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Assignment - No. 1

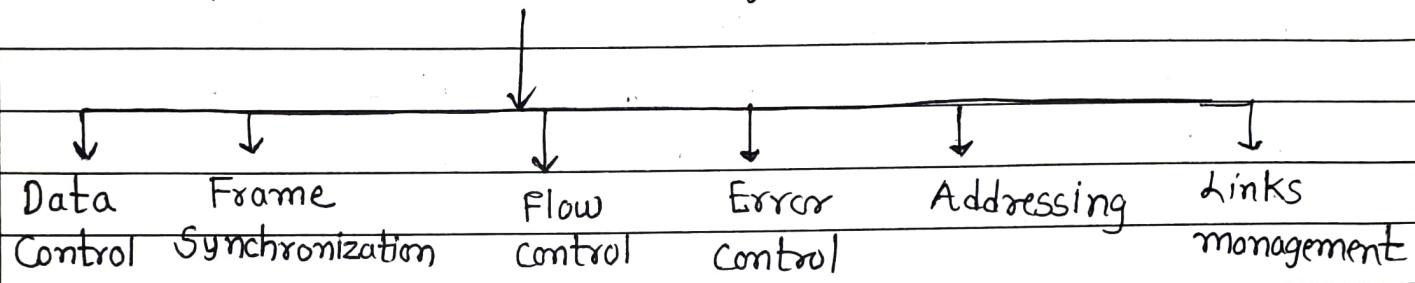
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Q.1 Enumerate the main responsibilities of Datalink layer.

→ The data link layer is supposed to carry out many specified functions.

functions of datalink layer



i) Services provided to the network layer

The data link layer provided a well defined service interface to the network layer.

ii) Frame synchronization :-

The source machine sends data in the form of blocks called frames to the destination machine. The starting and ending of each frame should be identified so that the frames can be recognized by the destination machine.

iii) Flow Control :-

The source machine must not send data frames at a rate faster than the capacity of destination machine to accept them.

iv) Error control :-

The errors introduced during transmission from source to destination machine must be detected and detected at the destination machine.

v) Addressing :-

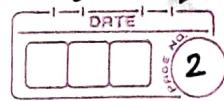
When many machines are connected together (LAN), the identify of the individual machines must be specified while transmitting the data frames. This is known as Addressing.

vi) Control and data on same link :-

The data and control information is combined in a frame and transmitted from source to destination machine. The destination machine must be able to separate out the control information from the data being transmitted.

vii) Link Management :-

The communication between the source & destination is required to be initiated, maintained & finally terminated for effective exchange of data. It requires co-ordination & co-operation among all the involved stations. Protocols or procedures are required to be designed for the link management.



Q.2 What is ISO-OSI reference model? compare it with TCP-IP model. Which layer is used for the following?



An OSI model is a layered framework for the given design of network systems. that allows for communication across all types of computer systems.

OSI	TCP/IP
1. It defines the services interfaces and protocols very clearly and makes a clear distinction between them.	It does not clearly distinguish between service, interfaces & protocols.
2. It has 7 layers	It has 4 layers.
3. Transport layer guarantees delivery of packets.	Transport layer does not guarantee delivery of packets.
4. It has horizontal approach.	It has vertical approach.
5. Separate session layer.	No session layer, characteristics are provided by transport layer.
6. Separate presentation layer	No presentation layer characteristics are provided by application layer.

- i) To route packets : Network layer.
- ii) To convert packets to frames : Data link layer
- iii) To detect and correct the errors : Data link layer.
- iv) To run services like FTP, Telnet etc : Application layer.



Q.3 With the help of suitable diagram, explain sliding window protocol with selective repeat. Compare its performance to sliding window with Go-Back-N technique.

In this method, only the specified damaged or lost frame is retransmitted. A selective repeat system differs from the go-back-n method in the following ways :-

- i) The receiver can do sorting of data frames & is also able to store frames received after it has sent the NAK until the damage frame has been replaced.
- ii) The window size in this method is less than or equal to $(n+1)/2$, whereas in case of go-back-n it is $n-1$.

The principle of operation of this protocol is illustrated in fig.

