Department of Electrical Engineering

Assignment

Date: 20/04/2020

Course Details

Course Title: Advance Computer Networks **Module:** _____

Instructor: Dr naeem **Total Marks:** 30

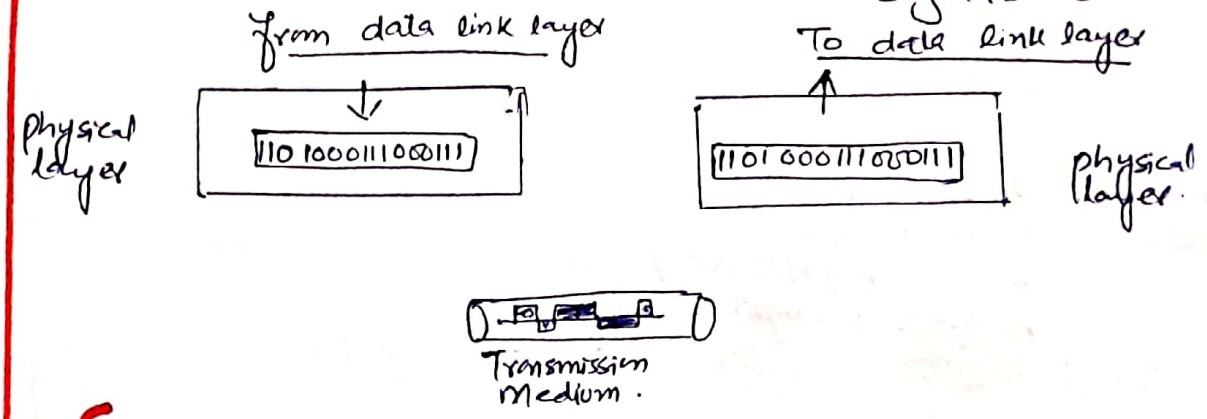
Student Details

Name: Hamza Mustajab **Student ID:** 15045

Q1.	(a)	Explain Physical layer services and Transmission Impairments?	Marks 6
	(b)	Express a period of 1 ms in microseconds, and express the corresponding frequency in kilohertz and A sine wave is offset one-fourth of a cycle with respect to time zero. What is its phase in degrees and radians?	Marks 4
Q2.	(a)	Explain the classification of digital to digital conversion? Difference between data element and signal element?	Marks 6
	(b)	We want to digitize the human voice. What is the bit rate, assuming 7 bits per sample?	Marks 4
Q3.	(a)	Explain the responsibilities of different layers of TCP/IP in detail?	Marks 6
	(b)	Convert the following data 01110010 to Manchester coding and Bipolar AMI?	Marks 4

Question 1a:- Explain Physical layer services and Transmission Impairments?

Answer:- it deals with the Mechanical and electrical specifications (Devices) · physical characteristics of interfaces and Medium · To move data in the form of electromagnetic signals across a transmission medium. it consists of a stream bits (sequence of 0s and 1s) · Bits are encoded into signals ·

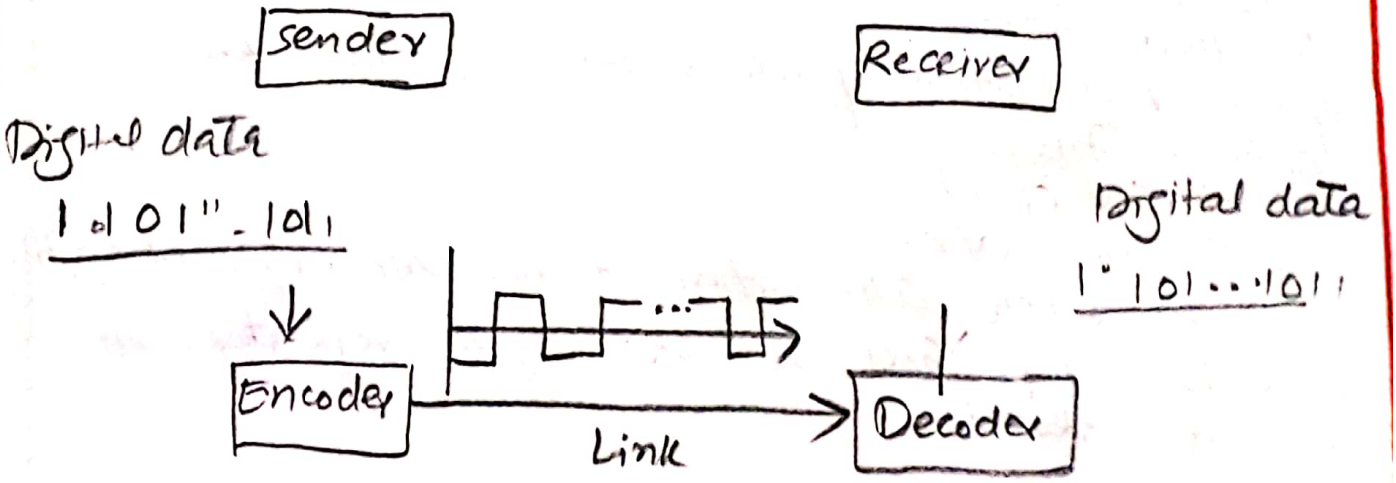


SIGNALS:-

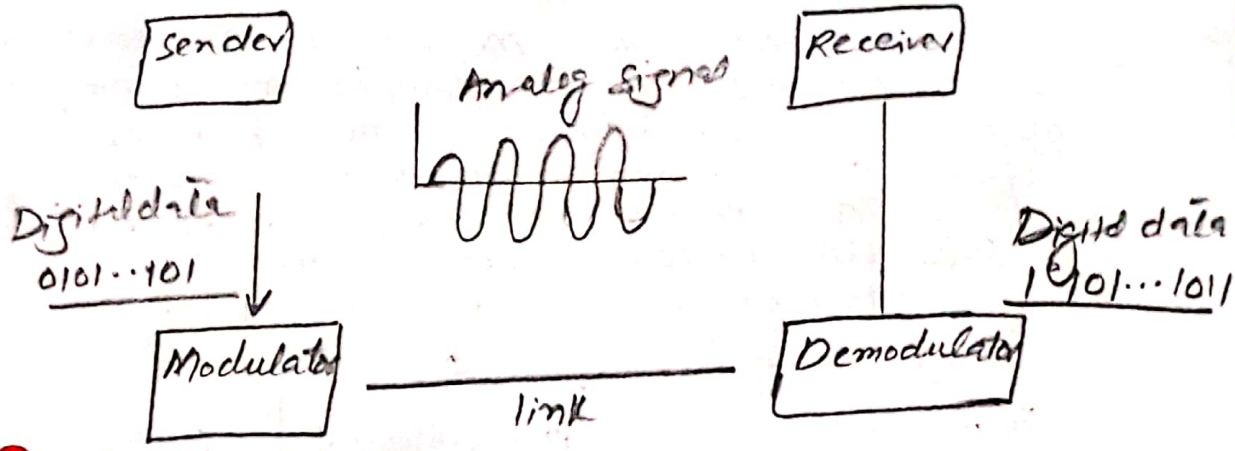
it is actually is an electric current or electromagnetic field used to convey data from one place to another.

