

Exam-2020

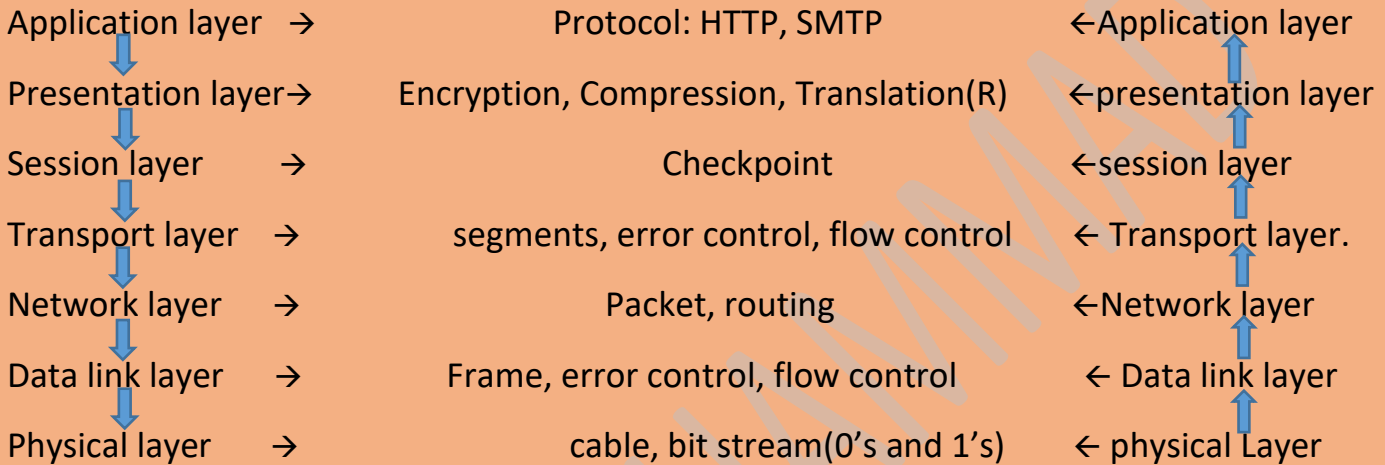
1.

A. Illustrate each layer of OSI model with a suitable example.

Ans: Developed by The **ISO**. Stands for International Standards for Organization.

Sender

Receiver.



B.

I. Compare the characteristics of LAN, MAN and WAN.

Parameter	LAN	MAN	WAN
Definition and Meaning	LAN is a network that usually connects a small group of computers in a given geographical area.	MAN is a comparatively wider network that covers large regions- like towns, cities, etc.	The WAN network spans to an even larger locality. It has the capacity to connect various countries together. For example, the Internet is a WAN.
Maintenance and Designing	Very easy to design and maintain.	Comparatively difficult to design and maintain.	Very difficult to design and maintain.
Speed	LAN offers a very high Internet speed.	MAN offers a moderate Internet speed.	WAN offers a low Internet speed.

Delay in Propagation	It faces a very short propagation delay.	It faces a moderate propagation delay.	It faces a high propagation delay.
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II. What are the key features of a protocol?

Ans: There are mainly three key elements of a protocol, they are as follows:

- I. **Syntax**
- II. **Semantics**
- III. **Timing**

- ✓ **Syntax:** Concerns the format of the data blocks
- ✓ **Semantics:** Includes control information for coordination and error handling
- ✓ **Timing:** Includes speed matching and sequencing

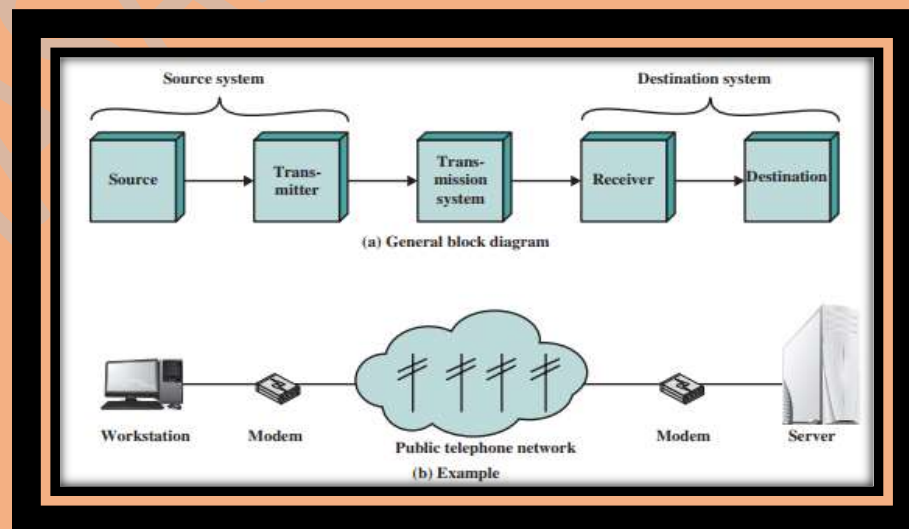
2.

A. Write the objectives and learning outcomes of the data communication and engineering as a student of CSE.

Ans: Updating technology is the biggest challenge in any field of engineering. Hence data communication helps you build a strong foundation in networking, digital technology, communication methods, etc. This will also help you choose your field of study in case of specialization.

B. Explain a simplified communications model with example.

Ans:



- ✓ The "**source**" is the sender of the message or information.

- ✓ The **transmitter** changes the message into a signal that is sent over the communication channel to the receiver.
- ✓ **Transmission system** is a system that transmits a signal from one place to another.
- ✓ The **receiver** is a sort of inverse transmitter, changing the transmitted signal back into a message, and interpreting this message.
- ✓ This message is then sent to the **destination**. The destination may be another receiver (i.e., the message is passed on to someone else), or the message may rest with the initial receiver, and the transmission is achieved.

C. Has any implementation of OSI model? Make comparison between the OSI model with the TCP/IP model.

Ans: Android's network capability is implemented over the OSI 7 layers model. The Open Systems Interconnection (OSI) model is a conceptual model that characterizes and standardizes the internal functions of a communication system by partitioning it into abstraction layers.

Comparison between The OSI and TCP/IP Model.

