Assignment : 1

Date
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Q:1 Define the following

1. Analog signals

→ An analog signal has infinitely many levels of intensity over a period of time.

2. Digital Signals

→ A digital signal on the other hand can have only a limited number of defined values.

3. Periodic and non Periodic Sin signals

→ A Periodic Signal completes a Pattern within a measurable time frame called a period and repeats that Pattern over Subsequent identical Periods. The completion of one full Pattern is called a cycle

4. Attenuation

→ Attenuation is the reduction in strength or intensity of a signal as it travels through a medium.

5. Distortion

→ Distortion is the alteration or change

in the original shape, form or quality of a signal during transmission.

6. Bandwidth

→ Bandwidth is the range of frequencies that a signal can carry or the maximum data transfer rate of a network or communication channel.

7. Throughput

→ Throughput is the actual rate at which data is successfully transmitted over a network or communication channel.

8. Latency

→ Latency is the delay or time it takes for data to travel from the source to the destination.

Q:2 Explain the Signal Conversion.

1. Digital to digital conversion

→ Digital-to-digital conversion in networking refers to the process of transforming digital data from one format or encoding to another for efficient transmission or storage.

——→ It is Primarily used to prepare data for transmission across networks or to decode received data for interpretation by devices.

——→ Below are the key aspects of digital-to-digital conversion.

2. Analog to digital conversion
——→

Digital-to-analog conversion is the process of changing one of the characteristics of an analog signal based on the information in digital data.

→ A sine wave is defined by three characteristics: amplitude, frequency and phase.

→ When we vary anyone of these characteristics, we create a different version of that wave.

→ Amplitude shift keying (ASK), frequency shift keying (FSK) and phase shift keying (PSK)

Q.3 Explain the Transmission modes

1. Simplex

→ In simplex mode the communication is unidirectional as on a one-way street. only one of the two devices on a link can transmit; the other can only receive. Keyboards and traditional monitors are examples of simplex devices. The keyboard can only introduce input; the monitor can only accept output. The simplex mode can use the entire capacity of the channel to send data in one direction.

2. Half-Duplex

→ In half-duplex mode, each station can both transmit and receive, but not at the same time. When one device is sending, the other can only receive and vice versa. In a half-duplex transmission, the entire capacity of a channel is taken over by whichever of the two devices is transmitting at the time. Walkie-talkies and CB radios are both half-duplex systems. The half-duplex mode is used in cases where there is no need for communication in both directions at the same time; the entire capacity of channel can be utilized for each direction.

3. Full-Duplex

→ In Full-Duplex both stations can transmit and receive simultaneously. The Full-duplex mode is like a two way street with traffic flowing in both directions at the same time. In full-duplex mode, signals going in one direction share the capacity of the link with signals going in the other direction. One common example of full-duplex communication is the telephone network. When two people are communicating by a telephone line both can talk and listen at the same time. The full-duplex mode is used when communication in both directions is required all the time. The capacity of the channel however, must be divided between the two directions.

Q:4 Explain the following digital Modulation Techniques:

1. Digital to analog Conversion

1. ASK (Amplitude Shift Keying):

→ In amplitude shift keying, the amplitude of the carrier signal is varied to create signal elements. Both frequency and

Phase remain constant while the amplitude changes. Although we can have several levels of signal elements, each with a different amplitude. ASK is normally implemented using only two levels. This is referred to as binary amplitude shift keying or on-off keying. The peak amplitude of one signal level is 0; the other is the same as the amplitude of the carrier frequency.

2. PSK (Phase shift keying)

In phase shift keying the phase of the carrier is varied to represent two or more different signal elements. Both peak amplitude and frequency remain constant as the phase changes. Today, PSK is more common than ASK or FSK. The simplest PSK is binary PSK in which we have only two signal elements one with a phase of 0°, and the other with a phase of 180°.

3. FSK (Frequency shift keying)

In frequency shift keying, the frequency of the carrier signal is varied to represent data. Both peak amplitude and phase remain constant for all signal elements. One way to think about

binary FSK is to consider two carrier frequencies. However, note that this is an unrealistic example used only for demonstration purposes. Normally the carrier frequencies are very high and the difference between them is very small.

2. Analog to Analog conversion

1. AM (Amplitude demodulation)

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In order that a radio signal can carry audio or other information for broadcasting or for two way radio communication, it must be modulated or changed in some way. Although there are a number of ways in which a radio signal may be modulated, modulated. one of the easiest easiest is to change its amplitude in line with variations of the sound.

