

①

Q1.

a) What is a MAC Address? What is flow control?

Ans:

MAC (Media Access Control) addresses are globally unique addresses that are written into hardware at the time of manufacture. The MAC address is a unique value associated with a network adapter. MAC addresses are also known as hardware address or physical address. They uniquely identify an adapter on a LAN. MAC addresses are 12 digit hexadecimal number.

Flow control :

Flow control refers to a set of procedures used to restrict the amount of data. The sender can send before receiving acknowledgement.

⑬ What is redundancy? What is the purpose of hamming code?

Ans Redundancy:

Redundancy is the error detecting mechanism, which means adding extra bits or extra bytes to a shorter group of bits, or extra bytes which may be appended at the destination of each unit.

Purpose of hamming code: A hamming code can be designed to correct burst errors of certain lengths, so, the simple strategy used by hamming code to correct single bit errors must be redesigned to be applicable for multiple bit correction.

⑭ What are the responsibilities of data link layer? Mention two types of errors.

3.

Flows:
• reliable, streaming, bidirectional, good delivery guarantee.
These are the responsibilities of data link layer.
• regional, local links to maintain

1. Framing

2. Physical addressing

different methods for addressing each other

3. flow control (e.g.) a local switch has to approach

4. Error control (retransmission) switch to store off

5. Access control (switches provide collision detection)

6. multiplexing (multiple channels share a single physical link)

There are two types of errors. These are
a. Single bit error
b. Burst error.

a. Single bit error
• local transmission errors just need one bit flip
• significant

b. Burst error
• unexpected errors
• significant

Q2.

- (a) Define flow control. Briefly explain the functions of data link layer.

Ans:

Flow control:

An important factor in the design of the data link layer is to control the rate of data transmission between two sources and destination hosts. If there is a discrepancy between the source and destination hosts data sending and receiving speed, then it will cause dropping of packets at the receiver end. It further causes the sender to clear the acknowledgement packets, thereby causing retransmission thus making the network efficient.

Functions of Data Link Layer:

The data link layer

has a number of specific functions it can carry out. These functions include:

1. Providing a well defined service interface to the network layer.
2. The data link layer accomplishes these activities in the following manner.
 - a. Unacknowledged connectionless service.
 - b. Acknowledged connectionless service.
 - c. Acknowledged connection-oriented service.

2. Framing: The data link layer received a raw bit stream from the physical layer that may not be error free. To ensure a reliable

transfer of bit streams to the network layers.
The data link layer breaks the bit stream into frames.

3. Error detection and correction :
It is a collection of methods involving coding which are used to detect errors in transmitted data and also to correct them.

4. Flow control :
It controls local transmission by delaying or dropping frames.

Q. What is LAN ? Briefly describe any one of framing method.

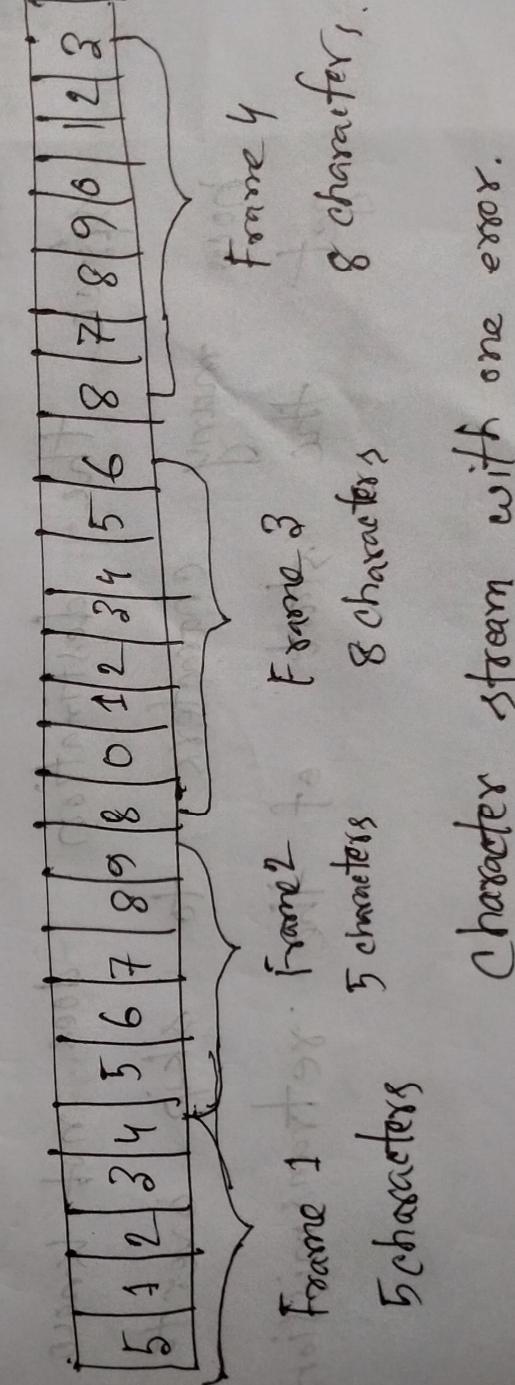
Ans:

A LAN is a common name used to describe a group of device that share

from a geographic location. LAN is limited to single building or campus.

Explaining Character Count method:

This method uses a field in the header to specify the number of characters in the frame. When the data link layer at the destination sees the character count, it knows how many character follow and hence where the end of frame is. This technique is shown in the following figure for four frames of size 5, 8, 8 and 8 characters respectively.



Character stream with one error.

The trouble with this algorithm is that if the count can be grabbed by a transmission error, for example, if the character count of 5 in the second frame of fig (b) becomes a 7, the destination will get out of synchronization and will be unable to locate the start of the next frame. Even if the checksum is incorrect so the destination knows that the frame is bad, it still has no way of telling where the next frame starts. Sending a frame back to the source asking for a retransmission does not help either, since the destination does not know how many characters to skip over to get the start of the retransmission.

- Q. Does Ethernet provide connection-oriented or connectionless service? Suppose two Ethernet LANs are interconnected by a box that operates as follows. The box has a table that tells its physical addresses of the mechanisms in each LAN. The box listens to frame transmissions on each LAN. If a frame is destined to a station at the other LAN, the box retransmits the frame onto other LAN, otherwise the box does nothing.
- Q. Is the resulting network still a LAN? Does it belong in the data link layer or the network layer?
- i) Can the approach be extended to connect more than two LANs? If so, what

problems arise as the number of LANs becomes large?

Ans: Number of stations sharing bandwidth is limited by the number of stations and the speed of the network.

Ans:

① Ethernet provides connectionless transfer

② Service of information frames, routing & switching out of the network is done by the MAC layer.

(i) The resulting network is a local area network.

(ii) That has been extended. The extended

and LAN transfer frames, and so it still belongs in the data link layer.

11 Yes more than two LANs can be connected (i) using one approach from an extended LANs. As the number of

LANs becomes large, the number of hubs or switches will increase and cost of

nodes will increase.

physical addresses stored in the bridge groups and becomes unmanageable. (1). Each time a machine is added the addresses in all the boxes need to be updated. Serious problems arise if boxes are connected so that loops can occur.

b) Suppose all laptops in a large city are to communicate using radio transmissions from a high antenna tower. Or, the data link layer or network layer more appropriate for this solution?

Ans:

The data link layer is connected with the transfer of frames of information across a single hop. The network layer involves the transfer of information across a network using multiple hops per path in general. The connection from a radio antenna to the

laptops is direct, and thus a data link layer protocol is more suitable for this situation (2).

(c) Now suppose the city is covered by a large number of small antennas covering smaller areas. Which layer is more appropriate?

Ans:

The number of areas each covered by small antennas can be interconnected using the "bridging" approach of problem 16, which remains the data link layer. However the network layer may be more appropriate because it provides for the transfer of data in the form of packets, across the communication network. A key aspect of this transfer is the routing of the

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packets from the source machine to the destination machine, typically traversing a number of transmission link and network nodes where routing is carried out,

Q4. Bits/bytes in transport unit, rebound to estd

- a) Explain why it is useful for application layer programs to have a "well-known" TCP port number?