- A transmitter encodes a message into a signal which is carried to a receiver by the communication ~~signal~~ channel.
- Signals can be interpreted as either Analog or Digital

Digital Signals:- Digital signals are non-continuous, discrete



Analog Signals:- Analog signals are continuous, non-discrete.



Devices:- HUB, Modem
Switcher, PC
Repeater, Mobile phone
Bridge, Cables etc.

Transmission Impairments :-

For analog signal:- Will cause various modifications that degrade the signal quality.

For Digital signal:- Will due to bit error a binary 1 maybe changed into 0 and vicversa.

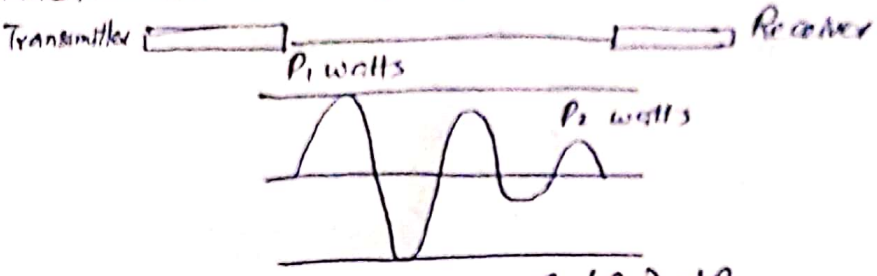
Three Types:-

i) Attenuation
ii) Distortion
iii) Noise

+ **Attenuation :-** Signal strength will falls off with distance. it happens exponential with the travelled distance.

- Affects propagation of waves and signals in optical fibers
electrical circuits
and in air.
- By too much attenuation it will becomes unintelligible that is why most networks require repeaters at regular intervals.

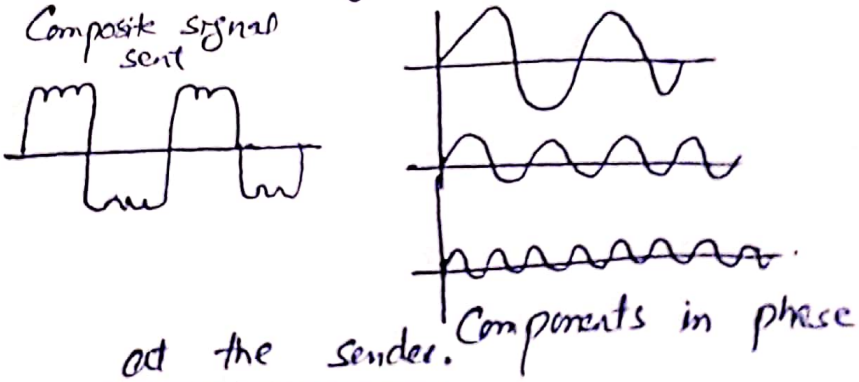
- Measured in (DB) decibels.

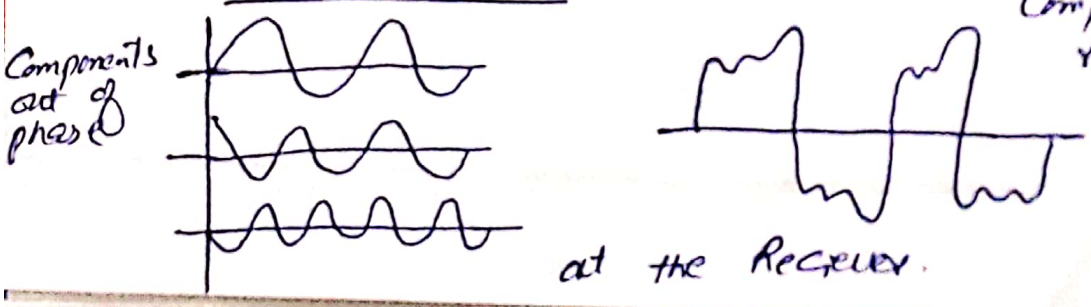


Attenuation $10 \log_{10} (P_1/P_2)$ dB
Amplification $10 \log_{10} (P_2/P_1)$ dB

- Particularly notice for analog signals due to signal distoration.
- By increasing function frequency. leads to attenuation distortion.

* **Distortion:-** also known as alteration of the original signal. May happen due to properties of the Medium. When it occurs shape of waveform will be changed.
- it actually happens in
  - Cables
  - wires
  - fibers etc
- Many types such as amplitude distortion, harmonic distortion and phase distortion.
- Critical for digital data since bits change into other bit.
- Can be solve by Circuit equalization.





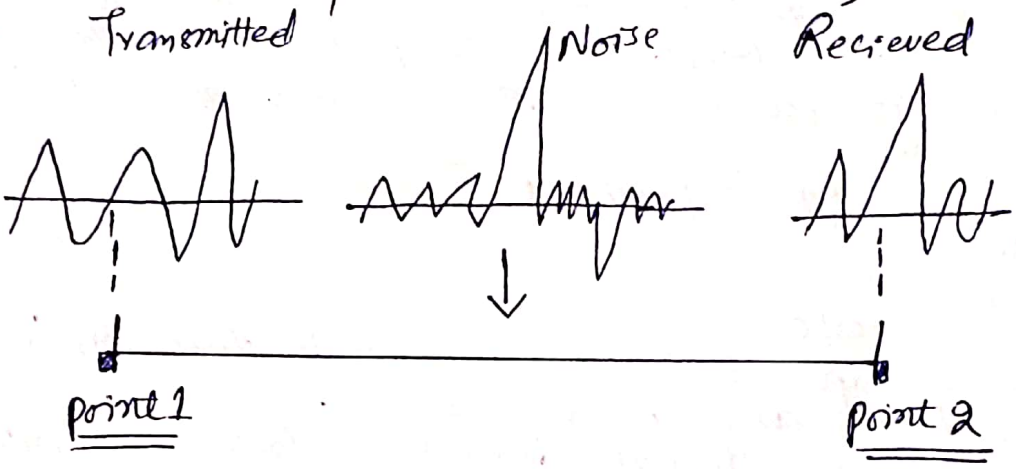
P# 05

Noise :-

- Random signal and unpredicted electrical signal (which is coming from both internal or external portion of the system). will interfere the reception of actual required signal called noise.
- Major factor for limiting the communication system performance.

Four Categories of Noise

- **Thermal noise** (due to thermal agitation of electrons)
- **Induced noise** (due to different frequencies).
- **Cross talk** (due to unwanted coupling b/w signals)
- **Impulse noise** (due to non-continuous, irregular pulses or noise spikes)



1b Express a period of 1ms in microseconds, and express the corresponding frequency in KiloHertz. A sine wave is offset of a cycle one-forth with respect to time zero. what is its phase in degrees and radians?