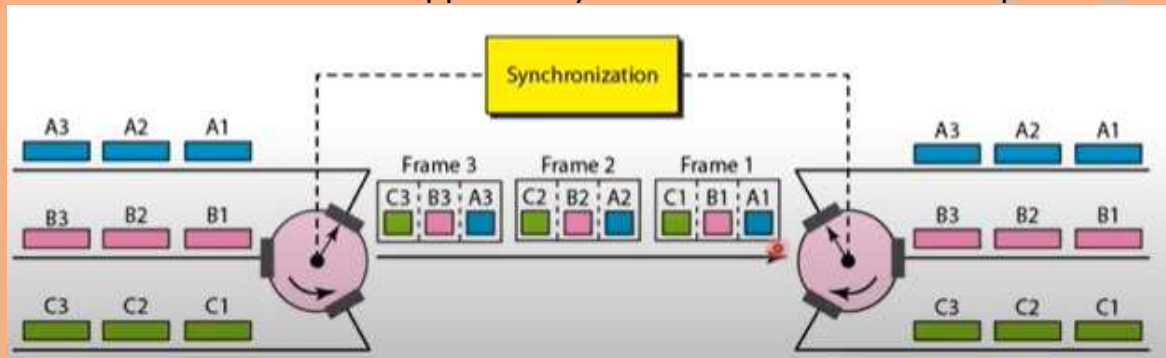
TCP/IP(5 layer)	OSI(7 layer)	TCP/IP(4 layer)
Application layer.	Application layer	Application layer.
	Presentation layer.	
	Session layer	
Transport layer.	Transport layer	Transport layer.
Network layer	Network layer.	Internet layer.
Data link layer	Data link layer.	Network access layer.
Physical layer	Physical layer.	

3.

A. Briefly describe STDM with figure. why is it that the start and stop bits can be eliminated when character interleaving is used in STDM.

The time slots are pre-assigned and fixed. This slot is even given if the source is not ready with data at this time. In this case, the slot is transmitted empty. It is used for multiplexing digitized voice streams.

- TDM can be visualized as two fast-rotating switches, one on the multiplexing side and the other on the de-multiplexing side.
- The switches are synchronized and rotate at the same speed, but in opposite directions.
- On the multiplexing side, as the switch opens in front of a connection, that connection has the opportunity to send a unit onto the path, this process is called **interleaving**.
- On the de-multiplexing side, as the switch opens in front of a connection, that connection has the opportunity to receive a unit from the path.



Start and stop bits can be eliminated when character interleaving is used in synchronous TDM, they are removed by the sender and then reinserted by the receiver. This improves the efficiency of bit interleaving.

B.

I. What is parity bit and CRC?

Ans: A **parity bit** is an extra bit included in binary message to make total number of 1's either odd or even.

A **cyclic redundancy check** is an error-detecting code commonly used in digital networks and storage devices to detect accidental changes to digital data.

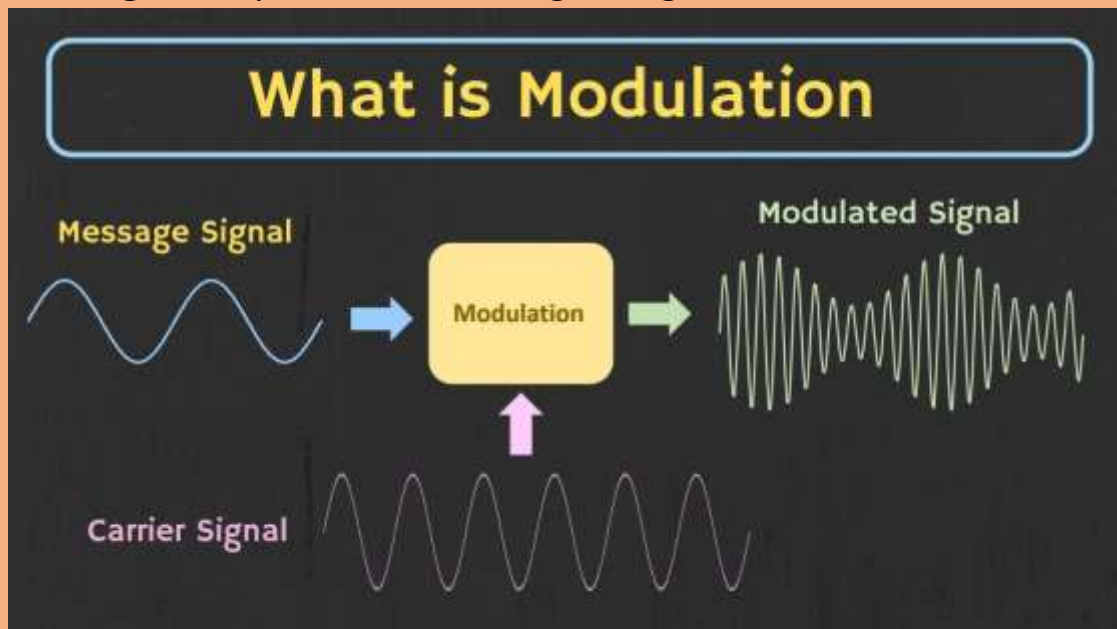
II. Calculate the CRC for given 8-bit block of data or message $M=1100011$, frame check sequence consist of 5 bits and the predetermined divisor $p=110011$.

Ans: solved, following by chapter note pdf(Chapter 6)

4.

A. Define encoding. Discuss the modulation technique with figure.

Ans: Encoding is the process of turning thoughts into communication.

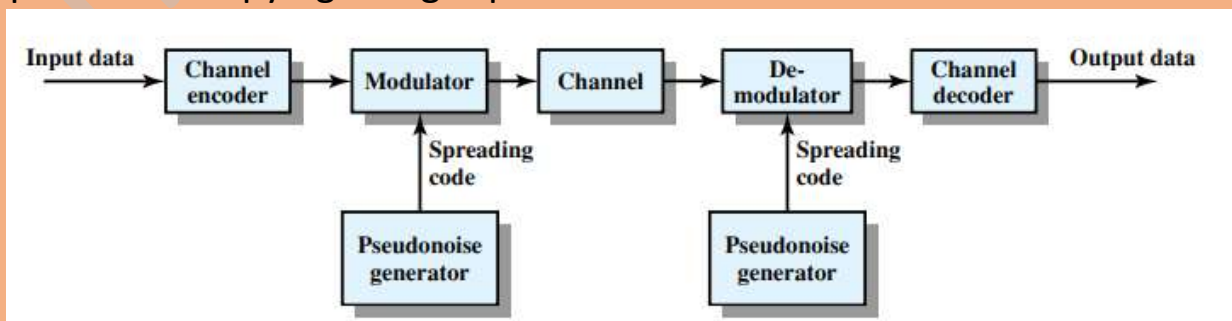


B. Why Pulse Code Modulation(PCM) is preferable to Differential Manchester for encoding analog signals that represents digital data.