2. PM (Phase Modulation)

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Phase modulation, PM is sometimes used for analogue transmission, but it has become the basis for modulation schemes used for carrying data. Phase shift keying, PSK is widely used for data communication.

3. FM (Frequency modulation)

→ As with any form of modulation, it is necessary to be able to successfully demodulate it and recover the original signal. The FM demodulator may be called a variety of names including FM demodulator, FM detector or an FM discriminator.

Q-5 What is error? Types of error.

↳ Error:—

Error is a condition when the receiver's information does not match the sender's.

- That means a 0 bit may change to 1 or a 1 bit may changed to 0.

* Types of Errors:-

1. Single-Bit Error:-

→ A single-bit error refers to a type of data transmission error that occurs when one bit of a transmitted data unit is altered during transmission, resulting in an incorrect or corrupted data unit.

2. Multiple - Bit Error :-

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A multiple - bit error is an error type that arises when more than one bit in a data transmission is affected. Although multiple-bit errors are relatively rare when compared to digital environments.

3. Burst Error :-

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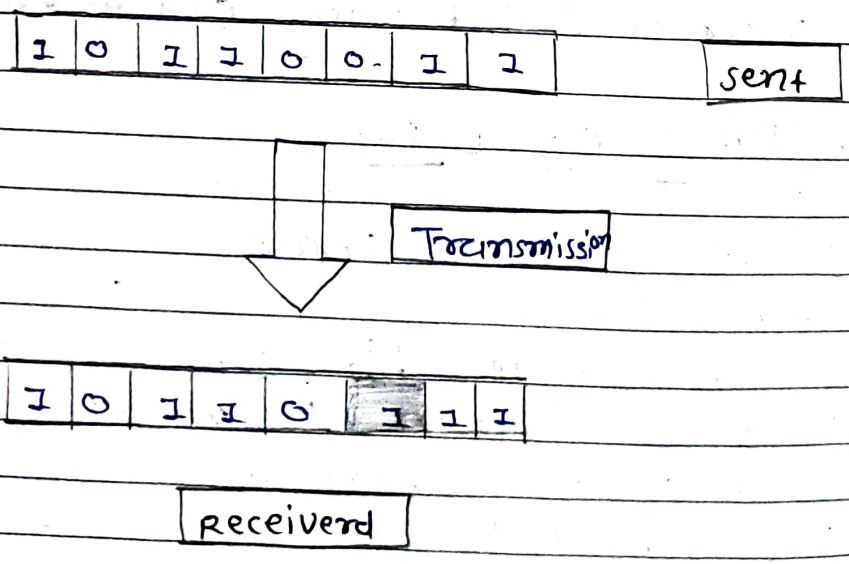
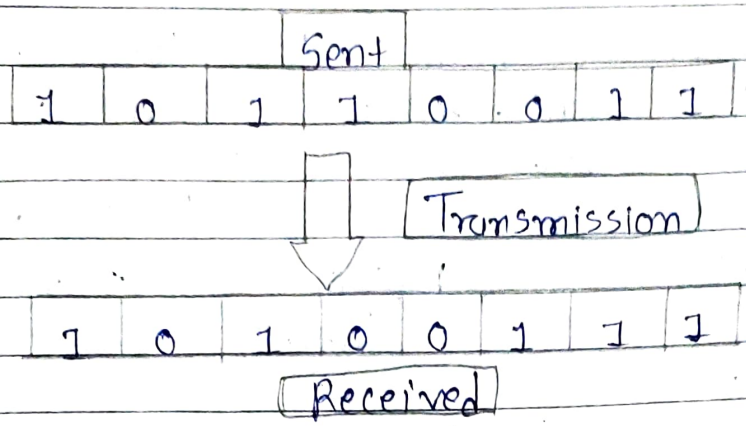
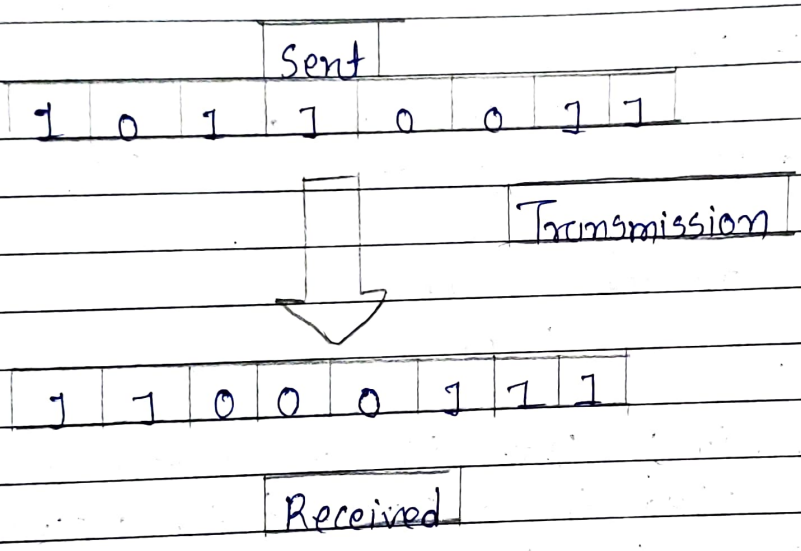
When several consecutive bits are flipped mistakenly in digital transmission, it creates a burst error. This error causes a sequence of consecutive incorrect values.