Answer:- As we know that find = ? period in Microsends = ? & frequency in kiloHz?

(A) ⇒ $1ms = 1 \times 10^{-3} s$

$= 1 \times 10^{-3} \times 10^{-6} \mu s$

$= \boxed{10^{3} \mu s}$

Now find inverse relationship to find the required i-e frequencing changing of Hz to KHz. as given below.

$1ms = 1 \times 10^{-3} s$

$= 1000s = \boxed{10^{2} s}$

⇒ $f = ?$

$f = \frac{1}{T} = \frac{1}{10^{2}} Hz$

$= 10^{-2} \times 10^{-3} KHz = \boxed{1 \times 10^{-5} KHz}$ Ans.

(B) ⇒ One Complete cycle = 360°

So for one forth (1/4)

find phase in degree and radians = ?

$(1/4)(360) = \frac{90}{90} = 90^{\circ} \times 2\pi / 360 rad.$

$= 90 \times 2(3.14)/360 rad.$

$= 90 \times 6.28/360$

$= 90 \times 0.0174$

$= \boxed{1.57}$ Ans.

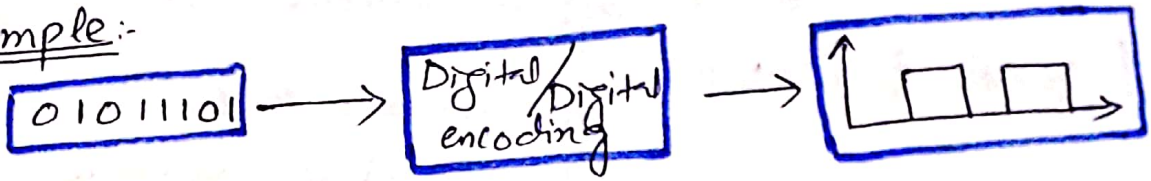
P #07

Explain the classification of digital to digital Conversion?

The data can be classified as analog or digital form. But the Computer need digital form to store the information; therefore that data should be converted into digital form.

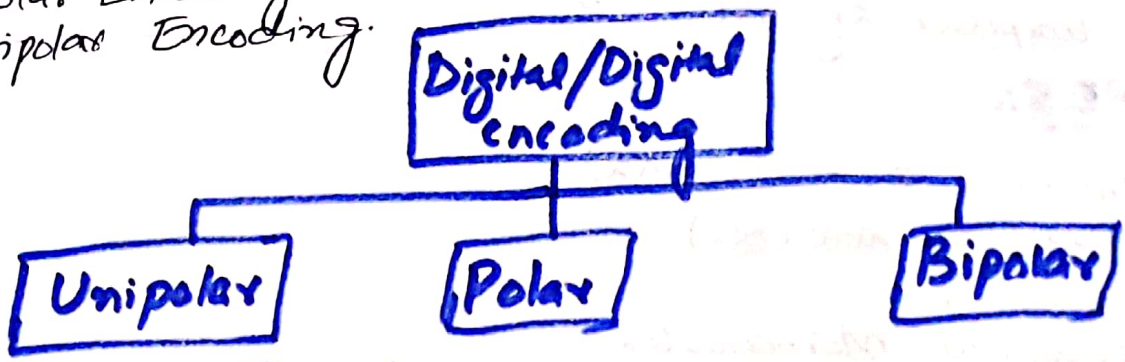
Digital to Digital Conversion:- it is the representation of digital information into digital signal that is '1s' and '0s' when generate by the Computer are translated into a voltage pulses that can propagated into a line. the process is called digital to digital Conversion or encoding.

Example:-



CATEGORIES:- There are three categories.

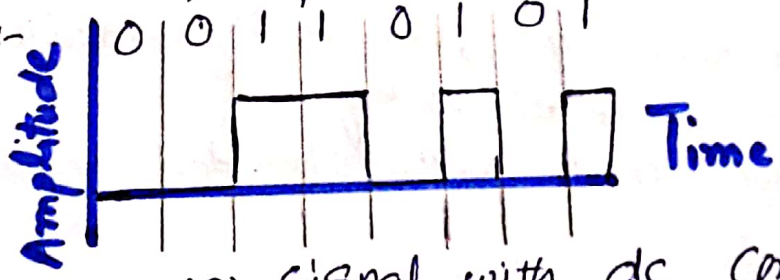
- Unipolar Encoding
- Polar Encoding
- Bipolar Encoding.



Unipolar Encoding:-

- Using of only one polarity.
- 0 state represents zero voltage.
- 1 is only encoded (one voltage level).
- polarity ('+' or '−') will be assigned to 1.
- Easy Method, inexpensive

Example:-

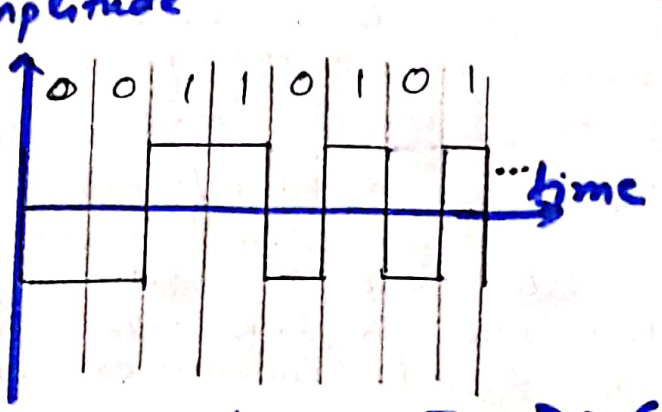


(a) signal with dc Compone

Problems:- it has two problems.

i) DC component (Average amplitude is non zero).
ii) Synchronization. (error in detection and recovery).

e.g:



(b) A signal without DC Component

(2) POLAR ENCODING:-

it has two leveles i-e (positive / negative) of amplitude.

- it eliminates some of DC residual problem because the level is reduced at voltage (average).
- Power to transmit the signal is one half of unipolar signal.

TYPES:-

- Nonreturn to zero (NRZ)
- Return to zero (RZ)
- Manchester
- Differential Manchester

NRZ (Non Return to zero):-

value of a signal will be always positive or negative.

Two Main types:- NRZ-L, NRZI

NRZ-L:- (NRZ level):-

- signal never returns to zero voltage, value during bit time is a level voltage.
- Good for short and well-sheilded transmission paths.

