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Questions

1

a) Explain different transmission speeds. 2

b) Classify line coding with example. 6

c) What are the possible reasons for data to deteriorate? Explain. 6

2

a) How many ways to converts digital data into digital signal? 3

b) Explain different types of wireless transmission. 6

c) Explain different types of cables used in transmission. 5

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3

a) Define physical ~~layer~~ and logical address. 3

b) List the functionalities of data link layer. 6

c) How to convert analog signals with digital signals. Explain with examples. 5

4

a) Define OSI model. Is OSI and ISO comparable ? 4

b) Define physical layer. When data is sent over physical medium which signals it is converted into ? 6

c) Error control mechanism may involve in how many ways ? 4

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5

a) Explain wireless transmission. 3

b) List the types of errors in data transmission. 5

c) Data link layer is responsible for which mechanisms? 6

6

a) Define channel capacity. which factors it depends on? 4

b) Explain multiplexing and switching. 4

c) Compare the physical and data link layer functions. 6

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7

a) Classify and explain error control mechanism. 3

b) Classify digital to analog conversion. 5

c) Classify analog to analog conversion. 6

8

a) Define data link layer. what are its Sublayers. 4

b) what layers are in OSI model? Draw the model. 6

c) what is multiplexing? Classify different types of multiplexing. 4

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Ans: To The Question No - 1 (i)

The transmission modes decides how data is transmitted between two computers.

1) **Parallel:** The binary bits are organized in-to groups of fixed length. Both sender and receiver are connected in parallel with the equal number of data lines.

2) **Serial:** In this, bits are sent one after another in queue manner. Serial transmission requires only one communication channel.

3) **Asynchronous serial transmission:** Data-bits have specific pattern and they help receiver recognize the start and end data bits.

4) **Synchoronous Serial transmission:** There is no pattern or prefix / suffix method.

Ans: To The Question NO - 1 (ii)

There are there types of line coding:

a) **Unipolar:** In this type of unipolar signaling, a high in data is represented by a positive pulse called as Mark, which has duration To equal to the symbol bit duration.

b) **Polar:** In this type of polar signaling, a high in data is represented by a positive pulse, which a low in data is represented by a negative pulse but it immediately returns to zero and shows the absence of pulse during the remaining half of bit duration.

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c) **Bipolar Encoding:** It uses three voltage levels, positive, negtive and zero. Zero voltage represents binary 0 and bit 1 is represented by altering positive and negative voltages.

d) **Manchester:** The encoding scheme is a combination of RZ and NRZ-L. Bit time is devided into two halves.

e) **Differential Manchester:** The encoding scheme is a combination of RZ and NRZ-I. It also transit at the middle of the bit but changes phase only when 1 is encountered.

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Ans: To The Question NO - 1 (iii)

when signals travel through the medium they tend to deteriorate. This may have many reasons as given:

1. **Attenuation**: In this, the signal must be sufficiently strong. As it covers distance, it loses strength.

2. **Dispersion**: As signal travels through the media, it tends to spread and overlaps. The ammount of dispersion depends upon the freequency used.

3. **Delay Distortion**: signals are sent over media with pre-defined speed and freequency. If the signal speed and freequency do not match, there are possibilities that signal reaches destination

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in arbitrary fashion.

4. **Noise:** Noise can be characterized in one of the following class:

a. **Thermal:** Noise heat against the electronic conductors of a medium which may introduce noise in the media.

b. **Cross talk:** This noise happens, when a foreign signal enters into the media.

c. **Impulse:** Digital data mostly affected by this sort of data.

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Ans: To The Question No- 2(i)

There are two ways to convert digital data into digital signals. They are:

1. **Line Coding:** A Line code used for data transmission of a digital signal over a transmission line.

2. **Block coding:** It helps in error detection and re-transmission of the signal. It is normally referred to as mB / nB coding as it replaces each m-bit group with an n-bit group.

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Ans: To The Question NO - 2 (ii)

Different types of wireless transmission:

Radio Transmission:

Radio frequency is easier to generate and because of its large wavelength it can penetrate through walls and structures alike. Radio waves can have wavelength from 1mm - 100,000 km and have frequency ranging from 3 Hz to 300 GHz.

