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Q.No.1

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

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.

Name three types of transmission impairment.

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.

What does the Shannon capacity have to do with communications?

Shannon information capacity C has long been used as a measure of the goodness of electronic communication channels. It specifies the maximum rate at which data can be transmitted without error

Compare and contrast flow control and 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.

Define piggybacking and its usefulness.

piggybacking

The usual purpose of piggybacking is simply to gain free network access rather than any malicious intent, but it can slow down data transfer for legitimate users of the network.

Piggybacking Usefulness

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.

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

High-level Data Link Control (HDLC) is a bit-oriented protocol for communication over point-to-point and multipoint links. It implements the ARQ mechanisms.

Three HDLC station types

The three HDLC station types are:

Primary station:

The primary station has the complete control of the link. The Primary station sends commands to the secondary station.

Secondary station: The secondary station sends responses.

Combined station: The combined station is one, which acts either as a primary or a Secondary, depending upon the nature and direction of the transmission. Combined station sends both commands and responses

Transfer Modes: HDLC provides two common transfer modes that can be used in different configurations: normal response mode (NRM) and asynchronous balanced mode (ABM).

Normal Response Mode:

In normal response mode (NRM), the station configuration is unbalanced. We have one primary station and multiple secondary stations. A primary station can send commands, a secondary station can only respond. The NRM is used for both point-to-point and multiple-point links.

Asynchronous Balanced Mode:

In asynchronous balanced mode (ABM), the configuration is balanced. The link is point-to-point, and each station can function as a primary and a secondary (acting as peers). This is the common mode today.

Frames:

To provide the flexibility necessary to support all the options possible in the modes and configurations, HDLC defines three types of frames: information frames (I-frames), supervisory frames (S-frames), and unnumbered frames (U-frames). Each type of frame serves as an envelope for the transmission of a different type of message.

I-frames are used to transport user data and control information relating to user data (piggybacking). S-frames are used only to transport control information. U-frames are reserved for system management. Information carried by U-frames is intended for managing the link itself.

Frame Format:

Each frame in HDLC may contain up to six fields, a beginning flag field, an address field, a control field, an

information field, a frame check sequence (FCS) field, and an ending flag field. In multiple-frame transmissions, the ending flag of one frame can serve as the beginning flag of the next frame.

Fields

1. Flag field: The flag field of an HDLC frame is an 8-bit sequence with the bit pattern 01111110 that identifies both the beginning and the end of a frame and serves as a synchronization pattern for the receiver.
2. **Address field**: The second field of an HDLC frame contains the address of the secondary station. If a primary station created the frame, it contains a to address. If a secondary creates the frame, it contains a from address. An address field can be 1 byte or several bytes long, depending on the needs of the network. One byte can identify up to 128 stations (l bit is used for another purpose). Larger networks require multiple-byte address fields. If the address field is only 1 byte, the last bit is always a 1. If the address is more than 1 byte, all bytes but the last one will end with 0; only the last will end with 1. Ending each intermediate byte with 0 indicates to

the receiver that there are more address bytes to come.

3. **Control field:** The control field is a 1- or 2-byte segment of the frame used for flow and error control. The interpretation of bits in this field depends on the frame type. We discuss this field later and describe its format for each frame type.

4. **Information field**: The information field contains the user's data from the network layer or management information. Its length can vary from one network to another.
5. **FCS field**: The frame check sequence (FCS) is the HDLC error detection field. It can contain either a 2- or 4-byte ITU-T CRC.field: The flag field of an HDLC frame is an 8-bit sequence with the bit pattern 01111110 that identifies both the beginning and the end of a frame and serves as a synchronization pattern for the receiver.

Name the protocols for noiseless channels?

Protocols for noiseless channels

1.Simplest Protocol

2.Stop and wait Protocol

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

differential encoding: **Encoding** in which signal significant conditions represent binary data, such as "0" and "1", and are represented as changes to succeeding values rather than with respect to a given reference

difference between NRZ-L and NRZI

"Non return-to-zero-level (NRZ-L) is a data encoding scheme in which a negative voltage is used to represent binary one and a positive voltage is used to represent binary zero. As with NRZ-L, NRZI maintains a constant voltage pulse for the duration of a bit time. The data themselves are encoded as the presence or absence of a signal transition at the beginning of the bit time. A transition (low to high or high to low) at the beginning of a bit time denotes a binary 1 for that bit time; no transition indicates a binary 0.

Question 2

There are several network layer models proposed in the OSI model. Find all of them.

Explain the differences between them.

