CMR
INSTITUTE OF
TECHNOLOGY

Scheme Of Evaluation
Improvement Test – March'17

Sub:	DATA COMMUNICATION			**Code:**	15CS46
Date: 30/03/17	Duration: 90mins	Max Marks: 50	**Sem:** IV	**Branch:**	CSE/ISE

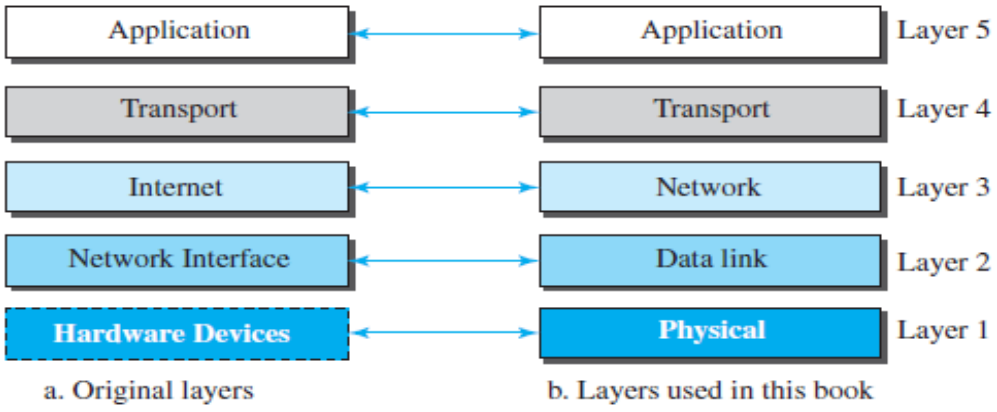
Note: Answer Any Five Question

Question #		Description	Marks Distribution		Max Marks
1	a)	5 layers Explanation of each layer(protocols)	2*5	10M	10 M
2	a)	Mesh- n(n-1)/2 Star- n Bus – 1 back bone & n drop lines Ring – n-1	2M	2M	10 M
	b)	Attenuation, Amplifier, formula Distortion Noise	3M 3M 2M	8M	
3	a)	Component diagram Explanation and problem solving	2M 8M	4M	10 M
4		Line coding definition unipolar, polar, bipolar and biphase	2M 2 each(8 M)	10M	10 M
5		Internet standards Maturity levels diagram and explaination	2M 8M	10M	10 M
6		Definition Explanation Approximation	2M 5M 3M	10M	10 M
7	a)	Asynchronous Transmission modes Synchronous Transmission modes	3M 3M	6M	10M
	b)	dB=10log10(p2/p1) Answer= 1.4mW	2M 2M	4M	

Solutions

1. **TCP/IP is a protocol suite (a set of protocols organized in different layers) used in the Internet today. It is a hierarchical protocol made up of interactive modules, each of which provides a specific functionality. The term *hierarchical* means that each upper level protocol is supported by the services provided by one or more lower level protocols.**

   Layered Architecture



Physical layer:
The physical layer is the lowest level in the TCP/IP protocol suite, the communication between two devices at the physical layer is through the transmission media, under the physical layer. Two devices are connected by a transmission medium (cable or air). So the bits received in a frame from the data-link layer are transformed and sent through the transmission media

Data link layer:
TCP/IP does not define any specific protocol for the data-link layer. It supports all the standard and proprietary protocols. Any protocol that can take the datagram and carry it through the link suffices for the network layer. The data-link layer takes a datagram and encapsulates it in a packet called a *frame*.

Network layer:
The network layer is responsible for creating a connection between the source computer and the destination computer. There can be several routers from the source to the destination, the routers in the path are responsible for choosing the best route for each packet.
Main protocols are

- **Internet Protocol (IP)- defines the format of the packet, called a datagram at the network layer. Also defines the format and the structure of addresses used in this layer.**
- **The Internet Control Message Protocol (ICMP) helps IP to report some problems when routing a packet.**
- **The Internet Group Management Protocol (IGMP) is another protocol that helps IP in multitasking.**
- **The Dynamic Host Configuration Protocol (DHCP) helps IP to get the network-layer address for a host.**

- **The Address Resolution Protocol (ARP) is a protocol that helps IP to find the link-layer address of a host or a router when its network-layer address is given.**

Transport Layer:

The logical connection at the transport layer is also end-to-end. The transport layer at the source host gets the message from the application layer, encapsulates it in a transport layer packet (called a *segment* or a *user datagram* in different protocols) and sends it, through the logical (imaginary) connection, to the transport layer at the destination host.