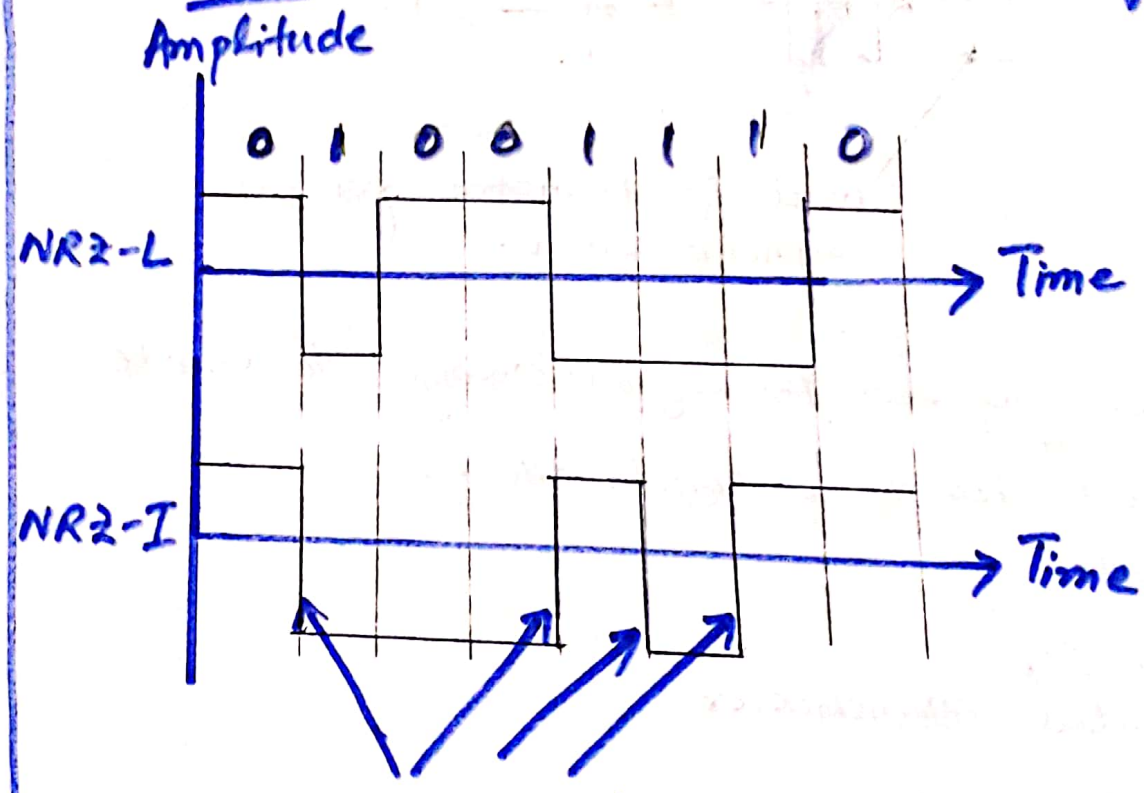
In NRZ-L it will dependent upon the state of the bit, dependent upon the state of the bit.

Problem: Synchornization of long streams of 0s or 1s.

NRZ-I (NRZ -invert):-

- it will invert on ones.
- The transition between a positive and negative ~~level~~ voltage represents a 1 bit.
- it will provide more synchronization than NRZ-L because there is a transition for each 1 bit.
- In NRZ-I the signal will be inverted if a 1 encountered.

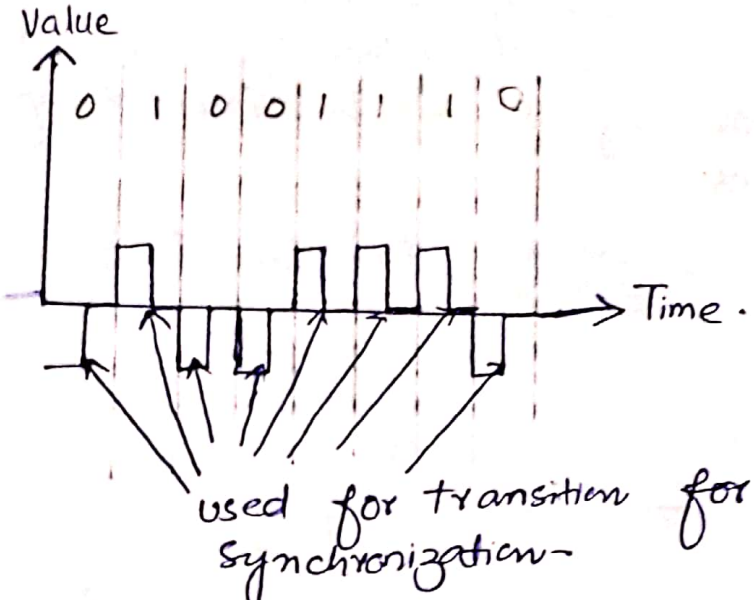
NRZ-L and NRZ-I encoding



transition because next bit is 1.

RZ encoding :-

- it will tries to solve the problem of losing synchornization due to long stings of consecutive 1s or 0s.
- Signal will change during each bit promotes synchronization.
- Positive voltage = 1;
- Negative voltage = 0.
- Signal will return to zero halfway through the bit interval.



Disadvantages :-

- it will required two signal changes to encode each bit
- required for more bandwidth.

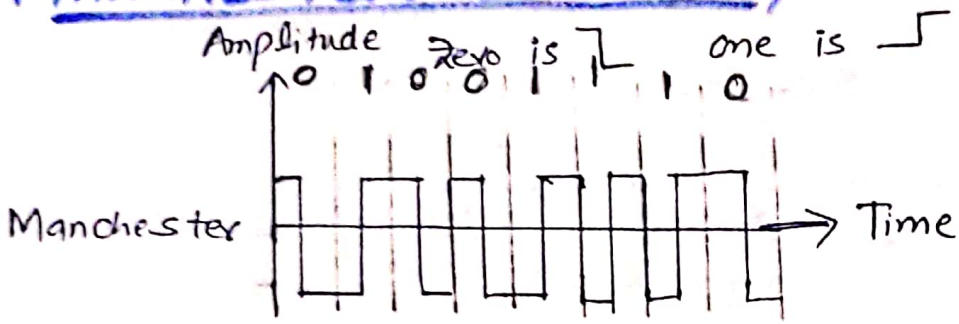
BIPHASE :-

- Manchester
- Differential Manchester.