Ans: Pulse code modulation (PCM) is a digital scheme for transmitting analog data. It converts an analog signal into digital form. Using PCM, it is possible to digitize all forms of analog data, including full-motion video, voice, music, telemetry, etc.

C. What is FHSS? Explain general model of spread spectrum digital communication system with figure.

Ans: Frequency-hopping spread spectrum (FHSS) is a method of transmitting radio signals by rapidly changing the carrier frequency among many distinct frequencies occupying a large spectral band.



5.

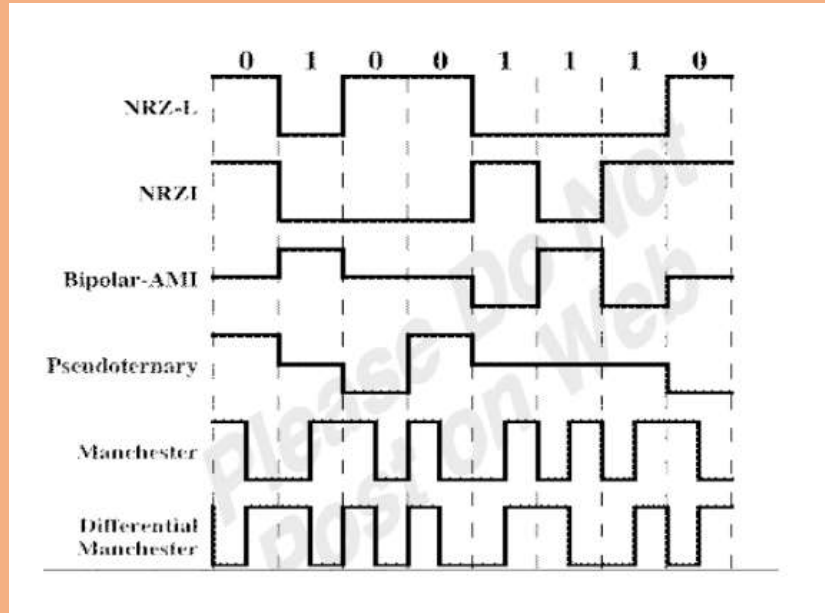
A. Write down difference between FDD and TDD.

<u>Feature</u>	<u>FDD</u>	<u>TDD</u>
Spectrum utilization	Less efficient because separate bands used for uplink and downlink	More efficient because it uses the same frequency band for uplink and downlink
Cellular coverage	More extended range because guard time (period) is not an issue in FDD	Shorter range because guard time (period) is proportional to the range
Network investment	Fewer base stations are required because of broader coverage	More base stations are needed due to smaller coverage
Uplink and downlink needs	Symmetric	Asymmetric

B. How are binary values represented in ASK and in BFSK? what are the limitations of these approaches.

Ans: With amplitude-shift keying, binary values are represented by two different amplitudes of carrier frequencies. This approach is susceptible to sudden gain changes and is rather inefficient.

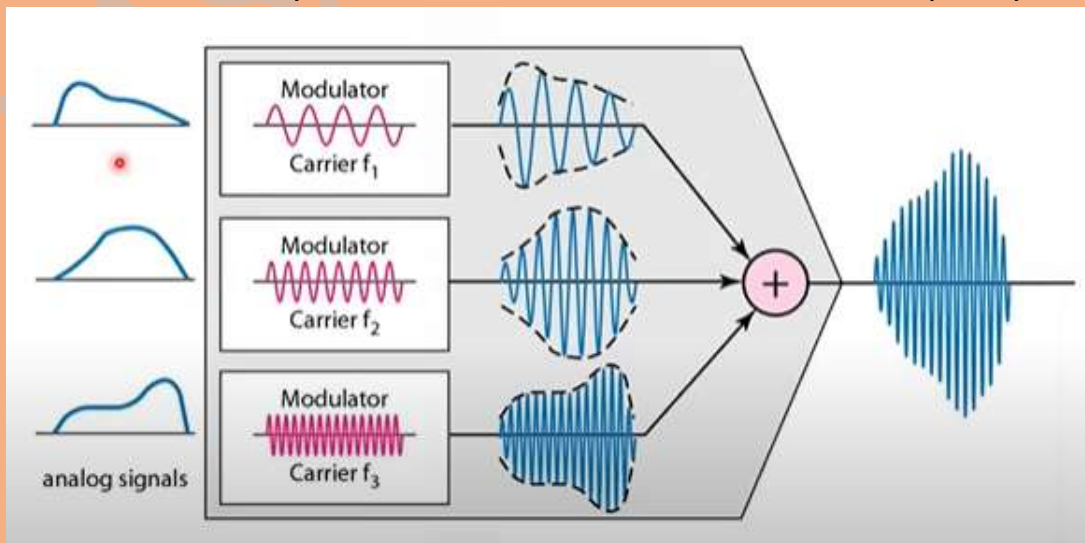
C. For the bit stream 01001110, sketch the waveforms for each of the codes of digital signal encoding formats(Digital data, Digital Signal).Assume that the signal level for the preceding bit for NRZI is high, the most recent preceding 1 bit(AMI) has a negative voltage and the most recent preceding 0 bit has a negative voltage.