Microwave Transmission:

Electromagnetic waves above 100 MHz tend to travel in a straight line and signals over them can be sent by beaming those waves

towards one particular station. Frequency ranging from 300 MHz to 300 GHz.

Infrared Transmission:

It has wavelength of 700 -nm to 1mm and frequency ranges from 300 GHz to 430 -THz.

Light Transmission:

Highest most electromagnetic spectrum which can be used for data transmission is light or optical signaling. This is achieved by means of laser. Laser beam is generally 1 mm wide hence it is work of precision to align two far receptors each pointing to lasers source.

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Ans: To The Question NO - 2 (iii)

Twisted Pair Cable:

A twisted Pair cable is made of two plastic insulated copper wires twisted together to form a single media. There are two types of twisted pair cables:

Shielded Twisted Pair Cable: STP cables comes with twisted wire pair covered in metal foil. This makes it more indifferent to noise and cross talk.

Unshielded Twisted Pair Cable: UTP has seven categories, each suitable for specific use. In computer networks, Cat-5, Cat5e, and Cat-6 cables are mostly used.

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Coaxial Cable:

It has two wires of copper. The core wire lies in the center and it is made of solid conductor. The core is enclosed in an insulator sheath. The coaxial cables provide high bandwidth rates up to 450 mbps.

Power lines: Power line communication (PLC) is layer - 1 technology uses power cables to transmit data signals. In PLC, modulated data is sent over the cables.

Fiber Optics:

Fiber optic works on the properties of light. The core of fiber optic cable is made of high quality glass or plastic. It is capable of carrying multiple beams of light.

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Ans: To The Question NO - 3 (i)

Physical Address:

Physical address, also known as the link address, is the address of a node as defined by its LAN or WAN. It is included in the frame used by the data link layer. It is lowest-level address. The physical addresses have authority over the network.

Logical Address:

Logical addresses are necessary for universal communications that are independent of underlying physical networks. A universal addressing system is needed in which each host can be identified uniquely, regardless of the underlying physical network.

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Ans: To The Question NO - 3(ii)

Data Link layer doer many tasks on behalf of upper layer. These are:

Framing: Data - link layer takes packets from Network layer and encapsulates them into Frames.

Addressing: Data - link layer provides layer-2 hardware addressing mechanism.. Hardware address is assumed to be unique on the link.

Synchronization: when data frames are sent on the link, both machines must be synchronized in order to transfer to take place.

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Error Control: Sometimes signals may have encountered problem in transition and the bits are flipped. These error detected and attempted to recover actual data bits.

Flow Control: stations on same link may have different speed or capacity. It ensures flow control that enables both machine to exchange data on same speed.

Multi Access: When lost on shared link tries to transfer the data, it has high probability of collison. It provides CSMA / CD to equip capability of accessing a shared media among multiple systems.

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Ans: To The Question NO- 3 (iii)

Analog to digital conversion Microphones create analog voice and camera creates analog videos, which are treated is analog data. PCM is one of the most commonly used method to convert analog data into digital form. It envolves three steps.

Sampling: The analog signal is sampled every T interval. Most important factor in sampling is the rate at which analog signal is sampled. According to Nyquist Theorem, the sampling rate must be at least two times of the highest frequency of the signal.

Quantization:

Sampling yeilds descrete form of continuous analog signal. Every descrete pattern shows the amplitude of the analog signal at that instance. The quantization is done between the maximum amplitude value and the minimum amplitude value. Quantization is approximation of instantaneous analog value.

Encoding:

In encoding each approximated value is then converted into binary formate.

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Ans: To The Question No: 4(i)

The OSI model is layered framework for the design of network systems that allows communication between all types of computers systems. It consists of seven separate but related layes.

We can't compare ISO and OSI model. ISO stands for international standards organization. It is an organization for agreement on international standards organization. It is an organization for agreement on international standards of network communication worldwide.