MANCHESTER :-

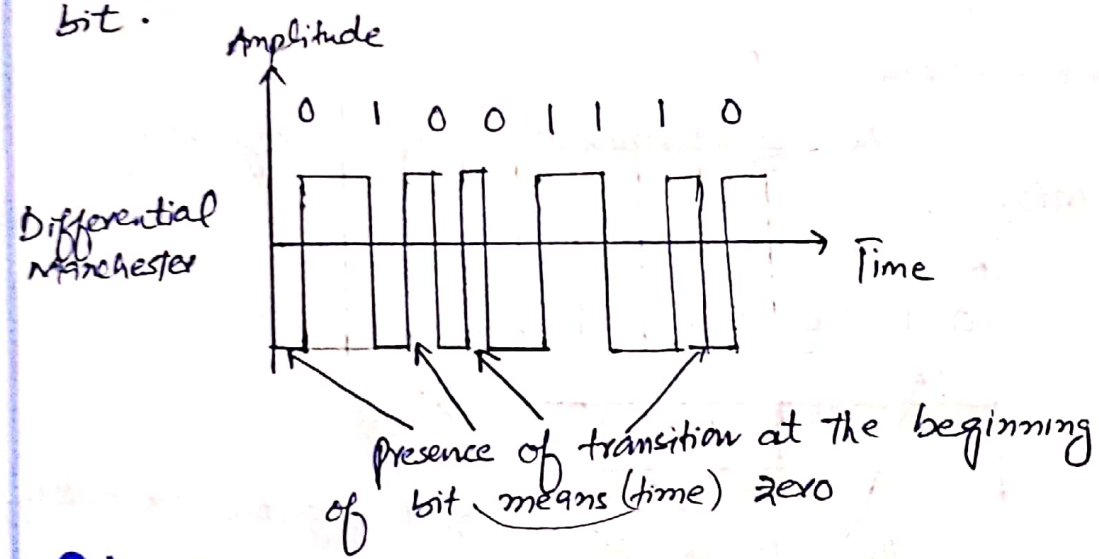
Code will be self clocking.
Transition for every bit in the the middle.
will be used for only to provide clocking.
positive to negative for a '0' bit. (Transition)
negative to positive for a '1' bit.

MANCHESTER ENCODING:-



Differential Manchester Coding :-

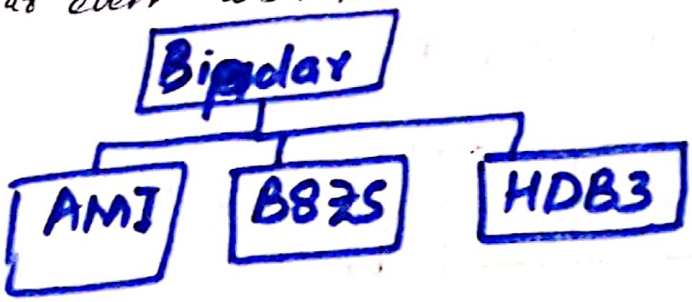
- Code will be self-clocking.
- Transition will be in the middle of the bit cell for every bit.
- For the beginning of the bit cell if the next bit is "0"
- No Transition at the beginning of the bit cell if the next bit is "1".
- Used in token ring.
- At the middle of the bit is only used for synchronization.
- Represents inversion or noninversion at the beginning of the bit.



Bipolar:-

- it will represents three voltage levels, positive, negative and zero.
- zero represents binary 0.
  one is represented by positive and negative voltages.
- the first 1 bit represents by positive amplitude, then the second one will be negative voltage, third 1 bit is

represented by the positive amplitude and so on. will occur even when the 1 bits are not consecutive.



* Bipolar AMI :-

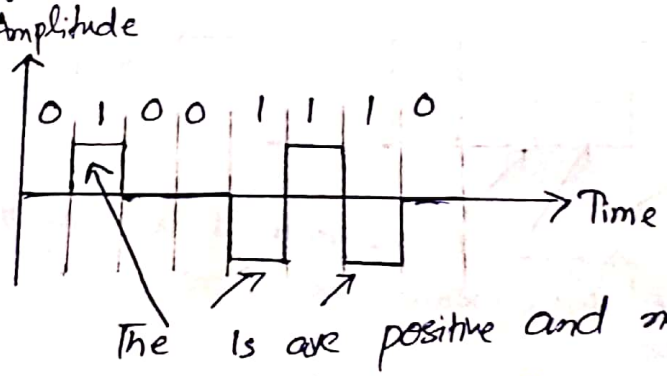
- AMI stands for alternate mark inversion, where mark word comes from telegraphy which means 1. it will be as alternate 1 inversion.
- In Bipolar AMI encoding scheme,
  0 bit represents by zero level.
  1 bit represents by alternating positive and negative voltages.

Advantages:-

- DC compenet will be zero.
- Sequence of 1s bit are synchronized.

Disadvantages:-

- Does not ensure the synchronization of a long strings of 0s bits.



* **B8ZS:-** stands for Bipolar 8-zero Substitution
* **HDB3:-** stands for High-Density polar 3.

Difference between Data element and signal element :-

A data element is the smallest entity which will represents a piece of information (a bit).

A signal element is the shortest unit of a digital signal. Data elements are what we need to send, signal elements are what we can send Data elements are being carried are the carriers.

A signal element is the shortest unit of a digital signal.

We are also defining a ratio r which is no of data element carried by each signal for the purpose of understanding relation b/w data element and signal element.

So $r = \frac{\text{data element}}{\text{signal element}}$.

P# 14

b) We want to digitize the human voice. What is the bit rate, assuming 7 bits per sample?

Answers:- Given data:

Bits = 7

Find:- Bit rate?

Sampling rate = ?

Solution:-

Human frequency contains = 0 to 4000 Hz

Sampling rate = $4000 \times 2 = 8000$ sample/s

Bit rate = Sampling rate × no. of bits per sample. — (A)

putting values in (A)

Sor

Bit rate = 8000×7

$= 56000$ bps

Convert to kps

Bit rate = 56 kbps Ans.

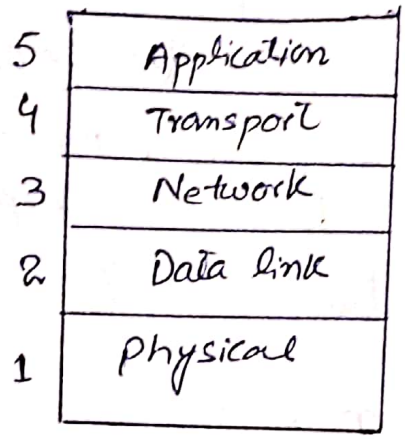
Q3(a) Explain the Responsibilities of different layers of TCP/IP in Detail.

Answer:-

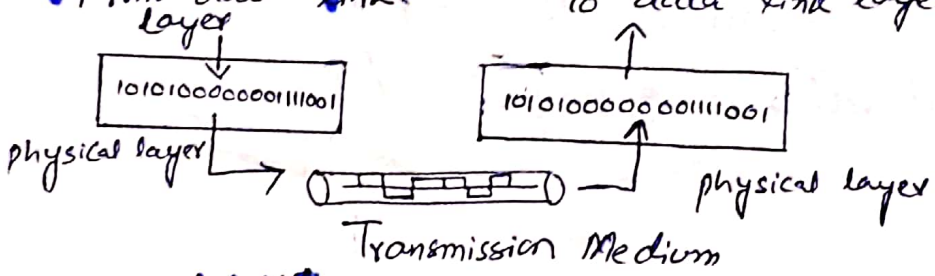
∴ **TCP/IP Model:-**

TCP/IP Model is prior to the OSI Model but not similiar as OSI Model.

There are 5 layers.



Physical layer:- Def:- It helps to transmitting the individual bits from one node to another



Responsibilities:-

1) Specifies the characteristics of the hardware to used for networking.
   e.g. communications Media.
2) Standards IEEE 802.3.
3) Ethernet network Media.
4) Pin Connectors specification.

