

Student Name :- Luqman.

ID NO : 13474.

Discipline :- BSS E

Teacher Name :- Mr. Mansoor Qadir.

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Question NO 1:- Part (A)

Briefly describe the layers in the internet model are the network support layers?

Ans:-

Physical layer, data link layer and network support layers and session, presentation and application layers are user support layers. The transport layer links these layers by segmenting and rearranging the data.

→ These layers deals with the electric specifications, physical connection, transport timing and reliability. The user support layers are

session layer

Presentation layer

Application layer

Part (B)

Describe three types of transmission impairment.

Ans:-

The signal received may differ from the signal transmitted. The effect will degrade the signal quality for analog

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signals and introduce bit errors in digital signals. There are three types of transmission impairment:

- Attenuation
- Delay distortion
- Noise

### Attenuation:-

It means loss of energy. The strength of signal decreases with increasing distance which causes loss of energy in overcoming resistance of medium. This is also known as attenuated signal. Amplifiers are used to amplify the attenuated signal which gives the original signal back.

### Distortion:-

It means change in the shape of signal. This is generally seen in composite signal with different frequencies. Each frequency component has its own propagation speed while travelling through a medium. Every component arrive at different time which leads to delay distortion. Therefore, they have different phases at receiver end from what they had at sender end.



### Noise:-

The random or unwanted signal that mixes up with the original signal is called noise, thermal noise and impulse noise which may corrupt the signal.

### Types of noise:-

- Induced noise
- crosstalk noise
- thermal noise
- Impulse noise.

### Part (c)

What does the Shannon capacity have to do with communications?

### Ans:-

The Shannon channel capacity is a formula that relates the bandwidth of a channel, the channel's SNR, and the bit rate.

[Shannon's channel capacity]

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

The channel capacity is the bit rate at which data can be sent along a channel with a negligible error rate. Attempting to send bits faster than this rate will increase the error rate beyond

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a negligible value. This will have large negative effects on our communications system. Notice that for a fixed bandwidth, as a SNR decreases the bitrate must also decrease.

Part (D)

Compare and contrast flow control and error control.

Ans:-

Flow control and error control are the control mechanism at data link layer and transport layer. When ever the sender 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 vs Error Control**

Flow control is the mechanism of delivering error free

Error control is the mechanism



For maintaining reliable data to the receiver  
the properties in data communication  
mission from the sender to  
the receiver in  
data communication

### Main Techniques

Stop and wait, Stop and wait ARQ, Go Back  
and sliding N-ARQ, selective Repeat ARQ  
Window are some example of error  
examples of control techniques.  
Flow control  
Techniques

### Part (E)

Explain piggy backing and its usefulness. In which layer of OSI is it used and why?

Ans:-

Piggy backing means to ride over something. In two way communication, whenever a frame is received, the receiver waits and does not send the control frame (acknowledgement or ACK) back to the sender immediately.

The receiver waits until its network layer passes in the next

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data packet. The delayed acknowledgement is then attached to this outgoing data frame.

The technique of temporarily delaying the acknowledgement so that it can be hooked with next outgoing data frame is known as piggybacking. It is used in transport layer of OSI.

This network optimizing technique has some advantages and disadvantages as similar as most of the other things. The main advantage is; blocking of link for sometime. This may cause a connection to go down or may cause a service problem if the delay is more than expected. To avoid problems, piggybacking uses a very small duration times.

On the advantage side, better use of bandwidth, the underlying cable and intermediate switches, routers etc will be less loaded. If someone is paying the cost to utilize a network based on messages, then the cost will also be reduced.

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Part (F)

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

Ans:-

HDLC stands for High Level Data Link Control. It is a transmission protocol used at the data link layer (layer 2) of the OSI seven layer model for data communications. The HDLC protocol embeds information in a data stream that allows devices to control data flow and correct errors. HDLC is an ISO standard developed from the synchronous data link control (SDLC) standard proposed by IBM in the 1970s. HDLC NRM (also known as SDLC)

HDLC is a bit oriented protocol that supports both half duplex and full duplex communication over point to point & multipoint link.

For any HDLC communication session one station is designated primary and the other secondary. A session can use one of the following connection modes, which determine how the primary



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and secondary station's interest.

**Normal/Balanced:-**

responds only for. The secondary station responds only to the primary station.

**Asynchronous:-**

The secondary station can initiate a message.

**Asynchronous Balanced:-**

Both station can send and receive over its part of a duplex line.

