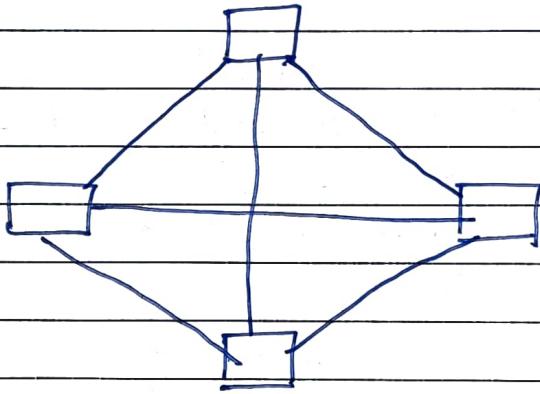


31/05/21

Q1 A

Ans In mesh topology, all the computers are interconnected to every other computer during a network. Each computer not only sends its own signals but also relays data from other computers.

Every node features a point-to-point connection to the opposite node. The connections within the mesh are often wired or wireless.



There are 2 types of mesh topologies : -

- 1) Fully-connected mesh topology
- 2) Partially-connected Mesh topology

ADVANTAGES :

- Failure of a single device won't break the network
- Fault identification is straightforward
- It provides high privacy and security.
- Adding new devices won't disrupt data transmissions

## DISADVANTAGES

- It is costlier than other network topologies
- Installation is a difficult process
- Power requirement is higher as all the nodes will need to remain active all the time
- Maintenance needs are challenging with a mesh

let say there are  $N$  nodes. You want to connect every node to every other node without redundancy.

From first node, you connect to  $N-1$  nodes  
 From second node, you connect to  $N-2$  nodes

$\vdots$

From  $K^{\text{th}}$  node, you connect to  $N-K$  nodes

$\vdots$

From  $N^{\text{th}}$  node, you connect to 0 nodes

$$\therefore S_N = (N-1) + (N-2) + \dots + (1) + (0)$$

$$S_N = 1 + 2 + 3 + \dots + (N-2) + (N-1)$$

$$\therefore 2S_N = N + N + N + \dots + N$$

$$2S_N = N(N-1)$$

$$\boxed{\therefore S_N = \frac{N(N-1)}{2}}$$

$\therefore N$  nodes will have  $\frac{N(N-1)}{2}$  connections

Q1B

ANS

The sliding window is a technique for sending multiple frames at a time. It controls the data packets between the two devices where reliable and gradual delivery of data frames is needed.

Sliding window protocol has two types :-

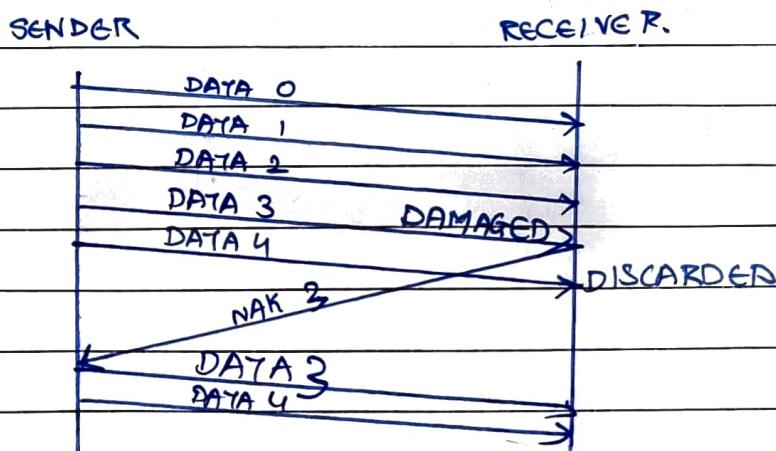
- 1) Go back N protocol
- 2) Selective Repeat protocol.

#### GO-BACK-N ARQ

Go-back-N ARQ protocol is also known as Go-back-N Automatic Repeat Request. It is a data link layer protocol. In this, if any frame is corrupted or lost, all subsequent frames have to be sent again.

The size of the sender window is  $N$ . The size of the receiver window is 1.

If the receiver receives a corrupted frame, it cancels it. The receiver does not accept a corrupted frame. When the timer expires, the sender sends the correct frame again.