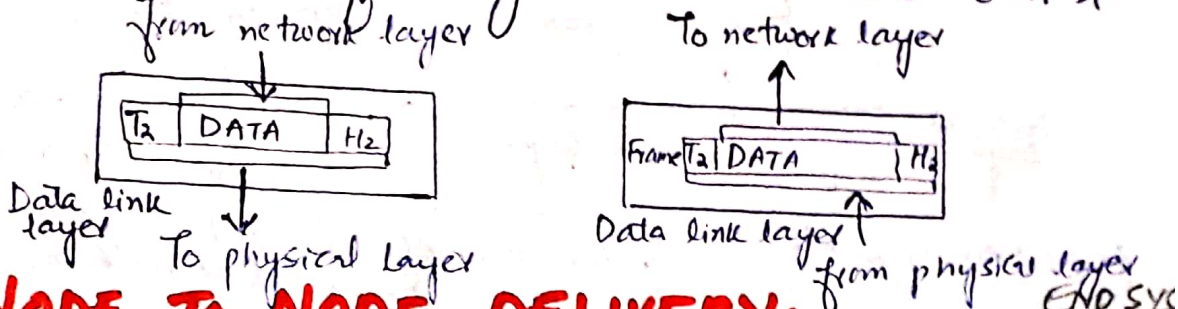
* DATA LINK LAYER:-

Definition:- It identifies the Network protocal type of the packet. (transmits frame from one node to next node).

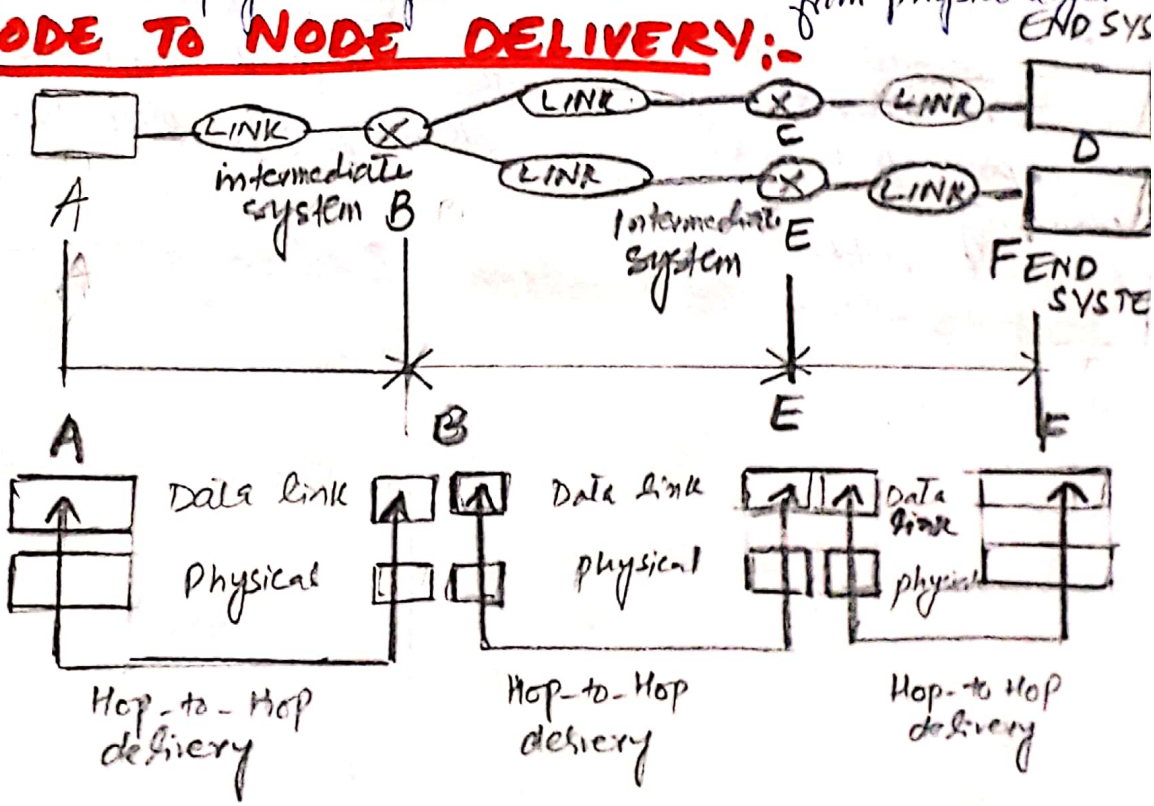
Responsibilities:-

1) it will provide framing.
2) provide error control.
3) provide flow control.
4) Access control.

Example:- framing and point-to-point protocol (APP) framing. Ethernet IEEE 802.2.



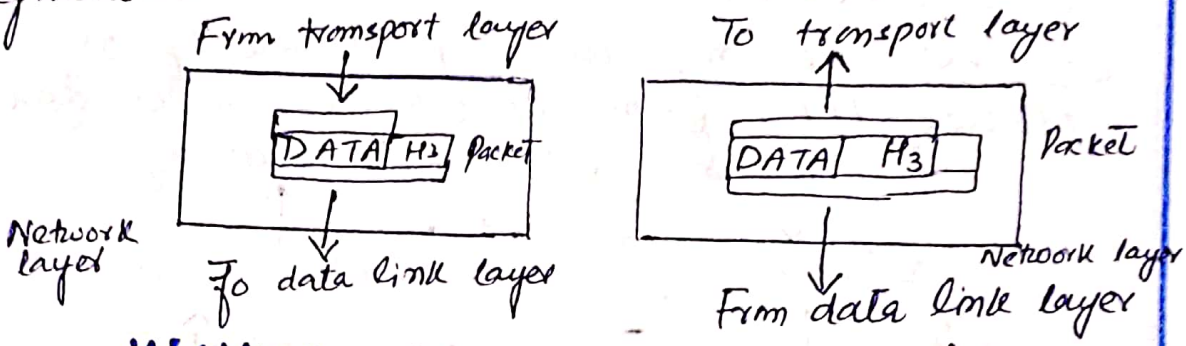
NODE TO NODE DELIVERY:-



* **Network Layer:-** it is also known as internet layer or IP layer, which works to accepts and delivers packets for the network it involves powerful internet Protocal (IP) etc.