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Ans: To The Question NO - 4(ii)

Physical layer in the OSI model plays the role of interacting with actual hardware and signaling mechanism. Physical layer is the only layer of OSI network model which actually deals with the physical connectivity of two different stations.

When data is sent over physical medium. It needs to be first converted into electromagnetic signals. Both digital and analog data can be represented in digital or analog analysis.

Digital signals:

Digital signals are discrete in nature and represent sequence of voltage pulses. Digital signals are used within the circuitry of a computer system.

Analog signals:

Analog signals are in continuous wave form in nature and represented by continuous electromagnetic waves.

Ans: To The Question No - 4 (iii)

Error control mechanism may involve two possible ways :

1. Error detection
2. Error correction.

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Ans: To The Question NO - 5 (i)

Wireless transmission is a form of unguided media. Wireless communication involves no physical link established between two or more devices, communicating wirelessly. Wireless signals are spread over in the air and are recieved and interpreted by appropriate antennas. When an antenna is attached to electrical circuit of a computer or wireless device, it converts the digital data into wireless signals and spread all over within its frequency range.

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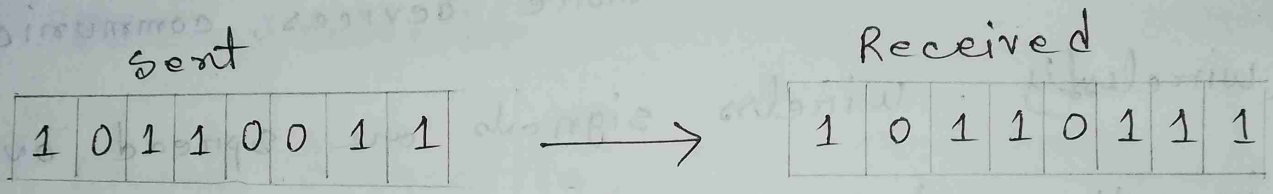
Ans: To The Question NO- 5 (ii)

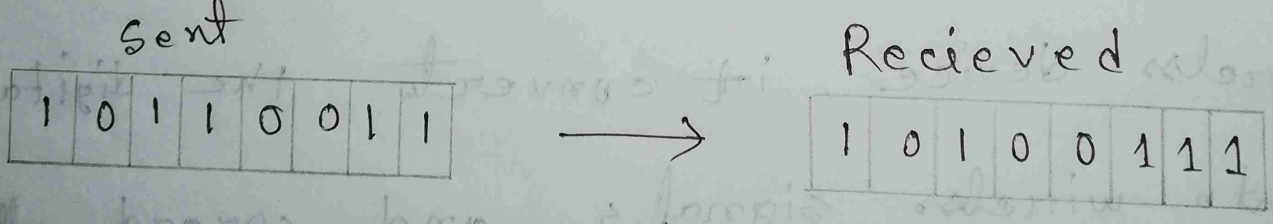
There are three types of errors:

single bit error:



In a fram, there is only one bit, anywhere though, which is corrupt.

Multiple bits error:



Fream is recieved with more than one bits in corrupted state.

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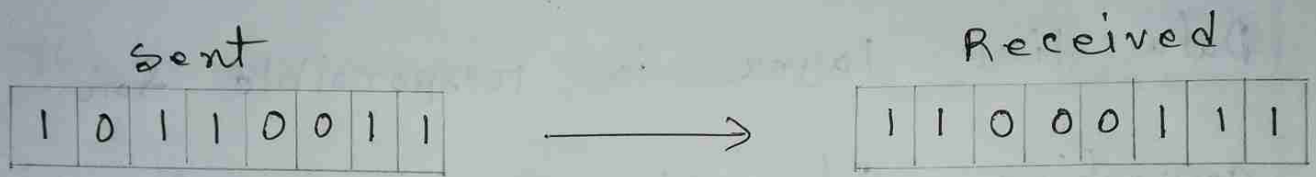
Burst error :



Frame contains more than 1 consecutive bits corrupted.