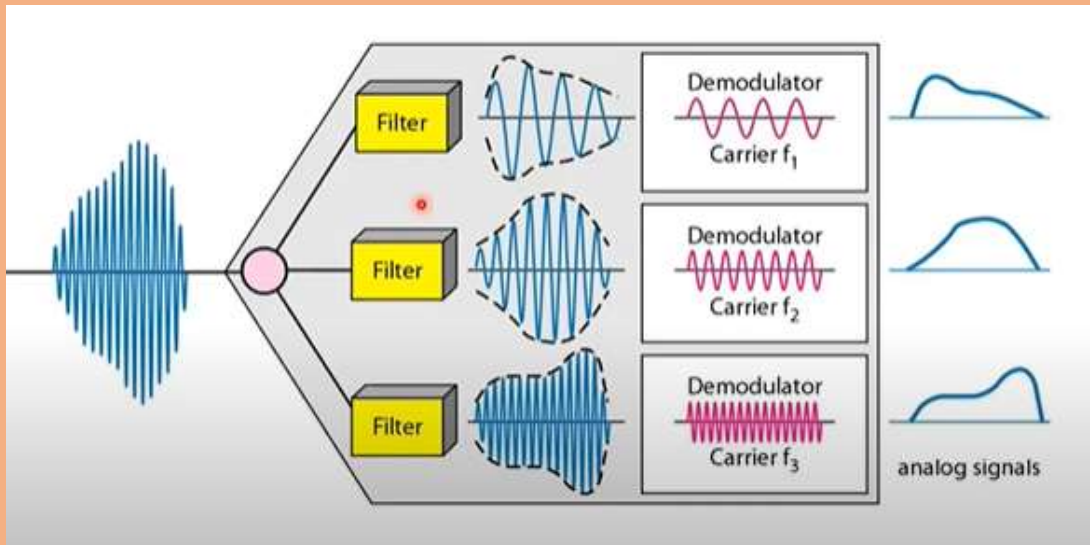


6.

A. How does FDM work? Explain FDM with example.

In frequency-division multiplexing, each message is identified with a separate subcarrier frequency; all of these subcarriers are then combined to modulate the carrier frequency. For wire transmission, the modulated subcarriers may be transmitted directly without the introduction of a carrier frequency.



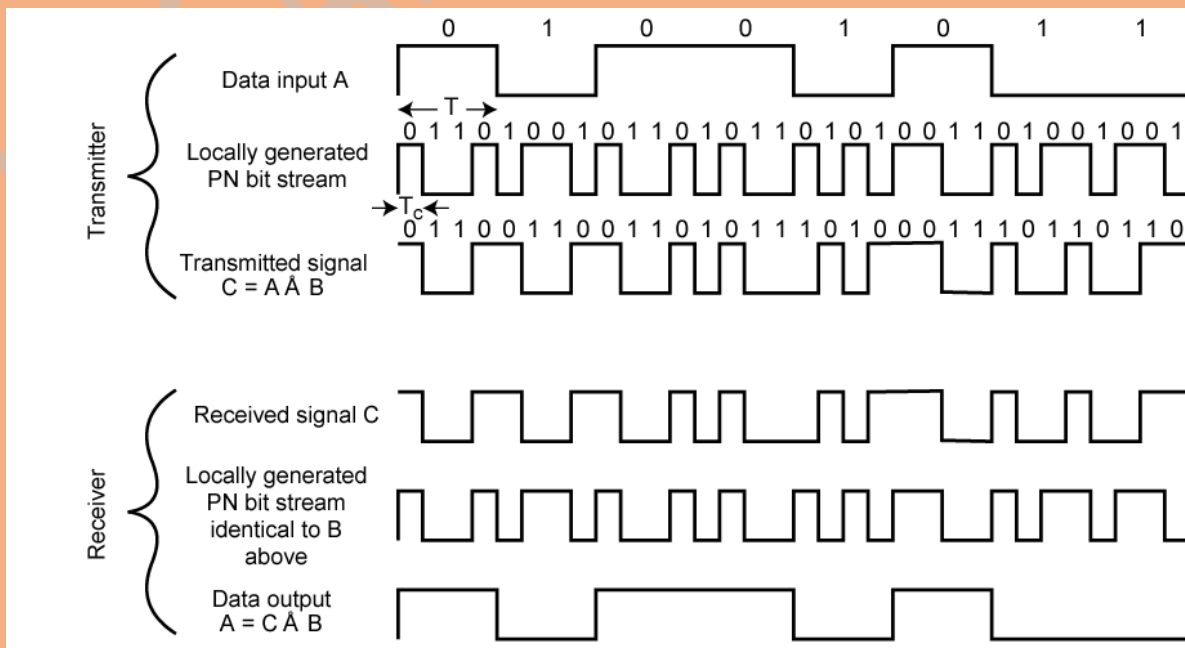


Example of FDM Consider an FDM system where It has 4 frequency bands, each of which can carry signal from 1 sender to 1 receiver. Each of the 4 senders is allocated a frequency band. The four frequency bands are multiplexed and sent via the communication channel. At the receiving end, a demultiplexer regenerates the original four signals as outputs.

Here, if the frequency bands are of 150 KHz bandwidth separated by 10KHz guard bands, then the capacity of the communication channel should be at least 630 KHz (channels : 150×4 + guard bands : 10×3).

- B. Assume direct sequence spread spectrum used on data input 01001011
note that an information bit of 0 causes the spreading code bits to be transmitted without inversion. How does the technique work in transmitter and in receiver end?

Ans:



C. Two communicating devices are using a single bit even parity check for error detection. The transmitter sends the byte 10101010 and because of channel noise, the receiver gets the byte 10011010. Will the receiver detect the error? Why or why not?

Ans: Based on the information given regarding the communicating device, the receiver will not detect the error.

Communicating devices simply mean the devices that are used for communication. These can be through text, video, call, email, etc.

In this case, since the two communicating devices are using a single-bit even parity check for error detection, the receiver will not detect the error.

Exam-2019.

1.

a) Why synchronization is the problem in data communications?

Ans: Synchronization is a common problem in data communications because noise can corrupt signals. Synchronizing a bit stream between a sender and a receiver is not difficult, but it is essential to do it in an efficient manner.

b) Discuss the relationship between the sampling rate, the received rate, and the received signal.

Ans:

c) Assume a data stream is made as 01101101, show the encoding using the encoding scheme of NRZ-L, RZ, Manchester, AMI.

Ans: solved using digital to digital encoding technique.

2.

a) What are the advantages of QAM over ASK and FSK?