∴ **IP Protocal:-** while IP is Responsible for

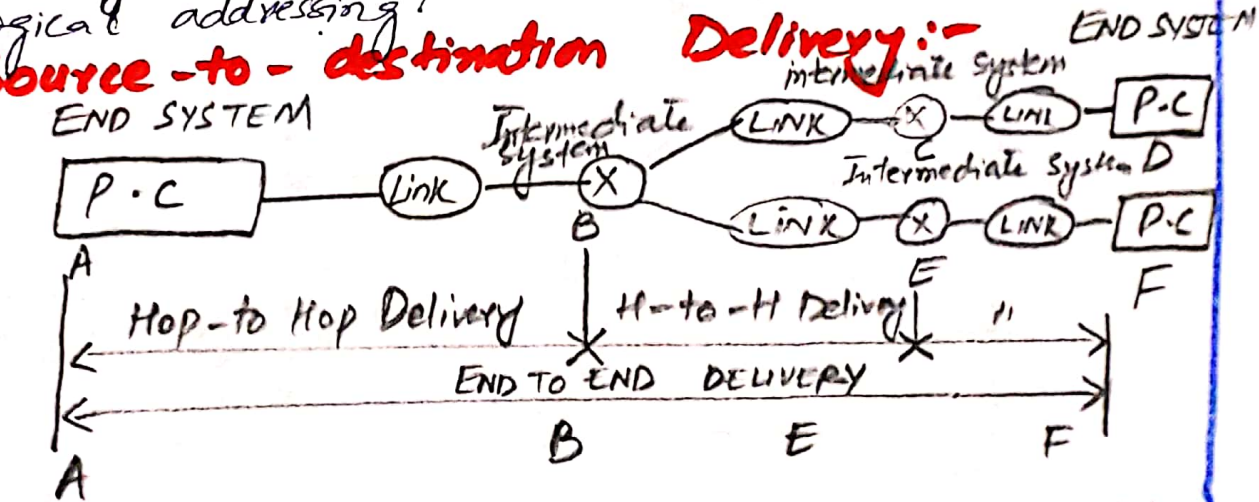
- IP addressing.
- Host to Host Communication.
- Packet formating.
- Fragmentation.

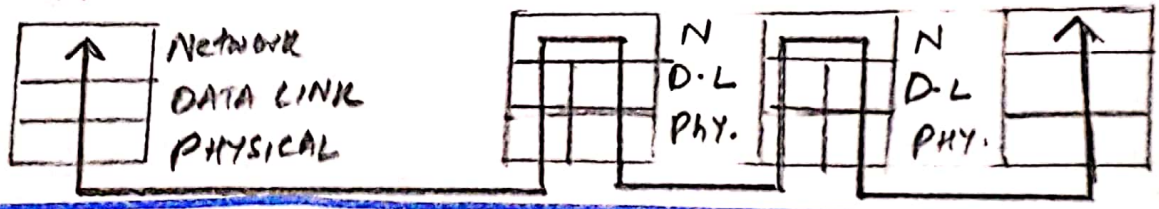


Responsibilities:- delivering of packets from the orginal sources to the final destination source.

- required Network layer for two adjoint systems.
- Multiple Networks for delivery of packets.
- Routing.
- Logical addressing.

Source-to-destination Delivery:-



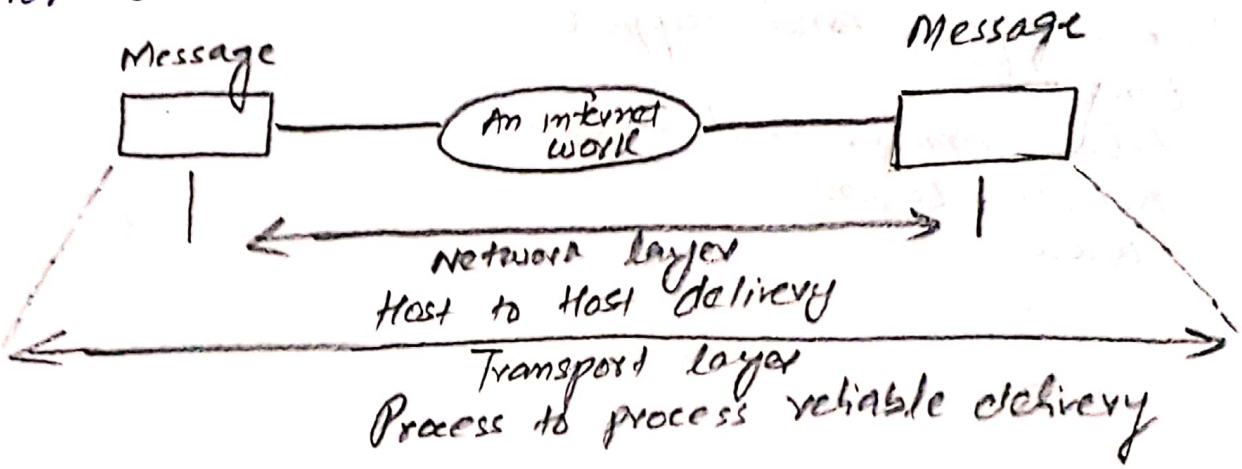


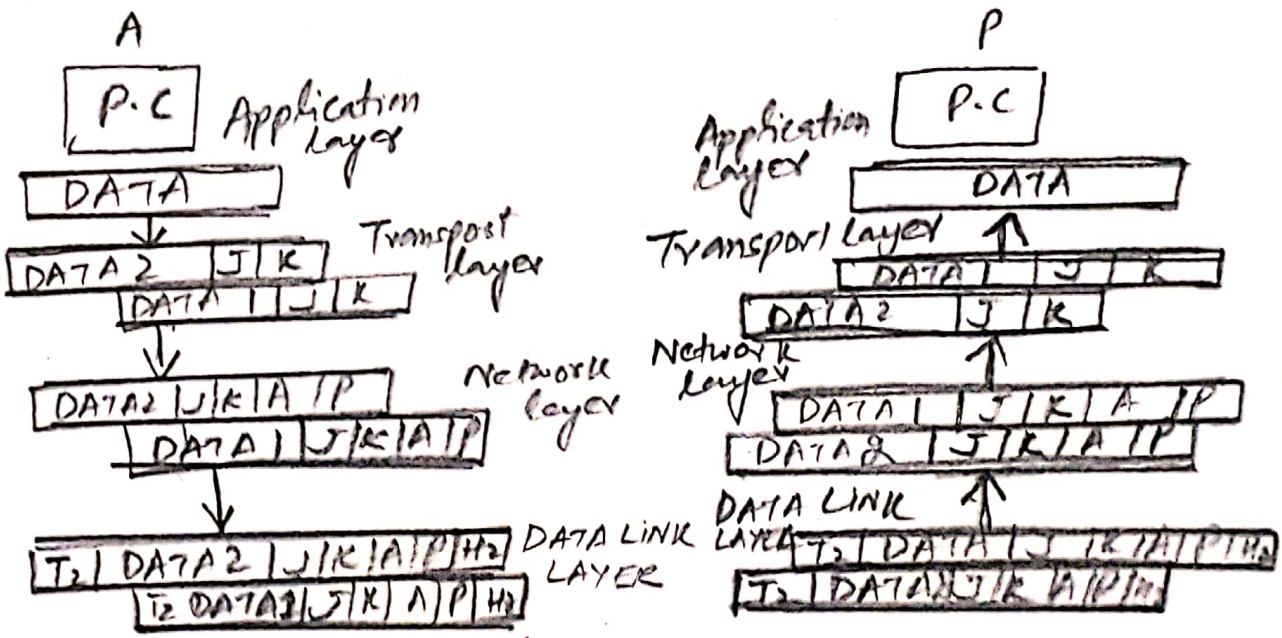
END to END DELIVERY

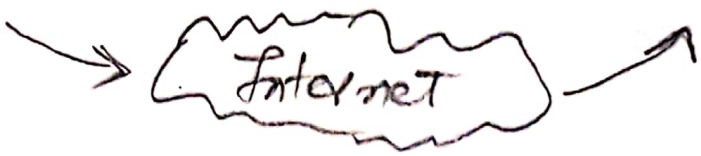
Transport layer:- it is reponsible for the reliability, flow control, and correction of data which is sent over the network.