- Single - Bit Error



- Multiple - Bit error



Q.6 Explain the error Detection Methods

1. Simple Parity check

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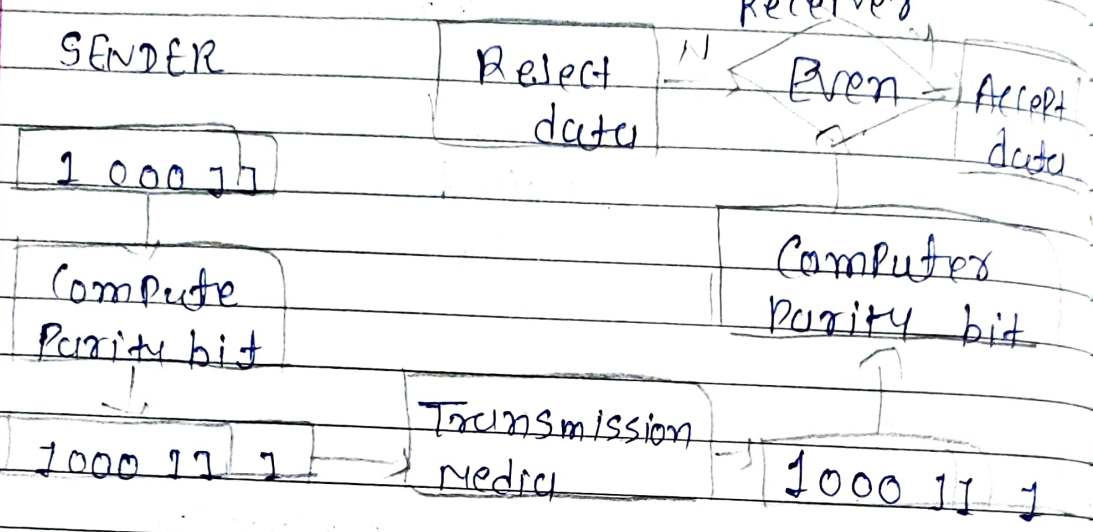
Simple-bit Parity is a simple error detection method that involves adding an extra bit to a data transmission. It works as:

- 1 is added to the block if it contains an odd number of 1's, and
- 0 is added if it contains an even number of 1's.

This scheme makes the total number of 1's even, that is why it is called even Parity checking



Q.7 Explain the error correction Methods Humming code.

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Humming code is an error-correcting code used to ensure data accuracy during transmission or storage.

→ Humming code detects and corrects the errors that can occur when the data is moved or stored from the sender to the receiver.

→ It adds extra bits to the original data allowing the system to detect and correct single-bit errors.

→ It is a technique developed by Richard Humming in the 1950s.

Algorithm of Hamming Code

Hamming code is simply the use of extra Parity bits to allow the identification of an error.

Step 1: Write the bit Positions starting from 1 in binary form (1, 10, 11, 100 etc.)

Step 2: All the bit Positions that are a Power of 2 are Marked as Parity bits (1, 2, 4, 8, etc.)

Step 3: All the other bit Positions are Marked as data bits.

Step 4: Each data bit is included in a unique set of Parity bits, as determined its bit Position in binary form:

a. Parity bit 1 covers all the bits Positions whose binary representation includes a 1 in the lest significant Position (1, 3, 5, 7, 9, 11, etc).

b In General each Parity bit covers all bits where the bitwise AND of the Parity Position and the bit Position is non-zero.