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Q1 (a) Briefly describe the layers in the internet model are the network support layers?

Ans The network support layers are the physical, Data link, and network layer.

(i) Physical layer:

Physical layer or layer 1 is the first and lowest layer. This layer may be implemented by a PHY chip.

The physical layer defines the means of transmitting raw bits over a physical ~~layer~~ data link connecting network nodes.

The bitstream may be grouped into code words or symbol and converted to a physical

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signal that is transmitted over a transmission medium.

The physical layer is responsible for transmitting a bit stream over a physical medium. It is concerned with:

- ★ Physical characteristic of the medium
- ★ Representation of bits
- ★ Type of encoding
- ★ Synchronization of bits
- ★ Transmission rate and mode
- ★ The way devices are connected with each other and to the link.

(2) Data Link:

The Data Link layer or layer 2 is the second layer of the seven-layer OSI model of computer networking. This layer is the protocol layer that

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that transfer data b/w nodes on a network segment across the physical layer. The data link layer provides the functional and procedural means to transfer data between network entities and might provide the means to detect and possibly correct that may occur in the physical layer.

Network Layer:

The Network Layer provides the means of transferring variable length network packet from a source to a destination host via one or more networks. Within the service layering semantics of the OSI network architecture, the network layer responds

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to service request from the transport layer and issues ~~layer~~ include. Issues service requests to the data link layer.

Function of the network layer include:

- * Connectionless communication
- * Host addressing
- * Message forwarding

since many network are partitioned into subnetworks and connect to other network for wide area communications, network used specialized hosts, called gateways or routers, to forward packets between networks.

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(b) Describe three types of transmission impairment.

Ans: There are three types of transmission impairment.

(1) Attenuation

(2) Distortion

(3) Noise

1. Attenuation:

* Attenuation refers to loss of energy by a signal time.

* When a signal, simple or composite, travels through a medium, it loses some of its energy in overcoming the resistance of the medium.

* It compensates for this loss, amplifiers are used.

2. Distortion:

* Distortion means signal changes its form or shape.

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★ Distortion can occur in a composite signal made of different frequency. Each signal component have its own propagation speed through a medium and therefore its own delay in arriving at the final signal.

(3) Noise:

Signal type of noise as thermal noise, induced noise, crosstalk noise, impulse noise may corrupt the signal.

Part:

(C) What does Shannon capacity have to do with communication?

Answer The Shannon-Hartley theorem state the channel capacity

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meaning the theoretical tightest upper bound on the information rate of data that can be communicated at an arbitrarily low error rate using an average received signal power through an analog communication channel
Subject. ~~rate using~~

To additive white Gaussian noise (AWGN) of power:

Shannon's theorem shows how to compute a channel capacity from a statistical description of a channel and establishes that given a noisy channel with capacity C and information ~~rate~~ transmitted at a line rate.

Then if there exists a coding technique which allows the

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the ^{probability} ~~probability~~ of error that at the receiver to be made arbitrarily small. This means that theoretically, it is possible to transmit information nearly without error up to nearly a limit of bits per second.

Q1 Part(d) Compare and contrast flow control and error control.

Ans

Basic for comparison

Basic Flow control	Error control
Basic Flow control is meant for the proper transmission of the data from sender to the receiver.	Error control is meant for delivering the error free data to the receiver.

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Approach	Feedback-based flow control and state based flow control are the approaches to achieve the proper flow control.	Parity checking, cycle 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.
Impact	Avoid overrunning of receivers buffer and prevent the data loss.	Detect and correct the error occurred in the data.

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Q1 Part (c) Explain Piggybacking and its usefulness. In which layer of

OSI is it used and why?

Ans In two-way communication whenever a frame is ^{received} ~~received~~ the receiver waits and does not send the control frame back to the sender immediately.

The receiver waits until its work is done and then passes in the next data packet. The delayed acknowledgement is then attached to this outgoing data frame. This technique of temporarily delaying the acknowledgement so that it can be hooked with next outgoing data frame is known as piggybacking.

Usefulness:

Improves the efficiency

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and better use of available channel bandwidth.