Ans:

The TCP Layer entity uses the port number to determine which application program the packet belonging to on the TCP connection setup process. It is very convenient to have a unique "well known" port number; otherwise some protocol or procedure would be required to find the desired number.

b) Suppose an application layer entity wants to send an L -byte message to its peer process, using an existing TCP connection. The TCP segment consists of the message plus 20 bytes of header. The segment is encapsulated into an IP packet that has an additional 20 bytes of header. The IP packet in turn goes inside an Ethernet frame that has 18 bytes of header and trailer. What percentage of the transmitted bits in the physical layer correspond to message information, if $L = 100$ bytes, 500 bytes, 1000 bytes?

Ans:

TCP / IP over Ethernet allows data frames with a payload size up to ~~1500~~ 1560 bytes.

Therefore, $L_{\text{max}} = 100, 500$, and 1000 bytes are within this limit.

The message overhead includes:

TCP: 20 bytes of header.

IP: 20 bytes of header.

Ethernet: total 18 bytes of header and trailer.

Therefore,

$$L = 100 \text{ bytes} + 100/158 = 63\% \text{ efficiency}$$

$$L = 500 \text{ bytes} - 500/558 = 90\% \text{ efficiency}$$

$$L = 1000 \text{ bytes} - 1000/1058 = 95\% \text{ efficiency}$$

Q

Suppose a computer is moved from one department to another. Does the physical address need to change? Does the IP address need to change? Does it makes difference if the computer is a laptop?

Ans:

- i) The physical address does not change ^{globaly NIC card.}
- ii) The IP address may need to be changed
 - to reflect a new subnetwork id and new host id.

iii) The situation is same for laptop.

- a) What difference does it make to the network layer if the underlying data

link layer provides connection-oriented service versus a connectionless service?

Ans:

if the data link layer provides a connection-oriented service to the network layer, then the network layer must proceed all transfer of information with a connection setup procedure. information-oriented services include is of the connection-oriented services that frames of information are arranged transferred correctly and in sequence by the data link layer, the network layer can then assume that the packets it sends to its neighbor traverse an error-free pipe.

On the other hand, if the data link layer is connectionless, then each frame is

sent independently through the data link, probably in unconfirmed manner (without acknowledgements or retransmissions). In this case, the network layer can not make assumptions about the sequencing or correctness of the packets it exchanges with its neighbours.

The Ethernet local area network provides an example of connectionless transfer of data link frames. The transfer frames using

"Type 2" service in logical link control, provides a connection - oriented data link control example.

Q Define Error detection and correction. What are the issues in data link layer?

Ans:

Error Detection: Data can be corrupted

during transmission. It's called an error. For reliable communication, the receiver must find out the errors occurred in the data which is called as error detection.

Error correction:

It is the mechanism to correct the errors and it can be handled in 2 ways.

- When an error is discovered, the receiver can have the sender retransmit the entire data again.
- A receiver can use an error correcting code, which automatically correct certain errors.

The data link layer has a number of

specific functions it can carry out.

These functions include,

- a) Providing a well defined service interface to the network layer
- b) Detailing with transmission errors.

- c) Regulating the flow of data so that slow receivers are not swamped by fast senders.

Q6. (a) What are the ways to address the framing problem?

The framing problem can be addressed by the following protocols;

- Byte Oriented protocols (PPP)

Bit-Oriented Protocols (HDLC)

Frame-Based Framing (SONET).

Q) Explain Spanning - Tree Protocol.

Ans: Spanning Tree Protocol (STP) is

defined in the IEEE 802.1D is protocol that provides a link management while preventing redundancy path loops in the network. Undesirable loops can disrupt function properly, only for the station. One active path can exist between two stations. Loop can occur due to reasons.

for a variety of reasons.