## SELECTIVE REPEAT ARQ

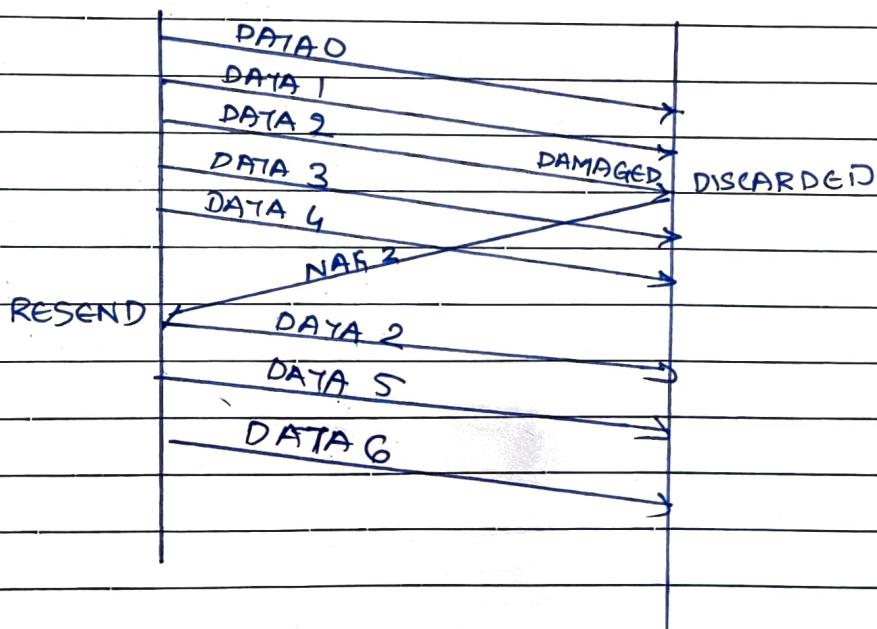
Selective Repeat ARQ is also known as the selective Repeat Automatic Repeat Request. The Go-back-N protocol works well if it has fewer errors. But if there are a lot of errors, to avoid bandwidth loss, we use Selective Repeat ARQ protocol.

In this the size of senders window is always equal to the size of the receiver window.

If the receiver receives a corrupt frame, it does not directly discard it. It sends a negative acknowledgement to the sender who retransmits that frame. There is no waiting for any time-out.