Answer:

- The following is the network layer model in the OSI model. Each layer of this seven layer architecture defines a separate set of protocols and deal with one or more specific aspects of communication.
- **Physical layer :** physical layer transmit raw bit streams between two nodes by converting
- Sequence of binary digits to electric signals, light

- Signals, or electromagnetic signals, depending on whether the two nodes are on a cable circuit, fiber optic circuit, or microwave/radio circuit. Physical layer protocols decide electrical details.
- **Data link layer** : data link layer detect and correct any error in transmitted data, it partition a raw bit stream of physical layer into frames and performs error detection and correction for each frame independently.
- It is also perform flow control of frames between two nodes to ensure that a sender does not flood a receiver with data by sending frames at a rate faster then the receiver can process.
- **Network layer :** network layer sets up a logical communication path between two nodes. The network layer protocols determine which route is suitable from source to destination.
- **Transport layer :** transport layer accept messages of arbitrary length from session layer, segments them into packets, submit them to network layer for transmission, and finally reassemble the packets at destination.
- Some packets may be lost on the way from sender to receiver, then the transport layer

protocols include mechanisms for handling lost and out-of-sequence packets.

- **Session layer :** session layer provide means of establishing, maintaining, and terminating a dialogue or a session between two end users.
- This layer allows a process to add checkpoints which are considered as synchronization points into the data.
- **Presentation layer :** presentation layer provide facilities to convert message data into a form that is meaningful to communicating application layer.
- It may perform on message data such transformation as encoding decoding, code conversion. Reduces the number of bits that need to be transmitted on the network.
- **Application layer :** application layer provide services that directly support end user of network. These applications produce the data, which has to be transferred over the network.

This layer also serves as a window for the application services to access the network and for displaying the received information to the

user. Application Layer is also called as Desktop Layer

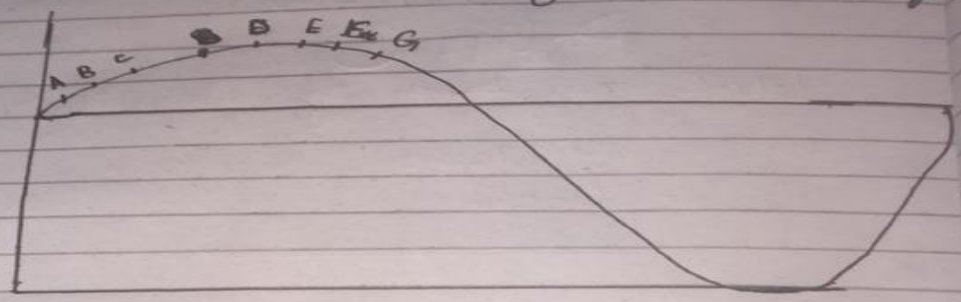
Question#2B

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

Answer:-

Phase is a specific location in a sine wave so in the series we cannot plot phase of a sine wave in a time - Phase Plot as the wave is constantly changing



As we can see that all the Points are in different Position thus we cannot explicitly Plot the Phase in time Phase - Plot.

Question#3a

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

Answer

it takes to send out 100bits

100/2000=0.05sec

Send out a signal character of 8 bits

8/2000=0.004sec

Question#3b

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.

PART - A

N = 1000
n = 1000
K = 4

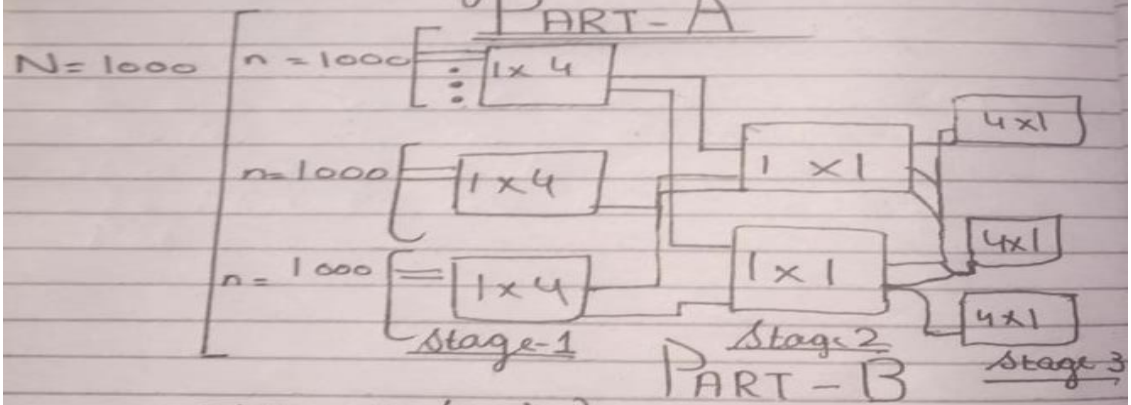
The first Stage we have

$N/n = \frac{1000}{1000} = 1$

crossbars each size is $1 \times 4 = 4$

in sec Stage we have = 1x1

in third Stage we have = 1x4



PART - B

$2KN + K\left(\frac{N}{n}\right)^2$

$2(4)(1000) + 4\left(\frac{1000}{1000}\right)^2$

$8 \times 1000 + 4(1)^2$

$8000 + 4$

8004 Cross pairs

PART-C

Total numbers of Sumilation

4×1000

$= 4000$