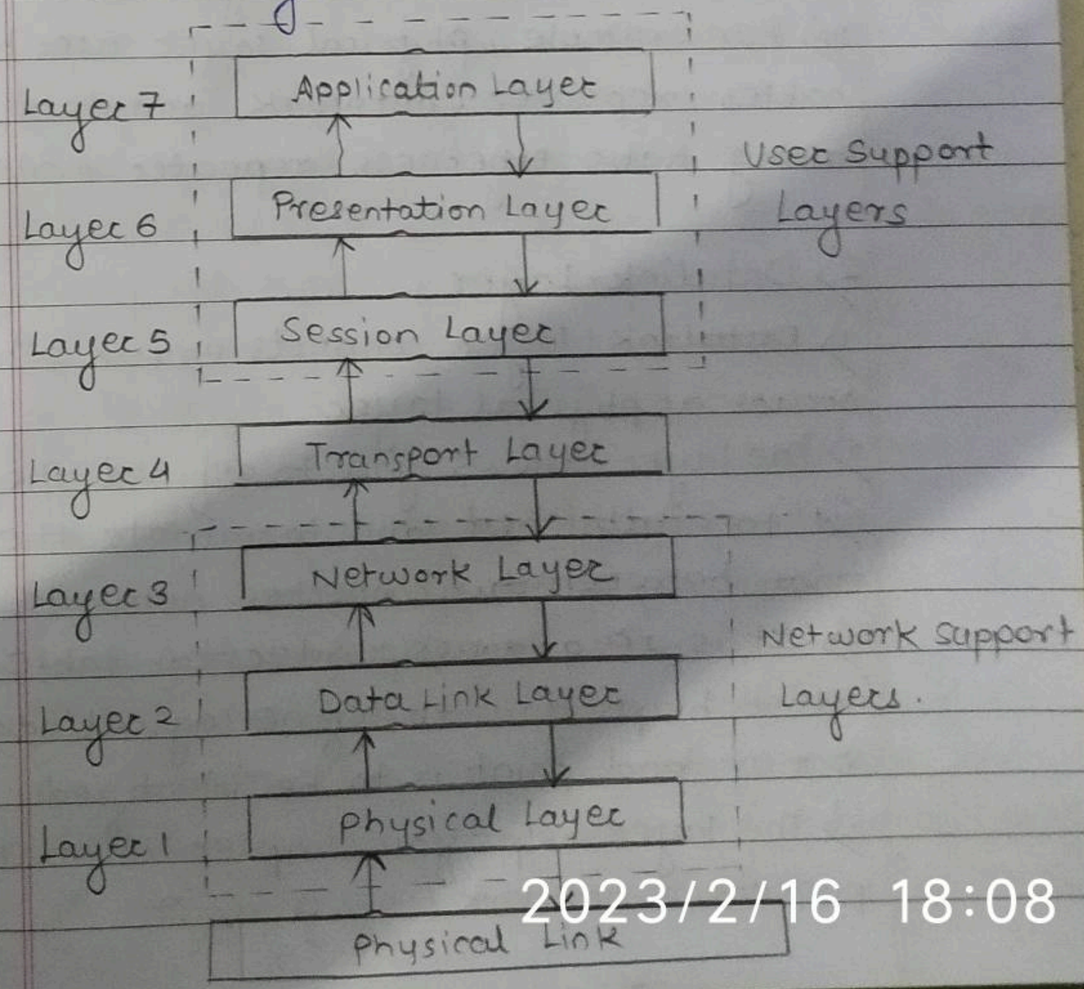
It is a control algorithm that indicates when traffic should be sent. This order comes based on the display of token. Each of the tokens defines a packet of predetermined size. Tokens in the bucket are deleted for the ability to share a packet. When tokens are shown, a flow to transmit traffic appears in the display of tokens.

No tokens means no flow sends its packets. Hence, a flow transfers traffic up to its peak burst rate in good tokens in the bucket

6) What is OSI reference model. Write about network structures & architechture of OSI layers.

In 1970 the ISO conducted a program to develop general standards and methods of networking. In 1973 an experimental packet switched system in the UK identified the requirement for defining higher level protocols. In 1983 OSI model was initially intented to be detailed specification of actual interfaces. In 1984 the OSI architecture was formally adopted by ISO as an international standard.

* Seven layers of the OSI Model



OSI model is layered server architecture system in which layer is defined according to specific function to perform. All these seven layers work colaborately to transmit the data from one layer to another.

1) Physical Layer

i) physical layer helps you to define the electrical and physical specifications of the data connection.

ii) The level established a relationship between a device and physical transmission medium.

iii) The physical layer is not concerned with protocols or other such higher level layers.

iv) For example, physical layer uses hardware cables, repeater, network adopters, networking hubs ethernes, repeater modems, etc.

2) Datalink Layer

i) Datalink layer connects error which can occurs at physical layer.

ii) The layer allows you to defined the protocol to established and terminate the connection between two connected network devices.

iii) It is IP address understandable layer which helps you to define logical addressing that end point is to be identified.

iv) This layer helps you implement routing of packets a network.

v) It helps you to define best path & the datalink layer is sub-divided in two layers.

i) MAC - Media Access Control

ii) LLC - Logical Link control

3) Network Layer

i) Network layer provides the functional & procedural means of transferring data sequences from one node to another connected in different network.

ii) Message delivery at network layer doesn't give any guarantee to be reliable.

iii) It uses routing protocols, multicast group management network layer addressing assignment.

iv) Router is used at network layer which uses several algorithm to define routes for destination.

4) Transport Layer

i) Transport layer decides how much data should be sent and what rate. This layer ensures that data units are delivered error free and in sequence.

ii) It controls the reliability through flow control, error control and segmentation or de-segmentation. of the successful data and sends next data

in case.
iii) No errors occures for this. it uses TCP protocol & also UDP protocols.

5) Session layer
i) It is layer which is responsible for establishing, maintaining and terminating the connection.
ii) This layer handles all the important logs and password validation.
iii) Session layer offers services like dialogue discipline. It can be duplex or half duplex.

6) Presentation layer
i) It handles data compression and de-compression. This layer is also known as syntax layer.
ii) This layer is responsible for formatting of data according to user or application requirement.

7) Application Layer
i) It is highest level layer in OSI model & it interacts with OSI model of software Examples - email, remote logging, file transfer and browser application.