The main protocol,

- **Transmission Control Protocol (TCP), is a connection-oriented protocol that first establishes a logical connection between transport layers at two hosts before transferring data. TCP provides flow control, error control, and congestion control to reduce the loss of segments due to congestion in the network.**
- **User Datagram Protocol (UDP), is a connectionless protocol that transmits user datagrams without first creating a logical connection. UDP is a simple protocol that does not provide flow, error, or congestion control.**

Application layer:

The logical connection between the two application layers is end-to-end. The two application layers exchange *messages* between each other as though there were a bridge between the two layers. Communication at the application layer is between two *processes*. To communicate, a process sends a request to the other process and receives a response. Process-to-process communication is the duty of the application layer.

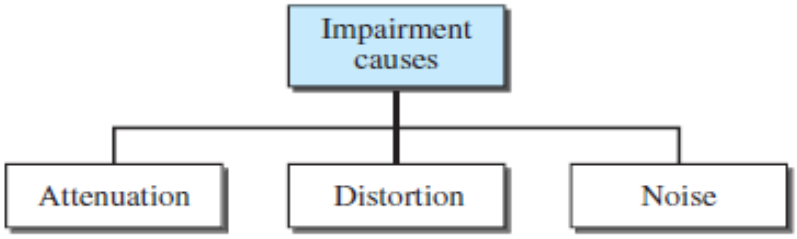
Protocols are :

- **The Hypertext Transfer Protocol (HTTP) is a vehicle for accessing the World Wide Web (WWW).**
- **The Simple Mail Transfer Protocol (SMTP) is the main protocol used in electronic mail (e-mail) service.**
- **The File Transfer Protocol (FTP) is used for transferring files from one host to another.**
- **The Terminal Network (TELNET) and Secure Shell (SSH) are used for accessing a site remotely.**
- **The Simple Network Management Protocol (SNMP) is used by an administrator to manage the Internet at global and local levels.**

2.a)

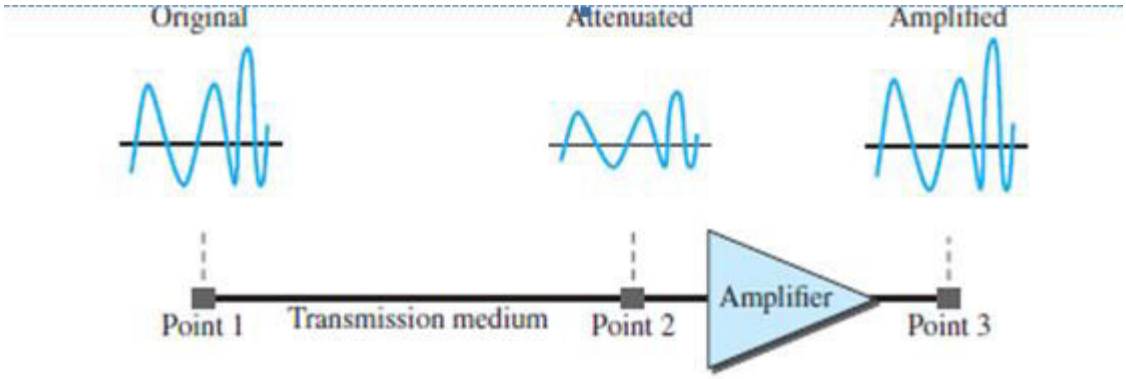
- **Mesh- n(n-1)/2**
- **Star- n**
- **Bus – 1 back bone & n drop lines**
- **Ring – n-1**

2b) The causes for impairments are



Attenuation

Attenuation means a loss of energy. When a signal, simple or composite, travels through a medium, it loses some of its energy in overcoming the resistance of the medium. That is why a wire carrying electric signals gets warm, if not hot, after a while. Some of the electrical energy in the signal is converted to heat. To compensate for this loss, amplifiers are used to amplify the signal.