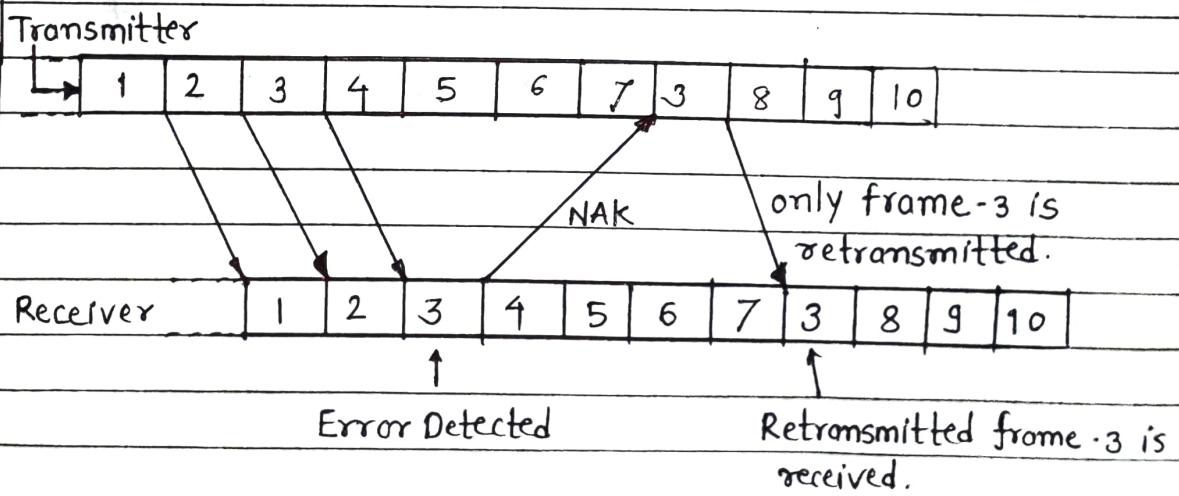
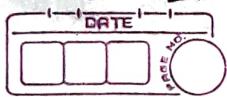


Fig. Selective Repeat ARQ system.

In this system as well, the transmitter does not wait for the ACK signal for the transmission of the next frame. It transmits the frames contiguously till it receives the 'NAK' signal from the receiver.

The receiver sends the "NAK" signal back to the transmitter as soon as it detects an error in the received frame. For example the receiver detects an error in the third frame, as shown in fig.



If no acknowledgement arrives in the allotted time, all the frames that remain unacknowledged are retransmitted. The disadvantage of this method is that because of the complexity of sorting and storage required is that because of the complexity of sorting and storage required by the receiver and the extra logic needed by the transmitter to select frames for retransmission. The system becomes more expensive. This is due to the use of pipelining in selective repeat ARQ.

Parameter	Go-Back-N-ARQ	Selective Repeat ARQ
1. Window size	Sliding window size : $(2^m - 1)$	Sending window size $2^m - 1$
2. Operating principle	Received frame is damaged.	Same as Go-Back N protocol.
	Transmitted frame is lost. NAK is lost.	
4. Principle of pipelining	Used	Used.
5. Efficiency	Moderately efficient due to pipelining.	Most efficient due to pipelining.
6. Complexity	Moderately complex	Highly complex.

Q.4 List the advantages of fiber optics as a communication medium.

→ Some of the advantages of fiber optics communication over the conventional means of communication are as follows :-

1) Small size & lightweight :-

The size of the optical fiber is very small. Therefore a large number optical fiber can fit into a cable of small diameter.

2) Easy availability & low cost :-

The material used for manufacturing of optical fibers is "silica-glass". This material is easily available. so the optical fibres cost lower than the cables with metallic conductors.

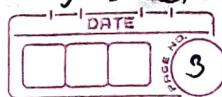
3) No electrical or electromagnetic interference :-

Since the transmission takes place in the form of light rays the signal is not affected due to any electrical or electromagnetic interference.

4) Large Bandwidth :-

As the light rays have a very high frequency in the GHz range, the bandwidth of the optical fiber is extremely large. This allows transmission of more number of channels.

Therefore this information carrying capacity of an optical fiber is much higher than that of a co-axial cable.



Q.5 Write Short Note on HOLE :

→ The high level data link protocol control (HDLC) protocol was developed by ISO. It is the most widely accepted data link layer protocol. It has the advantages of flexibility, adaptability, reliability & efficiency of operation.

HDLC is a bit oriented data link control protocol & it is designed to satisfy many of data control protocol requirements.

i) Primary Station :-

A primary station takes care of data link management. When communication between the primary & secondary station takes place, the primary station would connect and disconnect the data link. The frames sent by a primary station are commands.