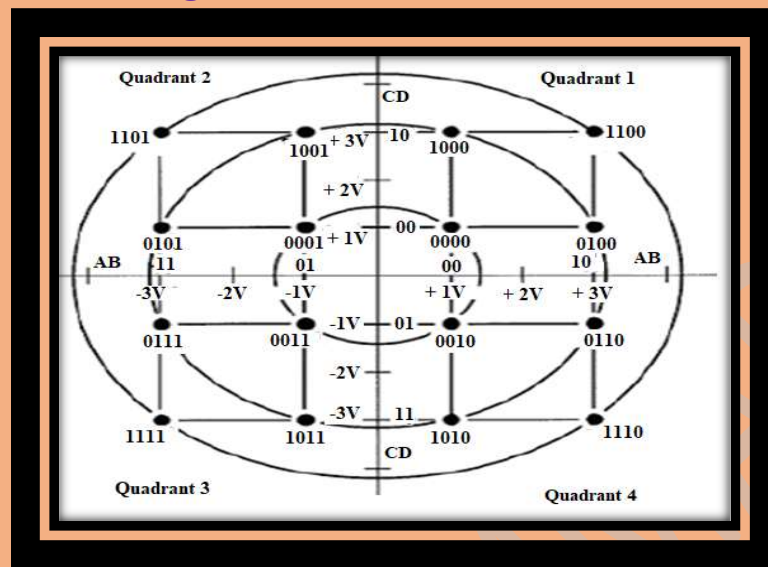
Ans:

QAM is used extensively as a modulation scheme for digital telecommunication systems.

- ✓ Noise immunity of QAM is very high.
- ✓ QAM is best suitable for high bit rates.

✓ Low error probability.

b) Show the constellation diagram of 16-QAM.



c) How does TDM combines multiple signals into one?

Ans: Time-division multiplexing (TDM) is a method of putting multiple data streams in a single signal by separating the signal into many segments, each having a very short duration. Each individual data stream is reassembled at the receiving end based on the timing.

The circuit that combines signals at the source (transmitting) end of a communications link is known as a multiplexer. It accepts the input from each individual end user, breaks each signal into segments, and assigns the segments to the composite signal in a rotating, repeating sequence. The composite signal thus contains data from multiple senders. At the other end of the long-distance cable, the individual signals are separated out by means of a circuit called a demultiplexer, and routed to the proper end users. A two-way communications circuit requires a multiplexer/demultiplexer at each end of the long-distance, high-bandwidth cable.

d) Discuss about interleaving in multiplexing and de-multiplexing.

Ans: On the multiplexing side, as the switch opens in front of a connection, that connection has the opportunity to send a unit onto the path. This process is called interleaving.

On the demultiplexing side, as the switch opens in front of a connection, that connection has the opportunity to receive a unit from the path. this process is called deinterleaving.

3.

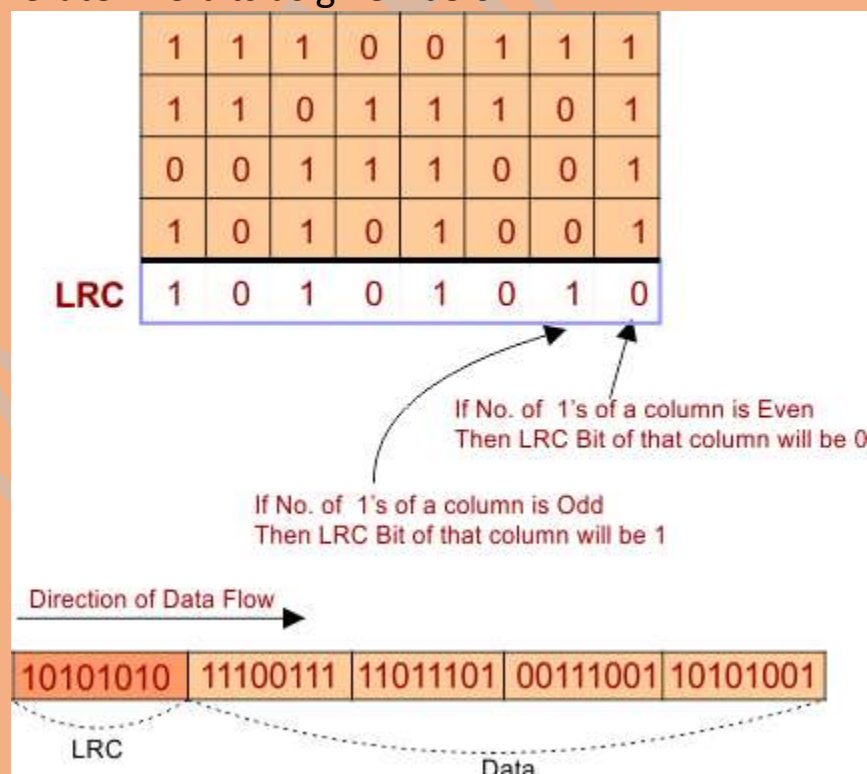
a) What is burst error? Show the performance of two-dimensional parity check.

Ans: The term burst error means that 2 or more bits in the data unit have changed from 1 to 0 or from 0 to 1. Figure shows the effect of a burst error on a data unit. In this case, 0100010001000011 was sent, but 0101110101100011 was received. A burst error does not necessarily mean that the errors occur in consecutive bits.