Decibel

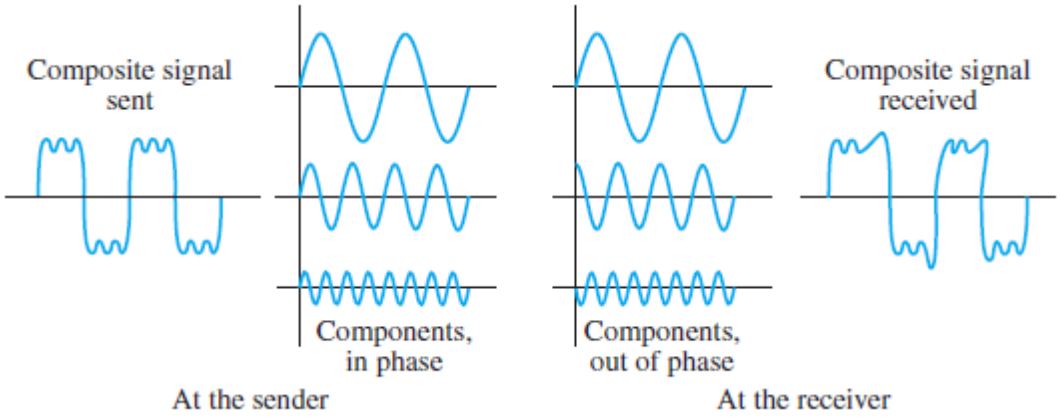
To show that a signal has lost or gained strength, engineers use the unit of the decibel. The **decibel (dB)** measures the relative strengths of two signals or one signal at two different points. Note that the decibel is negative if a signal is attenuated and positive if a signal is amplified.

$$\text{dB} = 10 \log_{10} \frac{P_2}{P_1}$$

Variables P_1 and P_2 are the powers of a signal at points 1 and 2, respectively. Note that

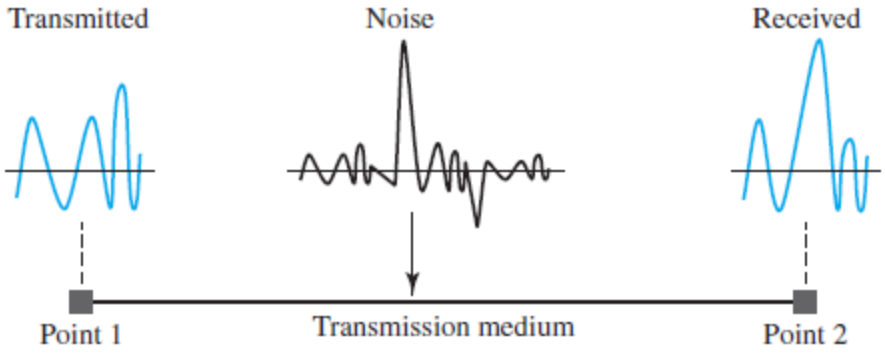
Distortion:

Distortion means that the signal changes its form or shape. Distortion can occur in a composite signal made of different frequencies. Each signal component has its own propagation speed through a medium and, therefore, its own delay in arriving at the final destination. Signal components at the receiver have phases different from what they had at the sender. The shape of the composite signal is therefore not the same.



Noise:

Noise is another cause of impairment. Types of noise, such as thermal noise, induced noise, crosstalk, and impulse noise, may corrupt the signal.