SENDER

RECEIVER

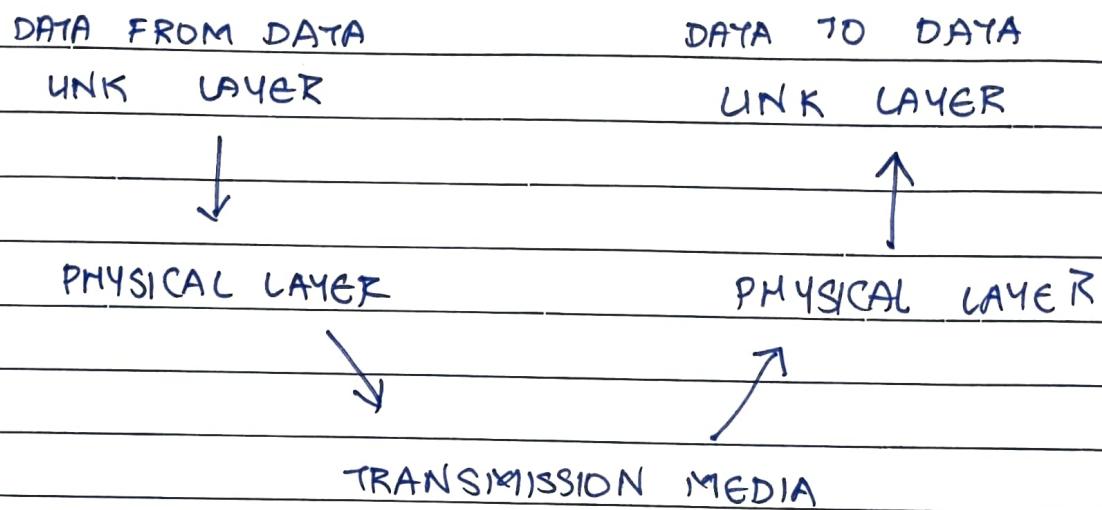


Q2 A

ANS

Functions of the physical layer:-

1. REPRESENTATION OF BITS : Data in this layer consists of stream of bits. The bits must be encoded into signals for transmission. It defines the type of encoding i.e. how 0's and 1's are changed to signals.
2. DATA RATE : This layer defines the rate of transmission which is the number of bits per second.
3. SYNCHRONIZATION : It deals with the synchronization of the transmitter and receiver. The sender and receiver are synchronized at bit level.
4. LINE CONFIGURATION : This layer connects devices with the medium : point to point configuration and multipoint configuration.
5. TRANSMISSION MODES : It defines the direction of transmission between two devices : simplex, half-duplex, full duplex.
6. Dealt with base band and broadband transmission.

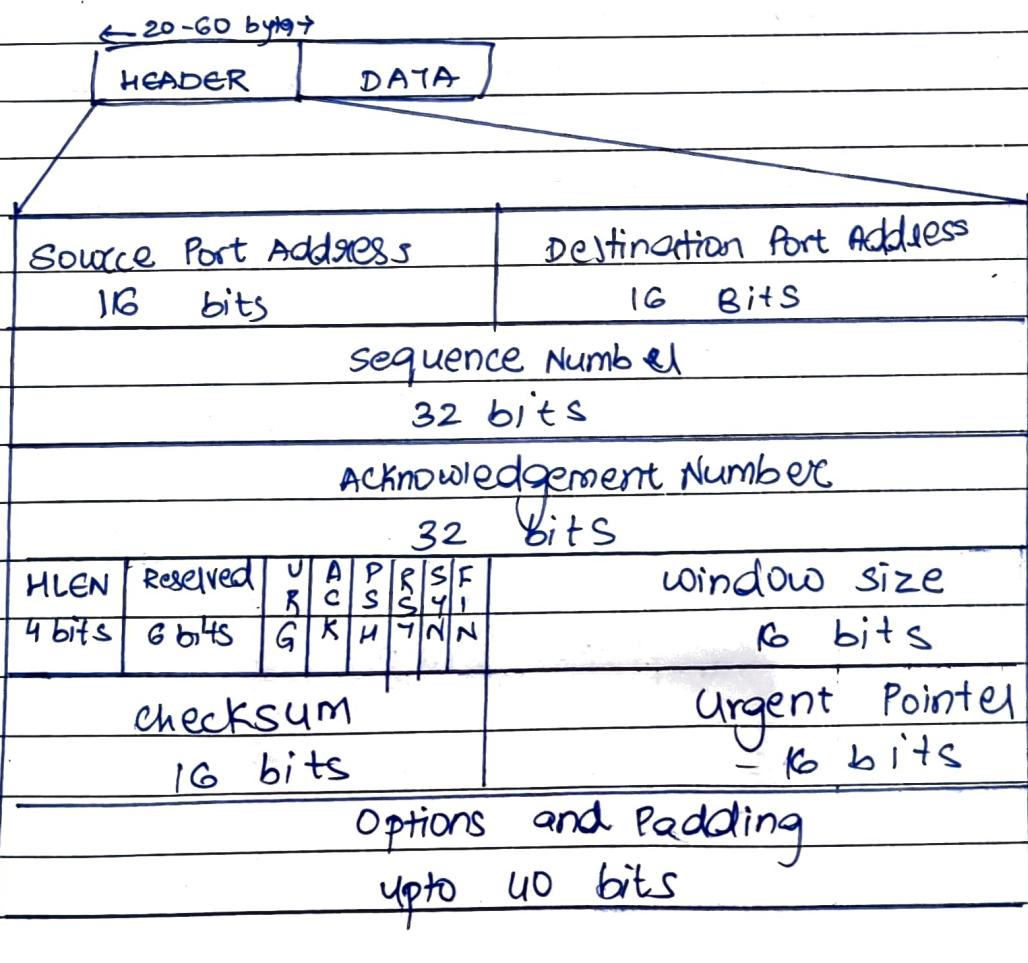


Q2 B	TWISTED PAIR	CO-AXIAL	OPTICAL FIBER
1.	Signal transmission takes place in electrical form over the metallic wires	Signal transmission takes place in the electrical form over the inner conductor of cable	Signal transmission takes place in optical form over a glass fiber.
2.	Affected due to external magnetic field.	External magnetic field is less affected.	External magnetic field is not affected
3	Power loss due to conduction and radiation	Power loss due to conduction	Power loss due to absorption, scattering and bending
4	It has low bandwidth	It has moderately high bandwidth	It has very high bandwidth.