**Transfer modes:-**

**HDL** 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 communication.

**Asynchronous Balanced Mode (ABM)**

Here the configuration is balanced i.e. each station can

both send commands and respond to commands, it is used for only point to point communication.

### HDLC Frame:-

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 HDLC frame are

#### Flag:-

It is an 8 bit sequence that makes the beginning and the end of frame. The bit pattern of flag is 01111110

#### Address:-

It contains the address of the receiver. If the frame is sent by the primary station, it contains the address(es) of the secondary stations, 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.

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### Payload:-

This carries the data from the network layer. Its length may vary from one network to another.

### FCS:-

It is a 2-byte or 4 bytes frame check sequence for error detection. The standard code used is CRC (Cyclic redundancy code).

### Types of HDLC Frame:-

There are three types of HDLC frames. The type of frame is determined by the control field of the frame.

#### I. Frame:-

I-frame or information frames carry user data from the network layer. They also include flow and error control information that is piggybacked on user data.

#### S. Frame:-

S frames or supervisory frames do not contain information field. They are used for flow and error control when piggybacking is not required. The first two bits of control field of S frame is 10.



### U Frame:-

U Frame is "unnumbered".  
are used for myriad miscellaneous functions, like link management. It may contain an information field, if required. The two bits of control field of U Frame is 11.

(9) Part

### Brief the Protocols of noiseless channels:-

#### Noiseless channel:-

Let may first assume we have an ideal channel in which no frames are lost, duplicated or corrupted.

#### Simple Protocol:-

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

#### Stop and wait Protocol:-

If the data frame arrives at receiver site faster than they can be processed, the frame must be stored until their use.

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Part (H)

What is differential coding? Also explain the difference between NRZ-L and NRZI. And name the coding scheme of multilevel binary & biphasic:-

Ans:-

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 the current signal state (or symbol)

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Q no a  
Part I:-

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

Part j:-

A device is sending out data at the rate of 1000 bps.

• How long does it take to send out a single character (8 bytes)?

$$(8/1000)s = 0.008s = 8ms$$

• How long does it take to send a file of 100,000 characters?

$$((100,000 \times 8) / 1000) = 800s$$



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Part k:-

We have a channel with 4 KHz bandwidth of we want to send data at 100 kbps, (with) what is the minimum SNR<sub>dB</sub>? what is SNR,

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

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

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

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

$$\text{SNR} = 2^{25} - 1 = 33,554,431$$

$$\text{SNR}_{\text{dB}} = 10 \log_{10} (33,554,431) \approx 75 \text{ dB}$$

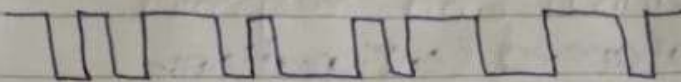
19 no 139/4  
**Question NO3 Part (L)**

The waveform here belongs to a Manchester encoding with the data.

**Step to step solz.**

**Step 1:-**

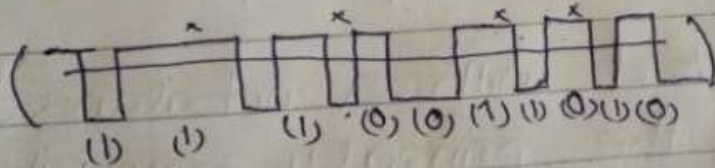
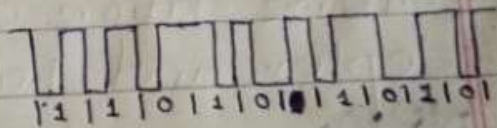
The given waveform is a manchester encoded binary data stream



**Manchester Encoding:-**

In the manchester encoding data stream a transition occurs in the middle of each bit period. The mid bit transition in the data stream serves as a data bit and clock period.

**step 2:-**



**Part (M)**

Assume that the primary HDLC station ----- Assume error face operation?



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Ans:-

A primary maintained a separate logical link with each secondary station combined station.

**Combined station:-**

Combined the feature of primary and secondary. A combined station may issue both commands and responses.

**unbalanced configuration:-**

Consist of one primary and one or more secondary station and supports both full duplex and half duplex.

**Balanced configuration:-**

Consist of two combine station and support both full duplex and half duplex.

**NRM:-**

Used with a unbalanced system the primary may initiate data transfer for a secondary.



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## ARM

Used with a unbalanced casting  
The secondary may initiate transmission  
without explicit pensis.