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SEMESTER: 4

SECTION: B

SUBJECT: Computer Communication & Networks

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ASSINSIONAL -ASSIGNMENT: NO 2

Which layers in the Internet model are the network support layers?

ANSWER:

Transport layers has the network support layer and the user support layer. The transport layer is the layer in the open system interconnection (OSI) model responsible for end-to-end communication over a network

Transport layers has the network support layer and the user support layer. The transport layer is the layer in the open system interconnection (OSI) model responsible for end-to-end communication over a network. It provides logical communication between application processes running on different hosts within a layered architecture of protocols and other network components. The original TCP/IP protocol suite was defined as having four layers: host-to-network, internet, transport, and application. However, when TCP/IP is compared to OSI, we can say that the host-to-network layer is equivalent to the combination of the physical and data link layers.

The transport layer is responsible for delivering data to the appropriate application process on the host computers. ... Some transport layer protocols, for example TCP, but not UDP, support virtual circuits, i.e. provide connection-oriented communication over an underlying packet-oriented datagram network. The network layer is responsible for routing, which is moving packets (the fundamental unit of data transport on modern computer networks) across the network using the most appropriate paths. It also addresses messages and translates logical addresses (i.e., IP addresses) into physical addresses (i.e., MAC addresses).

2) Name three types of transmission impairment?

ANSWER:

There are three types of transmission impairments: attenuation, delay distortion, and noise. Attenuation: The impairment is caused by the strength of signals that degrades with distance over a transmission link. Transmission Impairments The signal received may differ from the signal transmitted. The effect will degrade the signal quality for analog signals and introduce bit errors for digital signals. There are three types of transmission impairments: attenuation, delay distortion, and noise.

(1) Attenuation: The impairment is caused by the strength of signals that degrades with distance over a transmission link. Three factors are related to the attenuation:

The received signal should have sufficient strength to be intelligently interpreted by a receiver. An amplifier or a repeater is needed to boost the strength of the signal.

A signal should be maintained at a level higher than the noise so that error will not be generated. Again, an amplifier or a repeater can be used.

Attenuation is an increasing function of frequency, with more attenuation at higher frequency than at lower frequency. An equalizer can smooth out the effect of attenuation across frequency bands, and an amplifier can amplify high frequencies more than low frequencies.

(2) Delay distortion: The velocity of propagation of a signal through a guided medium varies with frequencies; it is fast at the center of the frequency, but it falls off at the two edges of frequencies. Equalization techniques can be used to smooth out the delay distortion. Delay distortion is a major reason for the timing jitter problem, where the receiver clock deviates from the incoming signal in a random fashion so that an incoming signal might arrive earlier or late.

(3) Noise: Impairment occurs when an unwanted signal is inserted between transmission and reception. There are four types of noises:

- **Thermal noise: This noise is a function of temperature and bandwidth. It cannot be eliminated. The thermal noise is proportional to the temperature and bandwidth as shown in the equation: thermal noise = K (constant) *temperature *bandwidth.**
- **intermodulation noise this noise is caused by nonlinearity in the transmission system f 1; f2 frequencies could produce a signal at f1 + f2 or ABS (f1 – f2) and affect the frequencies at f1 + f2 or ABS (f1 – f2).**
- **Cross talk: This type of noise is caused by electrical coupling in the nearby twisted pair or by unwanted signal picked by microwave antennas. For example, sometimes when you are on the telephone, you might hear someone else's conversation due to the cross talk problem.**

3) What does the Shannon capacity have to do with communications?

ANSWER:

In electronic communication channels the information capacity is the maximum amount of information that can pass through a channel

without error, i.e., it is a measure of channel "goodness." The actual amount of information depends on the code— how information is represented.

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NY Quist's theorem specifies the maximum data rate for noiseless condition, whereas the Shannon theorem specifies the maximum data rate under a noise condition. The NY Quist theorem states that a signal with the bandwidth B can be completely reconstructed if 2B samples per second are used.

4) Compare and contrast flow control and error control?

ANSWER:

Flow control	Error control

Flow control and Error control are the control mechanism at data link layer and transport layer. Whenever the sends the data to the receiver these two mechanisms helps in proper delivering of the reliable data to the receiver. The main difference between the flow control and error control is that the flow control observes the proper flow of the data from sender to receiver, on the other hand, the error control observes that the data delivered to the receiver is error free and reliable.