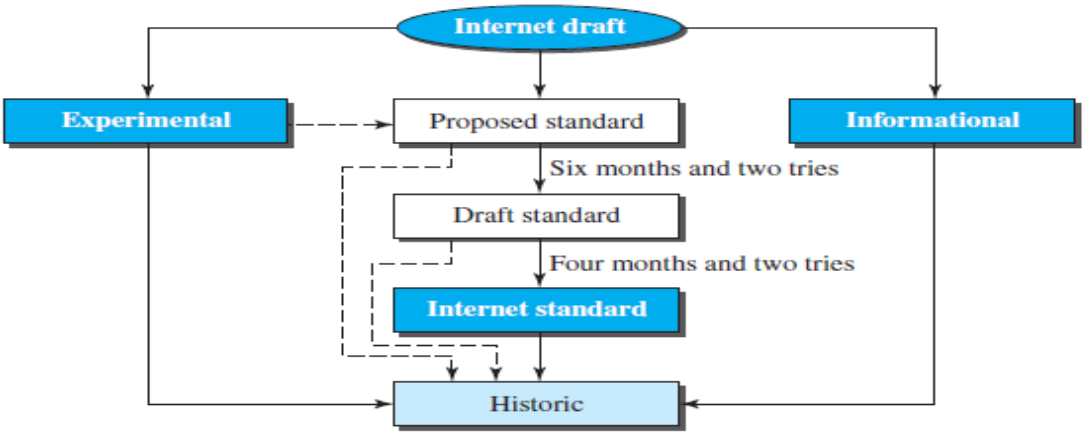


5) INTERNET STANDARDS

An Internet standard is a thoroughly tested specification that is useful to and adhered to by those who work with the Internet. It is a formalized regulation that must be followed. There is a strict procedure by which a specification attains Internet standard status. A specification begins as an Internet draft.

An Internet draft is a working document (a work in progress) with no official status and a six-month lifetime. Upon recommendation from the Internet authorities, a draft may be published as a Request for Comment (RFC).

An RFC, during its lifetime, falls into one of six *maturity levels:* proposed standard, draft standard, Internet standard, historic, experimental, and informational.



- ***Proposed Standard*. A proposed standard is a specification that is stable, well understood, and of sufficient interest to the Internet community. At this level, the specification is usually tested and implemented by several different groups.**
- ***Draft Standard.* A proposed standard is elevated to draft standard status after at least two successful independent and interoperable implementations. Barring difficulties, a draft standard, with modifications if specific problems are encountered,normally becomes an Internet standard.**
- ***Internet Standard.* A draft standard reaches Internet standard status after demonstrations of successful implementation.**
- ***Historic.* The historic RFCs are significant from a historical perspective. They either have been superseded by later specifications or have never passed the necessary maturity levels to become an Internet standard.**
- ***Experimental.* An RFC classified as experimental describes work related to an experimental situation that does not affect the operation of the Internet. Such an RFC should not be implemented in any functional Internet service.**
- ***Informational.* An RFC classified as informational contains general, historical, or tutorial information related to the Internet. It is usually written by someone in a non-Internet organization, such as a vendor.**

7)
b)

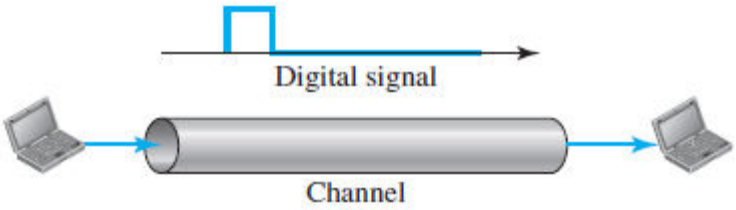
The loss in the cable in decibels is $5 \times (-0.3) = -1.5$ dB. We can calculate the power as

$$\text{dB} = 10 \log_{10} (P_2 / P_1) = -1.5 \quad \longrightarrow \quad (P_2 / P_1) = 10^{-0.15} = 0.71$$

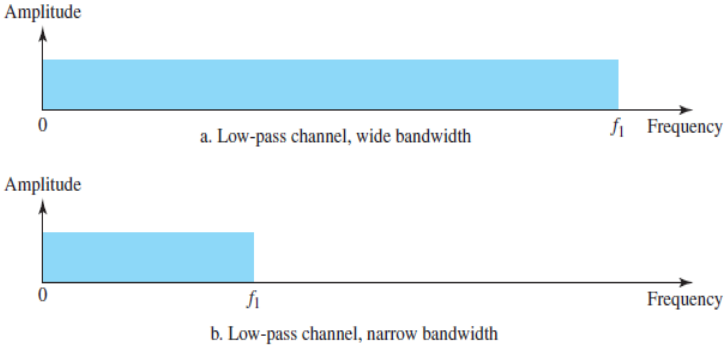
$$P_2 = 0.71 P_1 = 0.7 \times 2 \text{ mW} = 1.4 \text{ mW}$$

6) Explain in detail the Baseband transmission approach.

- Baseband transmission means sending a digital signal over a channel without changing the digital signal to an analog signal. Figure shows **baseband** transmission.