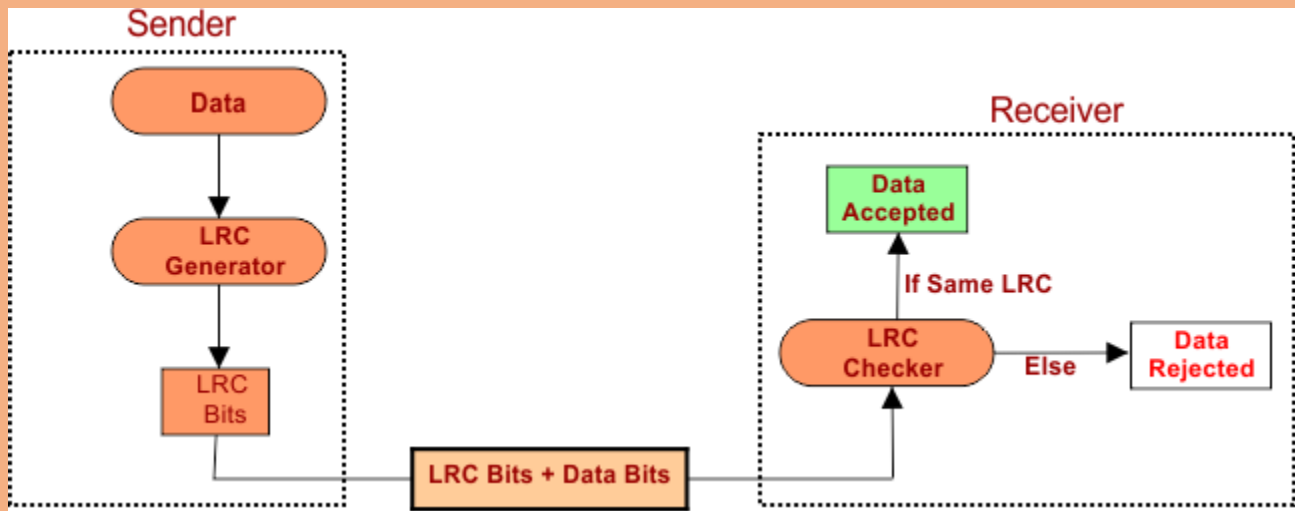
❖ **According to 2-D Parity Check**

- All sending data is placed in forms of rows and columns.
- For even Parity, bits are calculated of each column and redundant bits are attached with that column.
- Block of parity bits of each column acts as redundant bits.

Step 01: First generate LRC bits as given below



Step 02: Now attach LRC with original data and transmit to sender. Block diagram of LRC is given below



Performance of 2-D Parity Check

- It can detect the burst errors.
- If two bits are changed in exactly the same column then errors cannot be detected.

b) Show how error is corrected through hamming encoding algorithm.

Since we found that received code has an error, so now we must correct them. To correct the errors, use the following steps:

Now the error word E will be:

P4	P2	P1
1	0	1

Now we have to determine the decimal value of this error word **101** which is **5** ($22 * 1 + 21 * 0 + 20 * 1 = 5$).

We get **E = 5**, which states that the error is in the fifth data bit. To correct it, just invert the fifth data bit.

So the correct data will be:

D7	D6	D5	P4	D3	P2	P1
1	0	0	1	0	1	1

c) Show the performance of CRC generator if divisor is 1101 and data stream is 1000100.

Ans: solve using CRC concepts.

d) How orthogonal sequences are suitable for CDMA?

Ans: In synchronous CDMA system, the orthogonal spreading sequences are employed to reduce the multiple access interference. However, as the frequency selectivity of the propagation channel strengthens, the orthogonality among different users tends to diminish because of increasing inter-path interference. In this paper, various binary and non-binary orthogonal sequences are discussed. In order to maintain the orthogonality among different users, a new concept of generalized orthogonality is defined and the corresponding sequences are presented, including binary, quadri-phase and non-binary code sequences. Based on a simplified synchronous CDMA system model, the related system performance is also analyzed and compared for different orthogonal and generalized orthogonal spreading sequences. Our analytical and simulation results show that the generalized orthogonal code sequences are indeed more robust in the multipath propagation channels, compared with the traditional orthogonal code sequences.

4.

a)

1. Define spectrum, fundamental frequency and bandwidth.

Ans: Spread spectrum is a form of wireless communications in which the frequency of the transmitted signal is deliberately varied. This results in a much greater bandwidth than the signal would have if its frequency were not varied.

when all frequency components of a. signal are integer multiples of one frequency, it's referred to as the. fundamental frequency.

The maximum amount of data transmitted over an internet connection in a given amount of time.

II. Explain the features of each layer in TCP/IP protocol.

- TCP is reliable protocol. That is, the receiver always sends either positive or negative acknowledgement about the data packet to the sender, so that the sender always has bright clue about whether the data packet is reached the destination or it needs to resend it.
- TCP ensures that the data reaches intended destination in the same order it was sent.
- TCP is connection oriented. TCP requires that connection between two remote points be established before sending actual data.
- TCP provides error-checking and recovery mechanism.
- TCP provides end-to-end communication.
- TCP provides flow control and quality of service.
- TCP operates in Client/Server point-to-point mode.
- TCP provides full duplex server, i.e. it can perform roles of both receiver and sender.

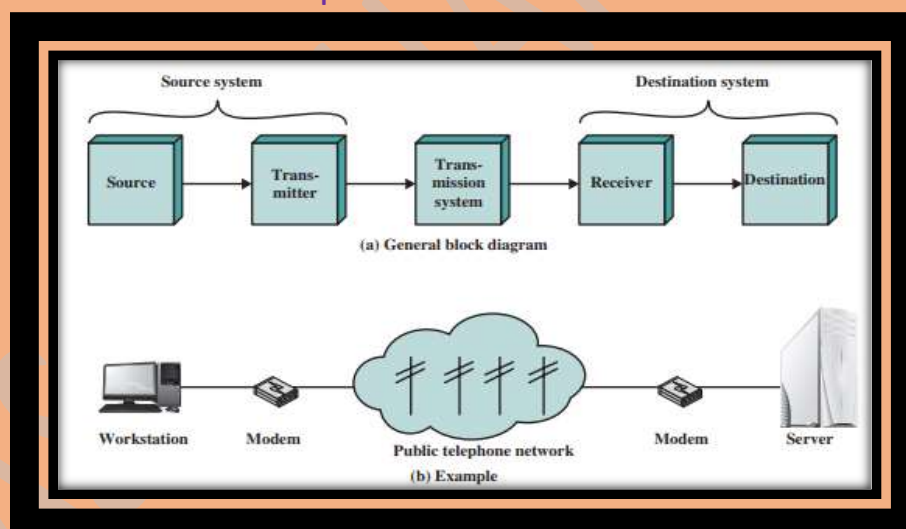
b)

i. Distinguish between LAN and WAN.

S.NO	LAN	WAN
1.	LAN stands for Local Area Network.	Whereas WAN stands for Wide Area Network.
2.	LAN's ownership is private.	But WAN's ownership can be private or public.
3.	The speed of LAN is high(more than WAN).	While the speed of WAN is slower than LAN.
4.	The propagation delay is short in LAN.	Whereas the propagation delay in WAN is long(longer than LAN).