FLOW CONTROL: Flow control is meant for the proper transmission of the data from sender to the receiver. Feedback-based flow control and rate-based flow control are the approaches to achieve the proper flow control.

ERROR CONTROL: Error control is meant for delivering the error-free data to the receiver. Parity checking, Cyclic Redundancy Code (CRC) and checksum are the approaches to detect the error in data. Hamming code, Binary Convolution codes, Reed-Solomon code, Low-Density Parity Check codes are the approaches to correct the error in data.

5) Define piggybacking and its usefulness?

ANSWER:

"Piggybacking is used to improve the efficiency of bidirectional transmission. When a frame is carrying data from A to B, it can also carry control information about frames from B; when a frame is carrying data from B to A, it can also carry control information about frames from A."

Improves the efficiency, better use of available channel bandwidth.

The receiver can jam the service if it has nothing to send. This can be solved by enabling a counter (Receiver timeout) when a data frame is received.

6) HDLC w.r.t station types, transfer modes, frame types supported and flag field purpose?

ANSWER:

High-level Data Link Control (HDLC) is a group of communication protocols of the data link layer for transmitting data between network points or nodes. Since it is a data link protocol, data is organized into frames. A frame is transmitted via the network to the destination that verifies its successful arrival. It is a bit - oriented protocol that is applicable for both point - to - point and multipoint communications.

Transfer Modes

HDLC supports two types of transfer modes, normal response mode and asynchronous balanced mode.

Normal Response Mode (NRM) – Here, two types of stations are there, a primary station that send commands and secondary station that can respond to received commands. It is used for both point - to - point and multipoint communications.

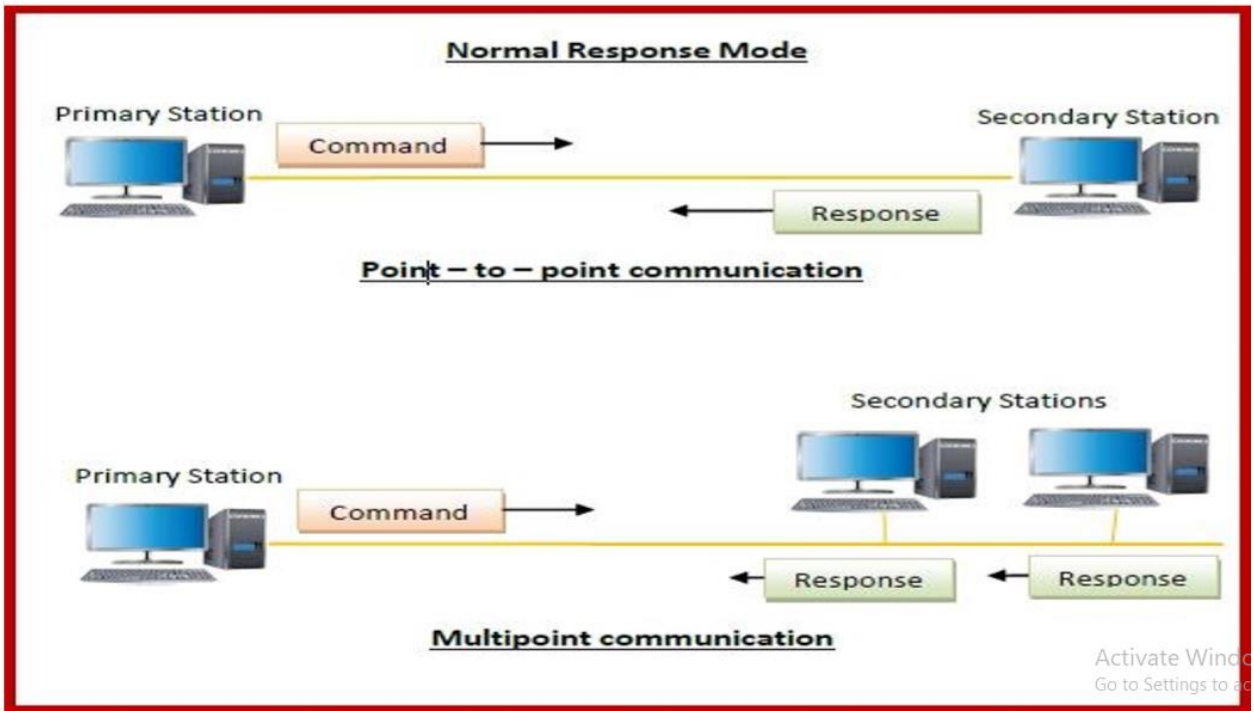
HDLC is a bit - oriented protocol where each frame contains up to six fields. The structure varies according to the type of frame. The fields of a HDLC frame are –