Q9

The most common reason you find loops in networks is the result of deliberate attempt to provide redundancy.

- a link or switch fails, another in case one link or switch fails, another can take over.

Q10 Explain VPN.

Ans: A VPN is a service that offers secure, reliable connectivity over a shared public network infrastructure such as the Internet. VPNs maintain the same security and management policies as private networks. They are free for use.

most cost effective method of establishing a virtual point to point connection between remote sites and an enterprise customer's network.

Q) Define virtual point to point connection between remote sites and an enterprise.

Ans: Virtual point to point connection is a method of establishing a virtual point to point connection between remote sites and an enterprise.

Q) Why is data link layer divided into two layers?

Ans: Data link layer is divided into two layers because it has two main functions:

1) Logical link control layer and LLC layer. LLC layer is divided into two parts: IEEE 802.11 and IEEE 802.3.

This LLC layer is used for Novell and TPX protocol transmission. IEEE 802.11 is used for wireless transmission.

Q. 8

For IP protocol we have two Spec
noting the ADDRESS AND DEST ADDRESS (for
communication), but when we use
IPX / NOVELL protocol
IPX / NOVELL protocol
include 1 more
more byte named "don't know")

through which communication happens.
at 1st layer. (in short to
② 2nd layer)
communicate with IP and IPX / NOVELL
we from LLC layer.

b) Describe about Network layer;

Ans.
The network layer is a portion of
the communication protocol that allows for the
online communication.

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connection and transfer of data packets between different devices or networks.

In Transport segment from sending to receiving host.

On sending side encapsulates segments into datagrams.

On receiving side, delivers segment to transport layer.

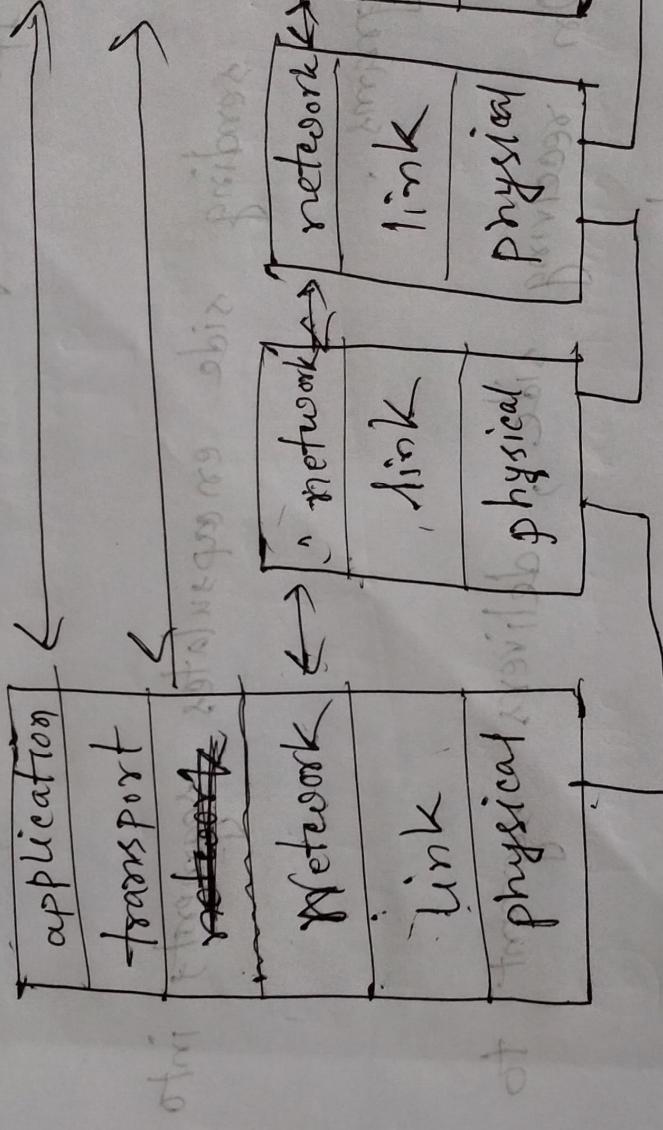
Network layer protocols in every host, router.