5) Easy installation	Fairly easy installation	Difficult to install
6 It has low noise immunity	It has higher noise immunity.	It has highest noise immunity

Q5 A

ANS TCP segment consists of data bytes to be sent and a header that is added to the data by TCP as shown



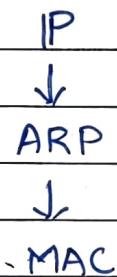
- Source Port Address : 16 bit field that holds the port address of the application that is sending the data segment.
- Destination Port Address : 16 bit field holding port address of the host that application receiving the data segment.
- Sequence Number : 32 bit field that holds the sequence number. It is used to reassemble the message at the receiver's end if the segments are not in order.
- Acknowledgement Number : 32 bit field that holds the acknowledgement number which is an acknowledgement for the previous bytes being received successfully.
- Header length (HLEN) = It is a 4 bit field that indicates the length of the TCP header
- Control flags :
  - URG : urgent pointer is valid
  - ACK : acknowledgement number is valid
  - PSH : Request for push
  - RST : Reset the connection
  - SYN : synchronize sequence numbers
  - FIN : terminate the connection
- Window size : tells the window size of the sending TCP
- Checksum : holds the checksum for error control.
- Urgent pointer : used to point to data that is urgent and needs to reach the receiving process at the earliest

Q5 B

ANS

The acronym ARP stands for Address Resolution Protocol which is one of the most important protocols of the network layer in the OSI model.

ARP finds the hardware address, also known as Media Access Control (MAC) address of a host from its IP address



ARP broadcasts a packet to all the devices of the source network. The devices peel the header from the protocol data unit (PDU) called frame and transfers the packet to the network layer where its network ID is validated with the destination IP's network ID and if equal responds to the source with the MAC address.

The above process continues till the second last network device in the path where it gets validated and ARP in return responds with the destination MAC address.

Q5 C

HTTP → 80

HTTPS → 443

FTP → 21

SFTP → 22

Q6 A

201.70.64.0

to form 8 subnets

∴  $6 < 2^3$ 

∴ 3 extra bits are required.

201.70.64.0 belongs to class C [192 - 223]

.. 255.255.255. --- | ---  
 N/w Post field.

All possible combinations

255.255.255.000 | 00000

255.255.255.001 | ..

255.255.255.010 | ..

255.255.255.011 | ..

255.255.255.100 | ..

255.255.255.101 | ..

255.255.255.110 | .. X

255.255.255.111 | ..

∴ Only 6 required last 2 are discarded.

∴ Subnet masks are

- 255.255.255.0
- 255.255.255.32
- 255.255.255.64
- 255.255.255.96
- 255.255.255.128
- 255.255.255.160

∴ There are 5 host fields

∴  $2^5 = 32$  hosts on each subnet

Subnet NO	IP Addresses	Subnet Mask
1	201.70.64.0 - 31	255.255.255.0
2	201.70.64.32 - 63	255.255.255.32
3	201.70.64.64 - 95	255.255.255.64
4	201.70.64.96 - 127	255.255.255.96
5	- 201.70.64.128 - 159	255.255.255.128
6	201.70.64.160 - 191	255.255.255.160

Q6 B

ANS TCP supports two types of connection releases like most connection-oriented transport protocols.

1 GRACEFUL CONNECTION RELEASE : The connection is open until both parties have closed their sides of connection

2 ABRUPT CONNECTION RELEASE : Either one TCP entity is forced to close the connection or one user closed both direction of data transfer.