Flag – It is an 8-bit sequence that marks the beginning and the end of the frame. The bit pattern of the flag is 01111110.

Address – It contains the address of the receiver. If the frame is sent by the primary station, it contains the address (is) of the secondary station(s). If it is sent by the secondary station, it contains the address of the primary station. The address field may be from 1 byte to several bytes.

Control – It is 1- or 2-bytes containing flow and error control information.

Payload – this carries the data from the network layer. Its length may vary from one network to another.



7) Name the protocols for noiseless channels?

ANSWER:

Noiseless and Noise Channel Protocols

Taxonomy of Protocols.

Simplest Protocol.

Stop-and-Wait Protocol.

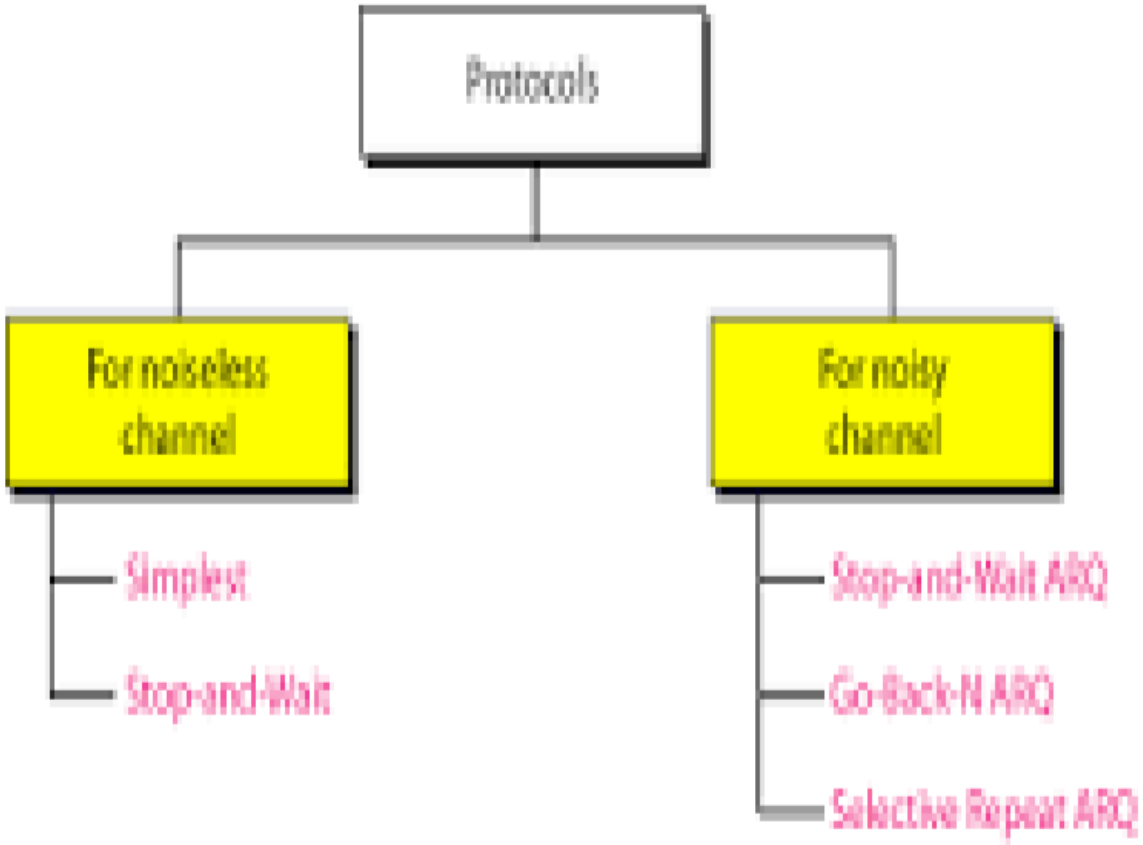
NOISY CHANNELS.