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 B to A, it can also carry control information about frames from A.

Why use in OSI:

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. Furthermore a network that is vulnerable to piggybacking for network access

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is equally vulnerable when the purpose is data theft dissemination of viruses or some other illicit activity.

Q1 Part

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

Ans There are three HDLC station types are:

(1) 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

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The secondary station sends responses.

Combined station:

The combined station is one which can act either as a primary or secondary depending upon the nature and direction of the transmission, combined station sends both commands and responses.

Transfer Modes:

HDLC SUPPORT

Two types of transfer modes:

(1) Normal Support Modes:

Here two types of situations are there a primary station that send commands and secondary station that can response to receive.

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Command. It is used for both Point-to-Point and multipoint communication.

(2) Asynchronous Balanced Mode:

Here the configuration is balanced i.e. each station can both send commands and respond to commands. Ans: It is used for only Point-to-Point communication.

Frames Types:

- * Information frames or I-frames, transport use data from the network layer. They can also include flow and error control information piggybacked on data.
- * Supervisory frames or S-frames are used for flow and error

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control whenever piggybacking is impossible, such as does not have data to send S-frames do not have information field.

Part (g) Brief the protocols for noiseless channels?

Ans: STOP-and-wait Protocol

stop-and-wait protocol is data link layer protocol for transmission of frames over noiseless channel. It provides unidirectional data transmission with flow control facilities but without error control facilities.

Simplest Protocol:

It has no flow or error control. It is unidirectional protocol in which data frames are traveling in only one direction from the sender to receiver.

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Part(h) what is differential encoding?
Also explain the difference b/w
NRZ-L and NRZI. And name
the coding schemes of multilevel
binary and bi-phase.

Aus Differential encoding:

Differential encoding is the digital encoding technique whereby a binary value is denoted by a signal change rather than particular signal state. using differential encoding, binary data in any user defined 1/Q modulation can be encoded during the modulation process via symbol table offsets defined in the differential state map.

Difference b/w NRZ-L
and NRZI:

Now return

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to zero level is a data encoding scheme in which a negative voltage is used to represent binary one and positive voltage is used to represent binary zero. As with NRZ-L ~~to represent binary one~~ NRZ-1 maintains a constant voltage pulse for the duration of bits time.

Bi-Phase encoding:

The signal level is checked twice for every bit time both initially and in the middle. Hence the clock rate is double the data transfer rate and thus the modulation rate is also doubled. The clock is taken from the signal itself. The bandwidth required for this coding is greater. There are two types of Bi-phase encoding.

- ★ Bi-Phase Manchester
- ★ Differential Manchester

Q2(I) - - - - -

Ans: Before using the destination address is an intermediate or the destination node, the packet goes through error checking what may help the node find the corruption and discard the packet. Normally the upper layer protocol will inform the source to resend the packet.

(K) we have channel with 4 GHz bandwidth. if we want to send data at 100 kbps. what is the minimum SNR_{dB}? what is SNR?

Ans:

$$C = B \times \log_2(1 + \text{SNR})$$

$$100 \times 10^3 = 4 \times 10^3 \log_2(1 + \text{SNR})$$

$$\log_2(1 + \text{SNR}) = 25$$

$$1 + \text{SNR} = 2^{25}$$

$$\text{SNR} = 2^{25} - 1 = 33554431$$

$$\text{SNR}_{\text{dB}} = 10 \log_{10}(33,554,431) = 75.27 \text{ dB}$$

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Q2(d) Answer:

$$1 \text{ mbps} = 1000000 \text{ bps}$$

$$\text{So, } 8 \div 1000000$$

AS = single character
= 8 bits

$$= 0.000008 \text{ sec}$$



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Q3 (L) ~~Q3~~ ID: 6833

Answer Q3 Part L

Ans A manchester stream at the given waveform is a manchester binary data stream:

→ In the manchester encoded binary stream, a transition occurs in the middle of each bit period. The middle transition in the data stream serves as a data bit and clock period.

(M) High level Data Link control is a bit oriented code transport synchronous data link layer protocol developed by the international organization