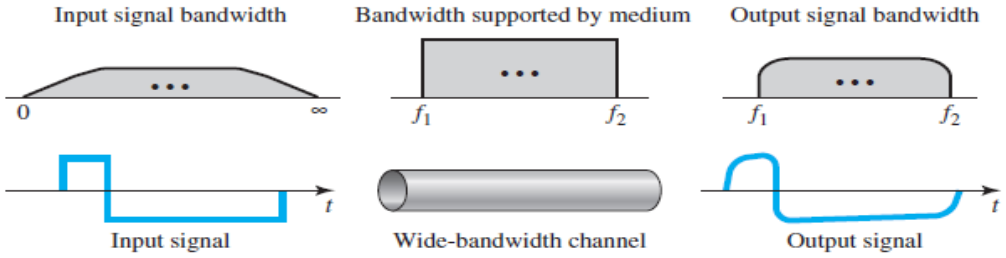
- Baseband transmission requires that we have a **low-pass channel,** a channel witha bandwidth that starts from zero.
- ***Bandwidths of two low-pass channels***
  Two low-pass channels: one with a narrow bandwidth and wide bandwidth.



Two cases of a baseband communication

- ***Case 1: Low-Pass Channel with Wide Bandwidth***
- If we want to preserve the exact form of a nonperiodic digital signal with vertical segments vertical and horizontal segments horizontal, we need to send the entire spectrum,the continuous range of frequencies between zero and infinity. This is possible if we have a dedicated medium with an infinite bandwidth between the sender and receiver that preserves the exact amplitude of each component of the composite signal.

Baseband transmission using a dedicated medium



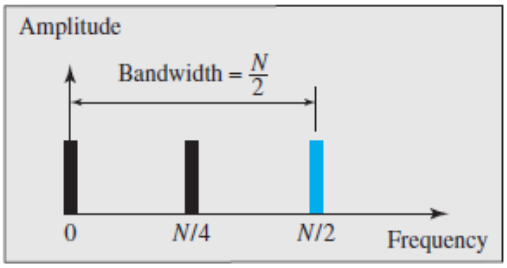
An example of a dedicated channel where the entire bandwidth of the medium is used as one single channel is a LAN.

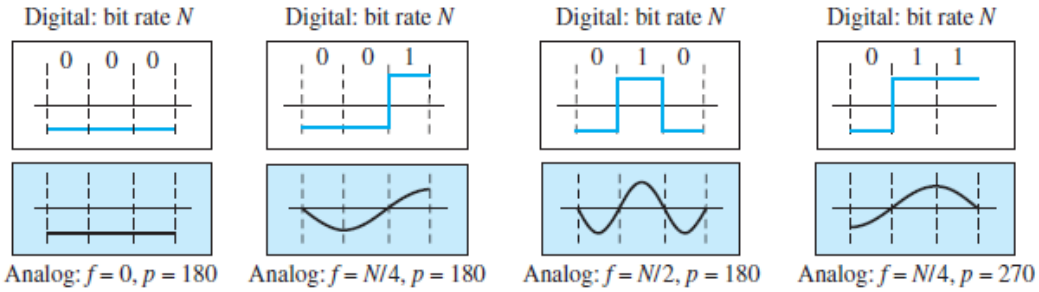
Case 2: Low-Pass Channel with Limited Bandwidth

In a low-pass channel with limited bandwidth, we approximate the digital signal with an analog signal. The level of approximation depends on the bandwidth available.

Rough Approximation

Let us assume that we have a digital signal of bit rate N. If we want to send analog signalsto roughly simulate this signal, we need to consider the worst case, a maximum number of changes in the digital signal. This happens when the signal carries the sequence 01010101 . . . or the sequence 10101010. . . . To simulate these two cases, we need an analog signal of frequency $f = N/2$. This rough approximation is referred to as using the first harmonic ($N/2$) frequency. The required bandwidth is