Sequence Numbers.

Design of the Stop-and-Wait ARQ Protocol.

Stop-and-Wait ARQ Protocol.

Send (sliding) window for Go-Back-N ARQ. ETC.



8) What is differential encoding? Also explain the difference between NRZ-L and NRZI. And name the coding schemes of multilevel binary & bi-phase?

ANSWER:

In digital communications, differential coding is a technique used to provide unambiguous signal reception when using some types of modulation. It makes data to be transmitted to depend not only on the current signal state, but also on the previous one.

Encoding is the process of converting the data or a given sequence of characters, symbols, alphabets etc., into a specified format, for the secured transmission of data. Decoding is the reverse process of encoding which is to extract the information from the converted format.

Data Encoding

Encoding is the process of using various patterns of voltage or current levels to represent 1s and 0s of the digital signals on the transmission link.

The common types of line encoding are Unipolar, Polar, Bipolar, and Manchester.

Encoding Techniques

The data encoding technique is divided into the following types, depending upon the type of data conversion.

Analog data to Analog signals – the modulation techniques such as Amplitude Modulation, Frequency Modulation and Phase Modulation of analog signals, fall under this category.

QUESTION#2

a) There are several network layer models proposed in the OSI model. Find all of them. Explain the differences between them?

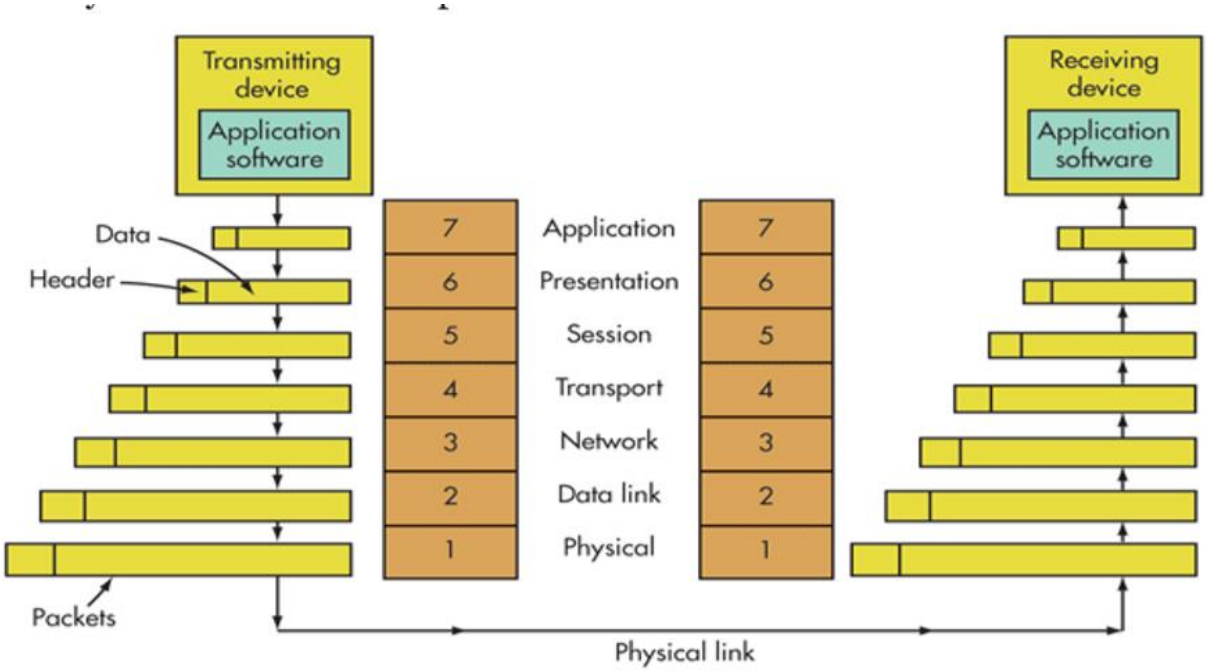
ANSWER:

Designated ISO/IEC 7498-1, the OSI model is a standard of the International Organization for Standardization (ISO). It is a general-purpose paradigm for discussing or describing how computers communicate with one another over a network. Its seven-layered approach to data transmission divides the many operations up into specific related groups of actions at each layer

The transmitting computer software gives the data to be transmitted to the applications layer, where it is processed and passed from layer to layer down the stack with each layer performing its designated functions. The data is then transmitted over the physical layer of the network until the destination computer or another device receives it. At this point the data is passed up through the layers again, each layer performing its assigned operations until the data is used by the receiving computer's software.