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Ans: To The Question NO- 5 (iii)

Data link layer is responsible for converting data stream to signals bit by bit and to send that over the underlying hardware. At the recieving end, Data link layer picks up data from hardware which are in the form of electrical signals, assembles them in a recognizable format and hands over to upper layer.

Data-link layer is responsible for implementation of point-to-point flow and error control mechanism.

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Ans: To The Question NO # 6 (i)

The speed of transmission of information is said to be the channel capacity. We count it as data rate in digital world. It depends on numerous factors such as:

1. **Band width**: The physical limitation of underlying media.

2. **Error - rate**: Incorrect reception of information because of noise.

3. **Encoding**: The number of levels used for signaling.

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Ans: To The Question NO- 6 (ii)

Multiplexing:

It is a teachnique to mix and send data streams over a single medium. The 3 types of multiplexing techniques include the following:

i) Freequency Division Multiplexing (FDM)

ii) Wavelength Division Multiplexing (WDM)

iii) Time Division Multiplexing (TDM)

Switching:

Switching is a mechanism by which data/information sent from source towards destination which are not directly

connected

Switching can be categorized as:

1) Circuit switching

2) Message switching

3) Packet switching

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Ans: To The Question NO – 6 (iii)

The two layer is compared below:

1 **Physical Layer:** A physical layer is concerned with the connection of devices to the media. It also defines the physical topology. It also helps in synchronization of bits. It helps to convert digital bits into electrical signal.

2 **Data Link Layer:** It devides the steam of bits recieved from the network layer into manageable data units called frames. It adds a header to the frame to define physical address of the sender or receiver of the frame.

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Ans: To The Question NO - 7(i)

Error Control: When data-frame is transmitted, there is probability that data-frame may be lost in the transit or it is recieved currupted. In both cases, the reciever doesn't receive the correct data frame.

Error Detection: The sender and reciever, either both or any, must accertain that there is some errors in the transit.

Positive ACK: When the recievers recieves a correct frame, it should acknowledge it.

Negative ACK: When the reciever receives a damaged frame or a duplicate frame, it sends a Nack back to the sender.

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Ans: To The Question NO - 7 (ii)

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.

1. **Amplitude shift keying:** 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.

2. **Frequency shift keying:** The frequency of the analog carrier signal is modified to reflect binary data.

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3. Phase shift keying: The phase of the original carrier signal is altered to reflect binary data.

4. Quardrature Phase Shift keying: QPSK alters the phase to reflect two binary digits at once. The serial data is converted in to parallel in both sub-streams and then each stream is converted to digital signal using NRZ technique.

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Ans: To The Question NO- 7(iii)

Analog to analog conversion can be done three ways:

1. **Amplitude modulation:** The amplitude of the carrier signal is modified to reflect the analog data. The amplitude of modulating signal is multiplied by the amplitude carrier frequency. which then reflects analog data.

2. **Frequency modulation:** In this, the frequency of the carrier signal is modified to reflect the change in the voltage levels of the modulating signal.

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3. **Phase modulation:** In this, the phase of carrier signal is modulated in order to reflect the change voltage of analog data signal. The phase of carrier signal is modulated in order to reflect the change in voltage of analog data signal.

Ans: To The Question NO - 8 (i)

Data link layer is second layer of OSI layered model. This layer is one of the most complicated layers and has complex functionalities and liabilities.

Data Link Layer has two sub-layers:

1. Logical Link control: It deals with protocols, flow-control, and error control.

2. Media Access Control: It deals with actual control of media.

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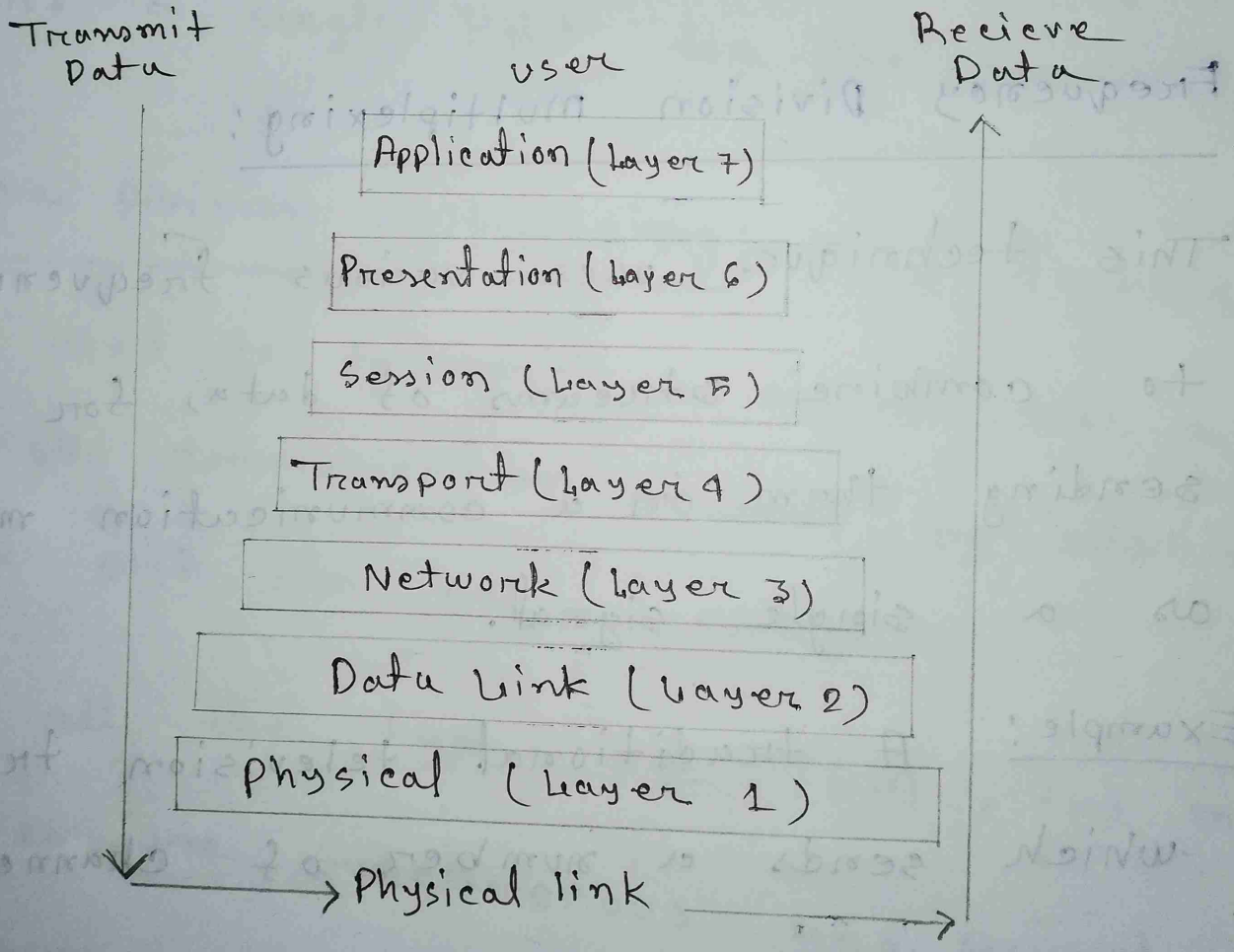
Ans: To The Question NO - 8 (ii)

OSI model is a 7 layer architecture with each layer having specific funtionality to perform. The model is given below:



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Ans to The Question NO.- 8 (iii)

Multiplexing is a technique by which different analog and digital streams of transmission can be simultaneously processed over a shared link.

Frequency Division Multiplexing:

This technique uses various frequencies to combine streams of data, for sending them on a communication medium, as a single signal.

Example: A traditional television transmitter, which sends a number of channels.

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Wavelength Division Multiplexing: In this, many data streams of different wavelengths are transmitted in the light spectrum.

Example: Optical fiber communications use the WDM, to merge different wavelengths into a single light for the communication.

Time Division Multiplexing: This technique is used to transmit a signal over a single communication channel, by allotting one slot for each message.

Of all the types of TDM, the main ones are Synchronous and Asynchronous TDM.