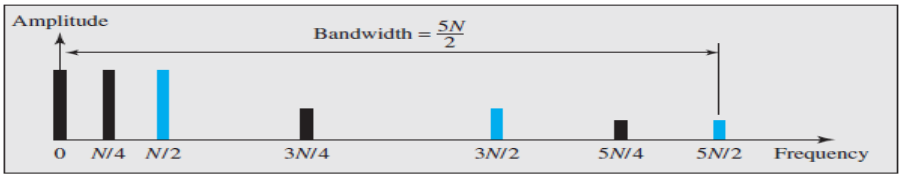


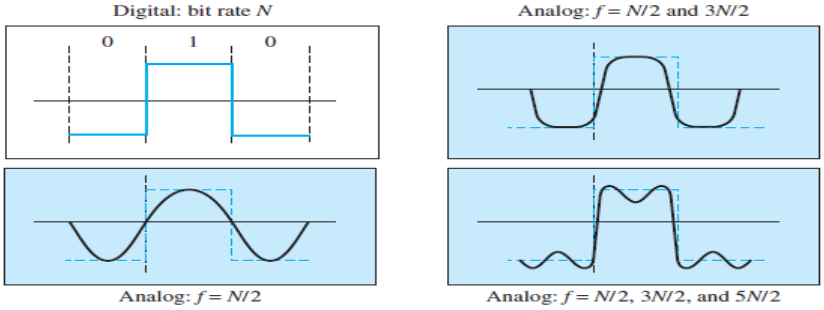


Better Approximation

We need to increase the bandwidth. We can increase the bandwidth to 3*N*/2, 5*N*/2, 7*N*/2, and so on.

Simulating a digital signal with first three harmonics



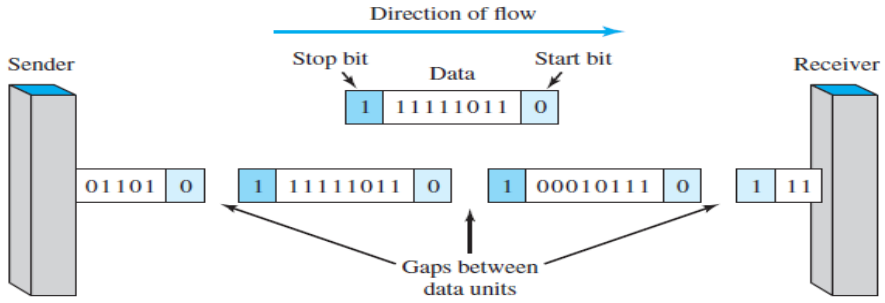


7 a) Write a note on asynchronous and synchronous transmission modes.

Asynchronous transmission

- The timing of a signal is unimportant.Instead, information is received and translated by agreed upon patterns.
- Patterns are based on grouping the bit streaminto bytes. Each group, usually 8 bits, is sent along the link as a unit. The sending systemhandles each group independently Patterns are based on grouping the bit stream into bytes. Each group, usually 8 bits, is sent along the link as a unit. The sending system handles each group independently
- the receiver cannot use timing to predict when the nextgroup will arrive. To alert the receiver to the arrival of a new group, therefore, an extrabit is added to the beginning of each byte.

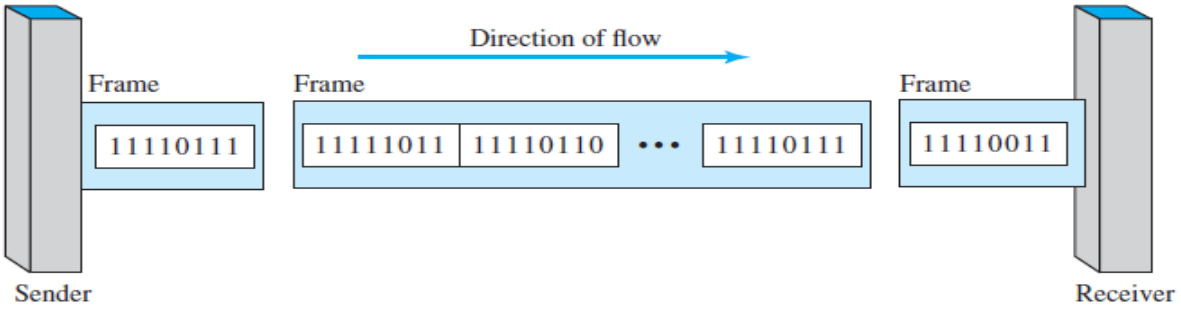
- **In asynchronous transmission, we send 1 start bit (0) at the beginning and 1 or more stop bits (1s) at the end of each byte. There may be a gap between bytes.**



  - **Advantage: less cost**
  - **Disadvantage: slower**

Synchronous Transmission

- In **synchronous transmission,** the bit stream is combined into longer "frames," which may contain multiple bytes.
- Each byte, however, is introduced onto the transmission link without a gap between it and the next one. It is left to the receiver to separate the bit stream into bytes for decoding purposes.
- data are transmitted as an unbroken string of 1s and 0s, and the receiver separates that string into the bytes, or characters, it needs to reconstruct the information.