## 1. Abrupt connection release :

An Abrupt connection release is carried out when a RST segment is sent for one of the below reasons :-

- when a non-SYN segment was received for a non-existing TCP connection
- In an open connection, some TCP implementation send a RST segment when a segment with an invalid header is received.
- when some implementation needs to close an existing TCP connection for the following reasons : -
  - lack of resources to support the connection
  - the remote host is now unreachable

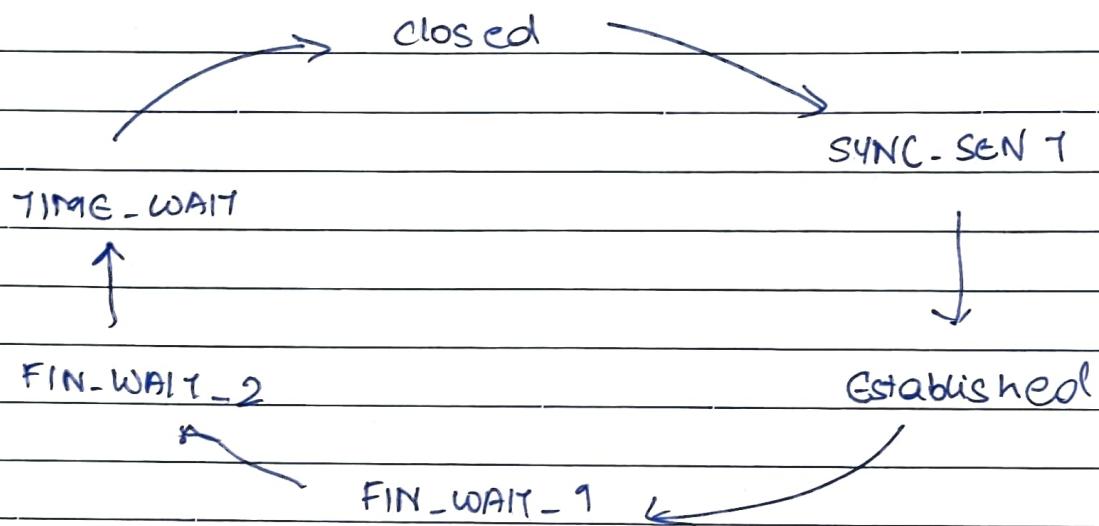
## 2 Graceful connection release :

The common way of terminating a TCP connection is by using the TCP header's FIN flag.

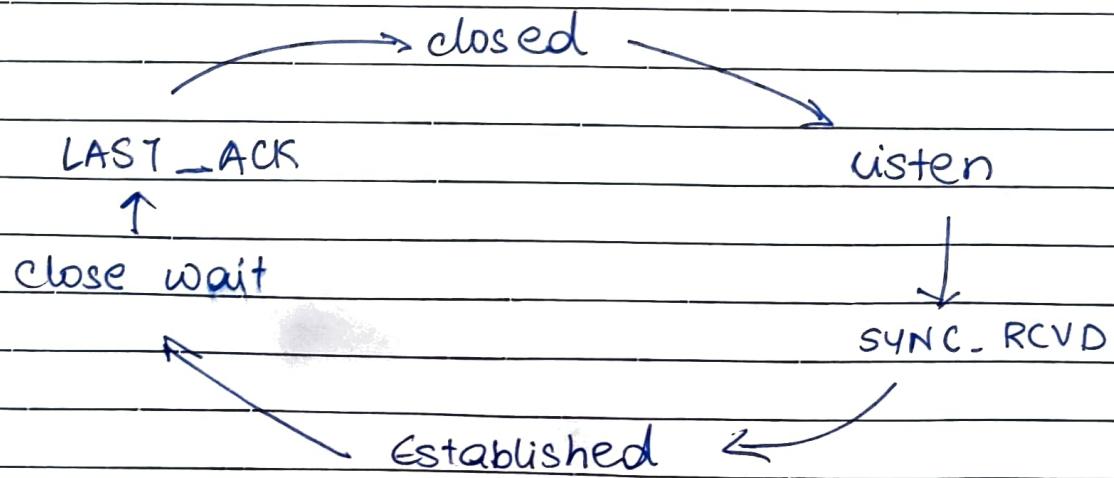
Mechanism :-

- Step 1 → FIN from Client
- Step 2 → ACK from Server
- Step 3 → Client waiting
- Step 4 → FIN from Server
- Step 5 → ACK from Client

☛ TCP states visited by client



TCP states visited by Server side



## Graceful connection release