They used two protocal:
User Datagram protocol.
Transmission Control protocol.

process to process delivering of entire message.
Port addressing
Segmentation and reassembly.
it will end-to-end flow control.
error control.



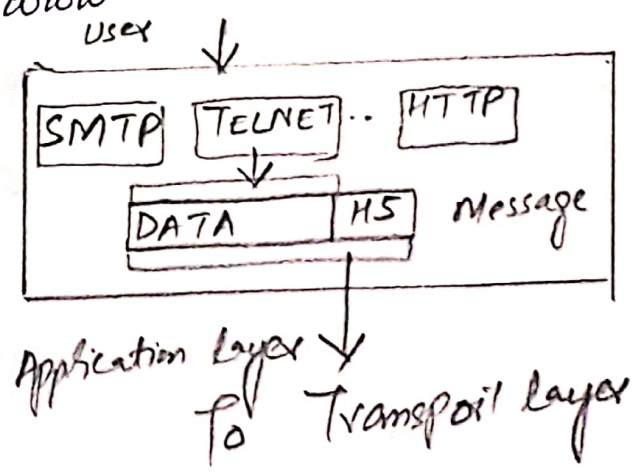


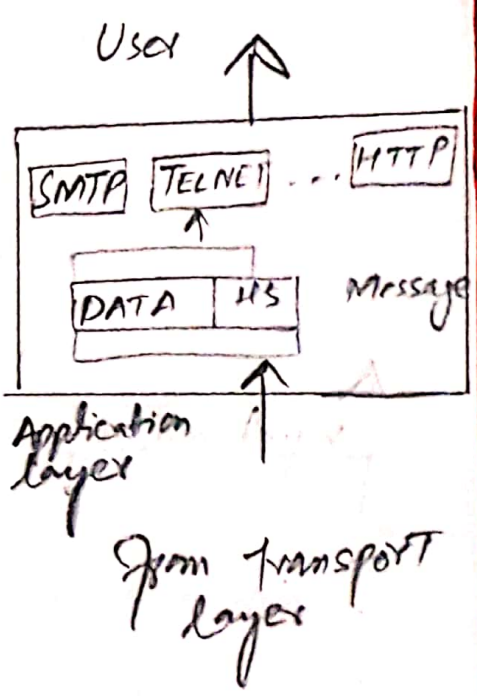


Application Layer:- It is the topmost layer in TCP/IP model. Responsible for handling high-level protocols, issues of Representation. it allows the user to interact with the application. if one layer protocol wants to communicate with another application layer, will forwards the data to transport layer.
Every application can not be placed inside the application lay except those who interact with the Communication System.
Used in application layer are:- HTTP, SNMP, SMTP DNS, TELENT, FTP

Responsibilities:-

- Enables access to the network.
- User interfaces and support.
  - Email
  - File Transfer and access
  - Remote Login
  - WWW



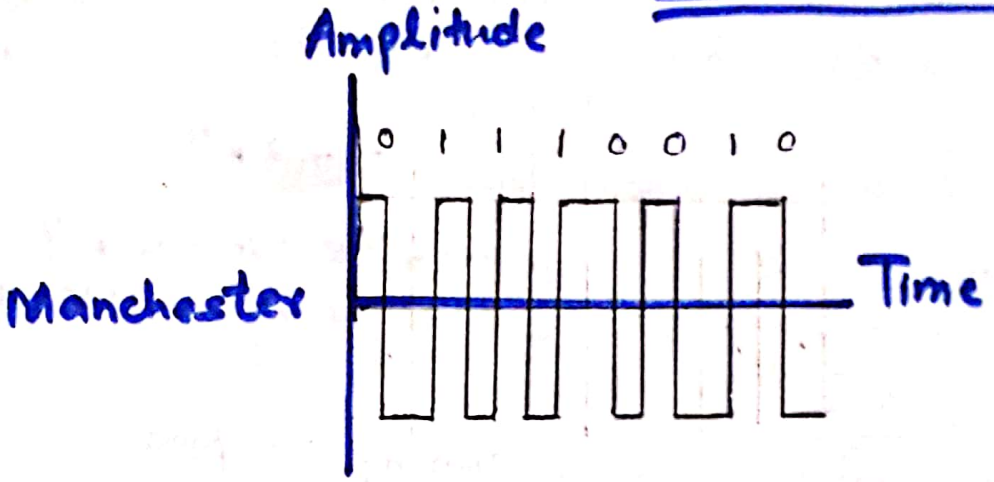


3(b) Convert the following data 01110010 to Manchester coding and Bipolar AMI?

Answer:-

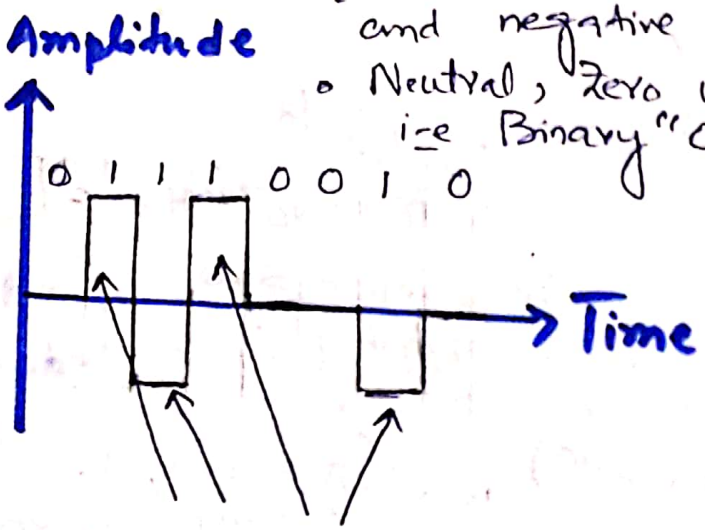
Zero is ⌐¯
One is ¯⌐

* Manchester coding



* Bipolar AMI :-

- Binary "1s" representation i.e alternative +ive and negative voltages
- Neutral, Zero voltage i.e Binary "0"



∴ The 1s is positive and the other 1 will be negatively alternatively.