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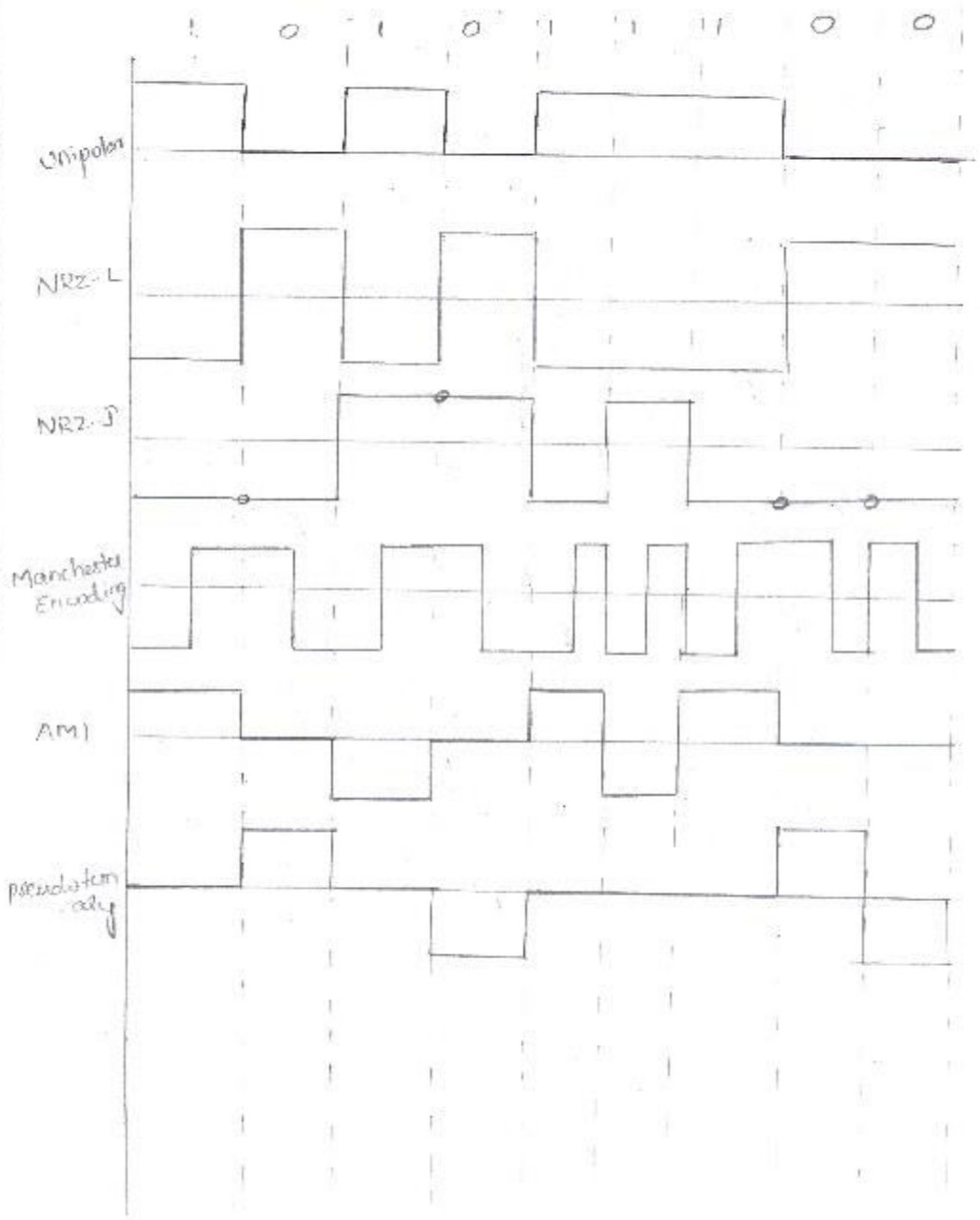
1 0 1 0 1 1 1 0 0
Unipolar
NRZ-L
NRZ-I
Manchester Encoding
AMI
pseudoternary