S.NO	LAN	WAN
5.	There is less congestion in LAN(local area network).	While there is more congestion in WAN(Wide Area Network).
6.	There is more fault tolerance in LAN.	While there is less fault tolerance in WAN.
7.	LAN's design and maintenance is easy.	While it's design and maintenance is difficult than WAN.
8.	LAN covers small area i.e. within the building.	While WAN covers large geographical area.

- ii. Suppose, a computer A wants to communicate computer B, explain the tasks that are needed to perform this communication.



- ✓ The "**source**" is the sender of the message or information.
- ✓ The **transmitter** changes the message into a signal that is sent over the communication channel to the receiver.
- ✓ **Transmission system** is a system that transmits a signal from one place to another.
- ✓ The **receiver** is a sort of inverse transmitter, changing the transmitted signal back into a message, and interpreting this message.

- ✓ This message is then sent to the **destination**. The destination may be another receiver (i.e., the message is passed on to someone else), or the message may rest with the initial receiver, and the transmission is achieved.

c) Consider the following equation of composite periodic signal.

$$S(t) = \sum \frac{1}{K} \sin(2\pi(kf)t)$$

Analyze the bandwidth and data rate for the following cases.

- I. $K=(1,2,3,4)$ and $f=1\text{MHz}$.
- II. $K=(1,3,5)$ and $f=4\text{MHz}$.

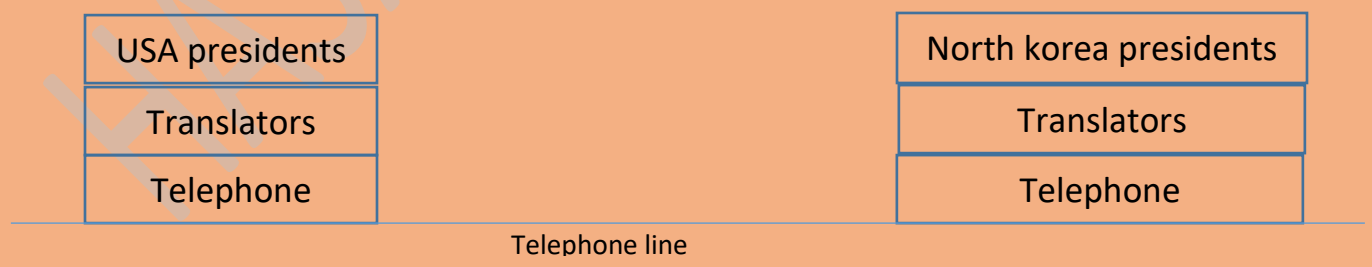
Ans: Not important according to our syllabus.

5.

a) Define communication. Explain the mandatory issues for modern data communication.

- I. The USA and North Korea presidents need to come to an agreement by telephone, but neither speaks the other's language. Further, neither has on hand a translator that can translate to the language of the other. However, both prime ministers have English translators on their staffs. draw a diagram to depict the situation, and describe the interaction and each level.

Communication is the act of giving, receiving, and sharing information



In this case, the translator receives the message from the USA presidents then translates it to English, and send it through the telephone line to the destination telephone.

The translator receives the message from the telephone then

translates that English message to Korean language, and finally sends to the North Korean presidents.

II. Distinguish between guided and unguided media.

BASIS FOR COMPARISON	GUIDED MEDIA	UNGUIDED MEDIA
Basic	The signal requires a physical path for transmission.	The signal is broadcasted through air or sometimes water.
Alternative name	It is called wired communication or bounded transmission media.	It is called wireless communication or unbounded transmission media.
Direction	It provides direction to signal for travelling.	It does not provide any direction.
Types	Twisted pair cable, coaxial cable and fibre optic cable.	Radio wave, microwave and infrared.

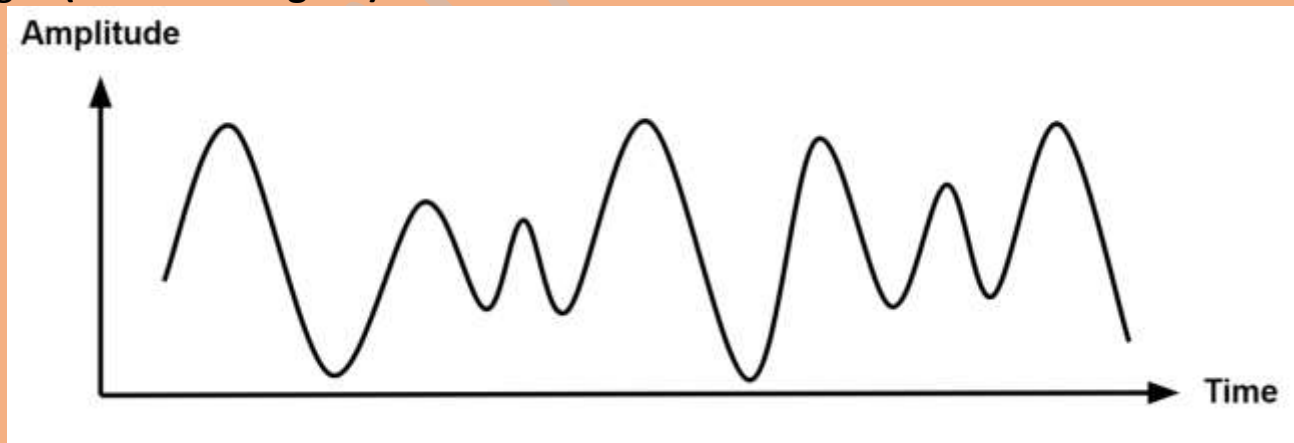
b) Distinguish between data and signal. Explain about analog transmission and digital transmission.

Data is raw facts and figures. They have no meaning. For e.g. 559873 is data. We cannot say what this number is. It can be your library number, a product number

Signal is an electric current used to convey data from one place to another. For e.g. If you want to call someone, over the telephone line there will be signals sent to connect to the other phone.