During transmission, each layer adds a header to the data that directs and identifies the packet. This process is called encapsulation. The header and data together form the data packet for the next layer that, in turn, adds its header and so on. The combined encapsulated packet is then transmitted and received. The receiving computer reverses the

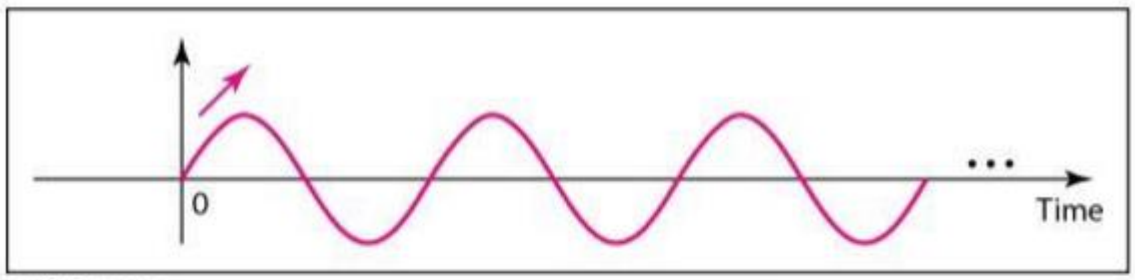
process, de-encapsulating the data at each layer with the header information directing the operations. Then, the application finally uses the data. The process is continued until all data is transmitted and received.



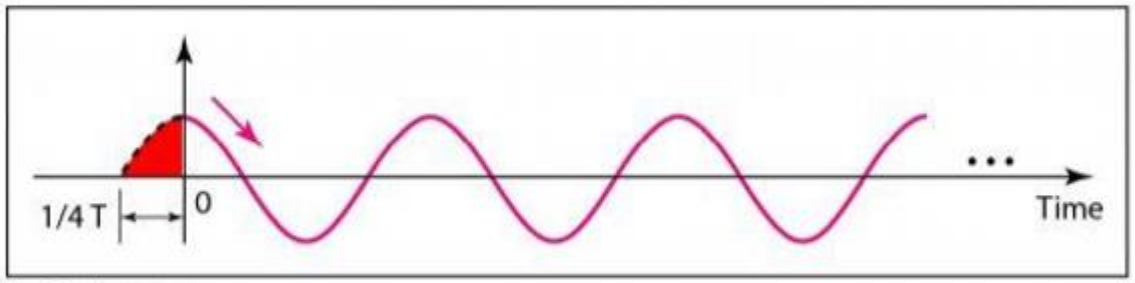
b) If a signal does not change at all, its frequency is zero. If a signal changes instantaneously, its frequency is infinite. Three components of a sine wave are amplitude, frequency and phase of a signal. The change in a signal shows the relation between signal's amplitude w.r.t to time whereas the phase is not shown. Explain your answer why we cannot explicitly show phase in a time-phase plot?

ANSWER:

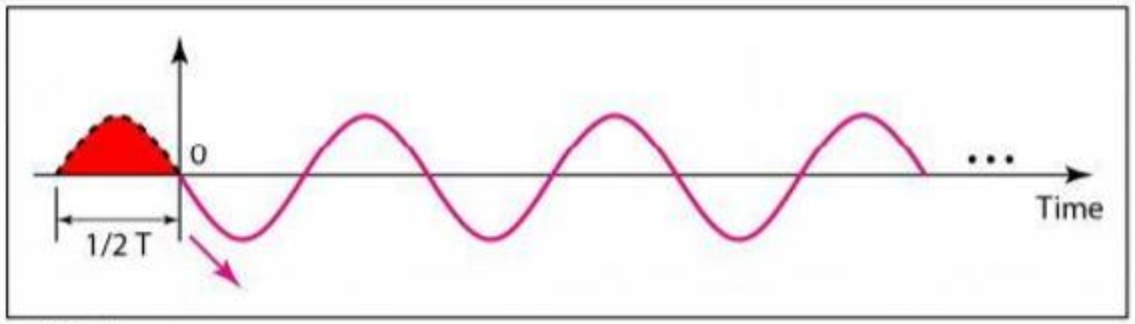
Phase describes the position of the Phase describes the position of the waveform relative to time 0.