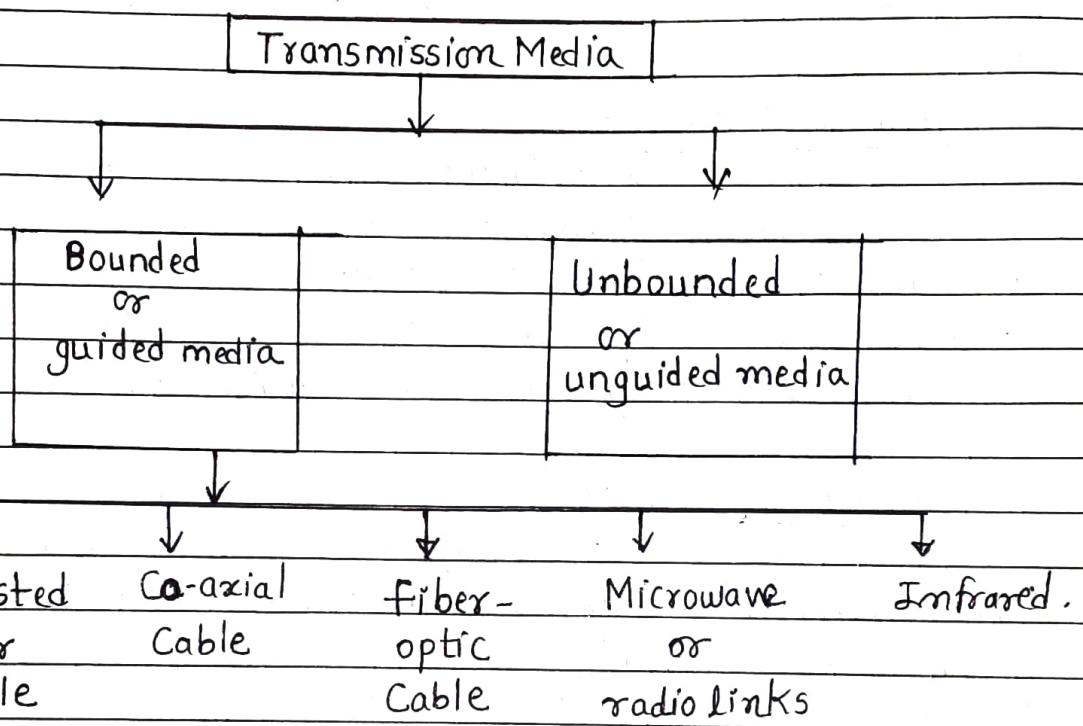
ii) Secondary station :-

A secondary station operates under the control of primary station. When communication between primary and secondary station takes place the frames sent by the secondary station takes place are called responses.

iii) Combined station :-

A combined station can act as primary as well as secondary stations. Therefore it can send both commands and responses.

- Q.6 What are the different guided & unguided transmission media?
 → The transmission medium mainly classified into two types:-
 a) Bounded or guided media
 b) Unbounded or unguided media.



A) Twisted Pair Cable :-

- i) Twisted Pair is least expensive and most widely used. A twisted pair (TP) consists of two insulated copper wires arranged in a regular spiral pattern.
- ii) A wire pair acts as a single communication link. TP may be used to transmit both analog & digital signals. For analog signals amplifiers are required about every 5 to 6 cm. For digital signals amplifiers are required about every 2 or 3 cm.
- iii) Twisted pair cable comes in two varieties
 - (a) Unshielded Twisted Pair (UTP)
 - (b) Shielded Twisted Pair (STP)

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B) Co-axial cable :-

- i) It is made up of two conductors that share the common axis. It consists of a hollow outer cylindrical conductor that surrounds a single inner wire conductor.
- ii) Coaxial cable is used to transmit both analog & digital signals. Data transfer rate of coaxial cable is in between TP & fiber optic cable.

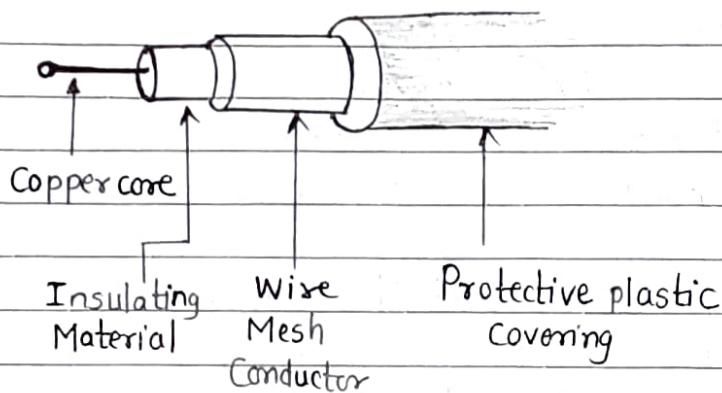
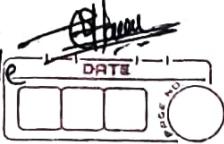


fig : Coaxial cable.

C) Fiber Optic Cable (FOC) :-

- i) A fiber optic cable is used to carry a light beam from one place to another. Light is an electromagnetic signal & can be modulated by information.
- ii) Since the frequency of light is extremely high hence it can accommodate wide bandwidths of information also higher data rate can be achieved with excellent reliability.
- iii) The modulated light travel along the fiber and at the far end are connected to electrical signals by means of a photoelectric cell, Thus the original input signal is recovered at the far end.



Wireless Transmission :-

1) Radio Transmission :

• Radio waves have frequencies between 10 kHz and 1 GHz.

Radio Waves include the following types :-

- a) short wave & fm radio
- b) very high frequency television
- c) ultra high freq. (UHF) radio & television.

2) Microwave Transmission :-

i) Above 100 MHz, the waves travel in straight lines and can therefore be narrowly focused. Concentrating all the energy into a small beam using a parabolic antenna gives a much higher signal to noise ratio, but the transmitting and receiving antennas must be accurately aligned with each other.

ii) A single hop is typically 30 to cm in relatively flat regions for frequencies in the 2 to 8 GHz bands. When antennas are placed between mountain peaks, a very long hop length can be achieved. Hop distances in excess of 200 cm are in existence.

3) Infrared Light Wave Transmission :

i) Unguided Infrared light (wave) are widely used for short range communication. The remote control used in TV, VCR & stereos all use infrared communication. They are relatively directional, cheap and easy to build but have a major drawbacks.

ii) It means an infrared system in one room of a building will not interfere with a similar system in adjacent rooms.