An analog signal is time-varying and generally bound to a range (e.g. +12V to -12V), but there is an infinite number of values within that continuous range. An analog signal uses a given property of the medium to convey the signal's information, such as electricity moving through a wire. In an electrical signal, the voltage, current, or frequency of the signal may be varied to represent the information. Analog signals are often calculated responses to changes in light, sound, temperature, position, pressure, or other physical phenomena.

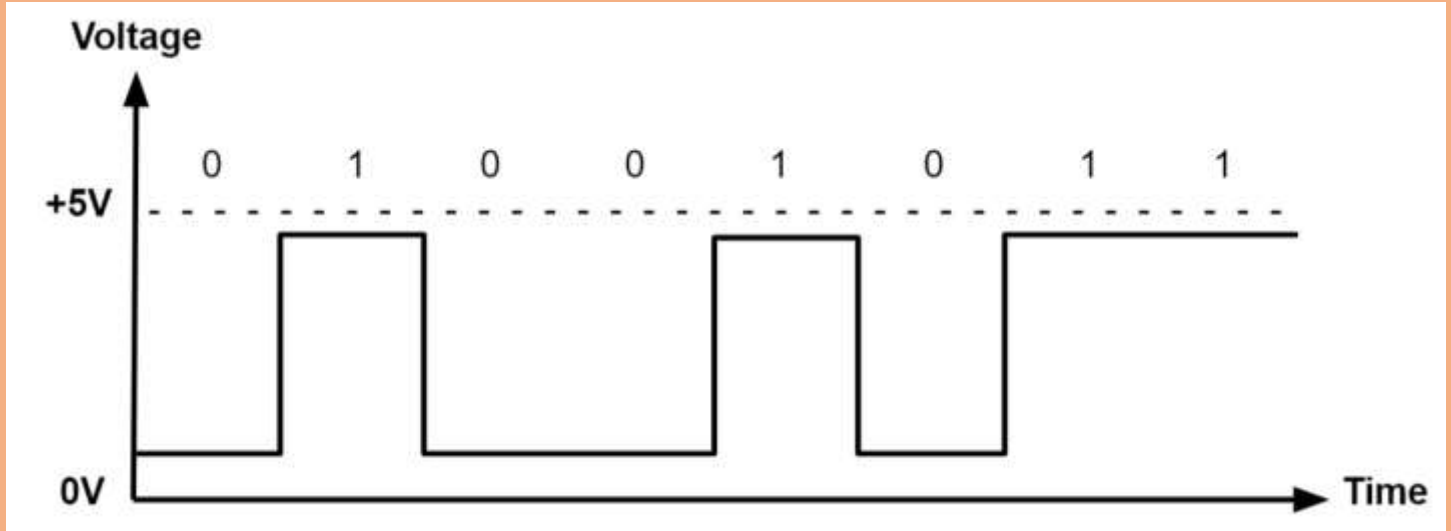
When plotted on a voltage vs. time graph, an analog signal should produce a smooth and continuous curve. There should not be any discrete value changes (**see below figure**).



A digital signal is a signal that represents data as a sequence of discrete values. A digital signal can only take on one value from a finite set of possible values at a given time. With digital signals, the physical quantity representing the information can be many things:

- ✓ Variable electric current or voltage
- ✓ Phase or polarization of an electromagnetic field

- ✓ Acoustic pressure
- ✓ The magnetization of a magnetic storage media



6.

a) Explain the operation of TCP and IP. Mention the components of PDU.

TCP and IP are two separate computer network protocols. IP is the part that obtains the address to which data is sent. TCP is responsible for data delivery once that IP address has been found.

components of PDU:

- ✓ **Remote control connections:** Operators have remote access to the entire power system.
- ✓ **EMI filters:** EMI filters prevent excess electromagnetic noise from entering the power line.
- ✓ **Control board:** Users can reconfigure the unit and view the metering parameters.
- ✓ **Auxiliary output:** Monitor the breaker status and connections with auxiliary output.
- ✓ **Main output:** This component is the primary power distributor to your devices.
- ✓ **AC inlet and outlet:** Host additional power with detachable AC line cords and access.

- ✓ **GFI module:** Ground-fault interrupters prevent harmful consequences from arising due to electrical accidents.
- ✓ **Relays:** Relays allow users to switch and monitor the power provided across several devices.
- ✓ **Main circuit breaker:** Manage the PDU power source through the main circuit breaker.

b) Write short notes on following topics.

- I. **UTP:UTP stands for Unshielded Twisted Pair cable.** UTP cable is a 100 ohm copper cable that consists of 2 to 1800 unshielded twisted pairs surrounded by an outer jacket. They have no metallic shield. This makes the cable small in diameter but unprotected against electrical interference. The twist helps to improve its immunity to electrical noise and EMI.
- II. **Line of Sight: Line of sight (LOS)** is the imaginary line between an observer and the target. In communication, line of sight is the direct path from a transmitter to the receiver and the obstructions that may fall in that path. A clear line of sight is important to high-speed communication.

Line of sight is the direct path between two points. It's called the "line of sight" because if a person was standing at one point, the LOS would be the path they look along. If an object were blocking the view, it would be considered out of sight or an obstructed line of sight.

c)

- I. What are some major advantages and disadvantages for microwave transmission?

Advantages of Microwaves

There are many advantages of Microwaves such as the following –

- ✓ More antenna gain is possible.
- ✓ Higher data rates are transmitted as the bandwidth is more.
- ✓ Antenna size gets reduced, as the frequencies are higher.
- ✓ Low power consumption as the signals are of higher frequencies.
- ✓ Effect of fading gets reduced by using line of sight propagation.

- ✓ Provides effective reflection area in the radar systems.

Disadvantages of Microwaves

There are a few disadvantages of Microwaves such as the following –

- ✓ Cost of equipment or installation cost is high.
- ✓ They are hefty and occupy more space.
- ✓ Electromagnetic interference may occur.
- ✓ Variations in dielectric properties with temperatures may occur.
- ✓ Inherent inefficiency of electric power.

II. Describe ATM and frame relay in the field of data communication.

ATM has a data rate of between 155 and 622 Mbps, depending on the media being used. ATM has a quantifiable quality of service, whereas frame relay does not.

Frame relay is generally less expensive than ATM. A frame relay network also has a variable packet size, whereas ATM has a fixed packet size.