a. 0 degrees



b. 90 degrees



c. 180 degrees

QUESTION#3

a) **A device is sending out data at the rate of 100 bps. How long does it take to send out a single character (8 bits)?**

ANSWER:

How long does it take to send out 100 bits?

100/100 = 1 sec

How long does it take to send out a single character of 8 bits?

8/100 = 0.008 sec

How long does it take to send a file of 100000 characters?

As, single character is of 8 bits. So,

{8*100000}/2000 = 400 sec.

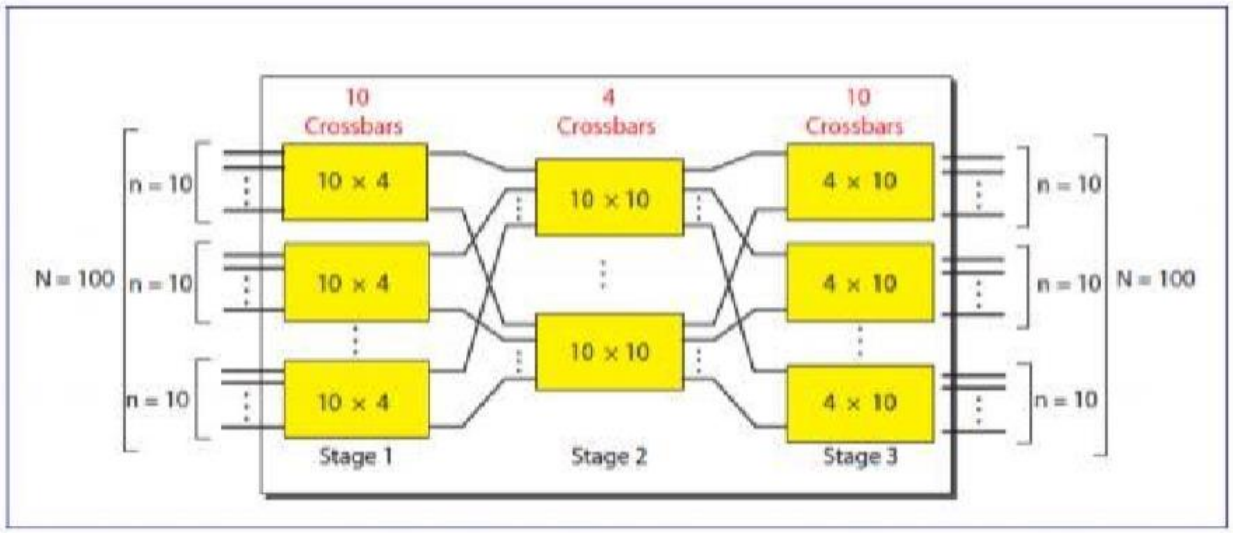
b) We need a three-stage space-division switch with total inputs of 1000. We use 1000 crossbars at the first and third stages and 4 crossbars at the middle stage.

a. Draw the configuration diagram.

b. Calculate the total number of cross-points.

c. Find the possible number of simultaneous connections?

ANSWER:



a) The total number of cross points = 10 (10 × 4) + 4 (10 × 10) + 10 (4 × 10) = 1200 c) Only four simultaneous connections are possible for each crossbar at the first stage.

b) This means that the total number of simultaneous connections is 4*10= 4

c) Only four simultaneous connections are possible for each crossbar at the first stage. This means that the total number of simultaneous connections is 4*10= 40

d) If we use one crossbar

(100 × 100), all input lines can have a connection at the same time, which means 100 simultaneous connections.

e) The blocking factor is 40/100 or 40 percent.