Router examines header fields in all TP datagrams passing through it.

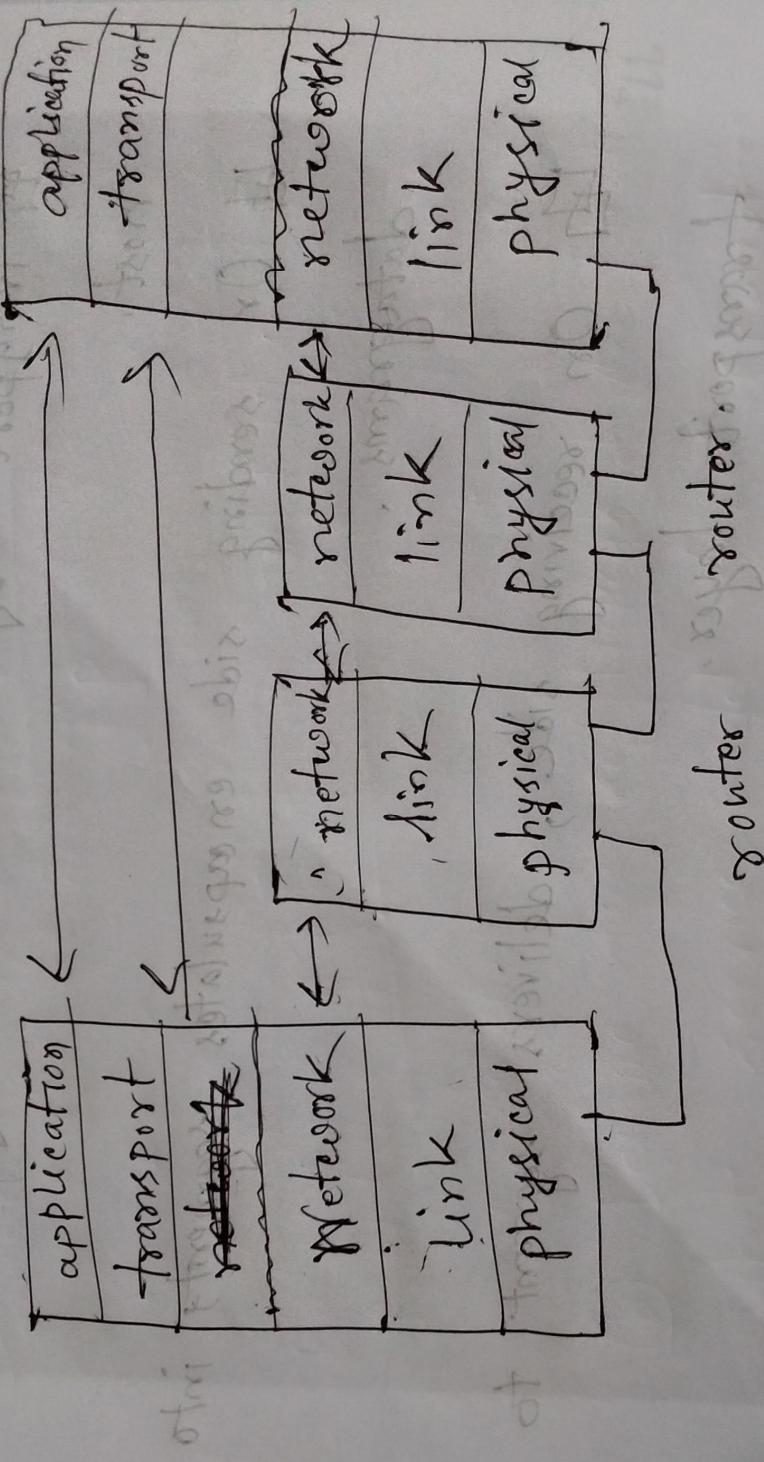
Q8

Explain what Network Layer is? Host-to-Host communication in OSI model is organized

client



Server -

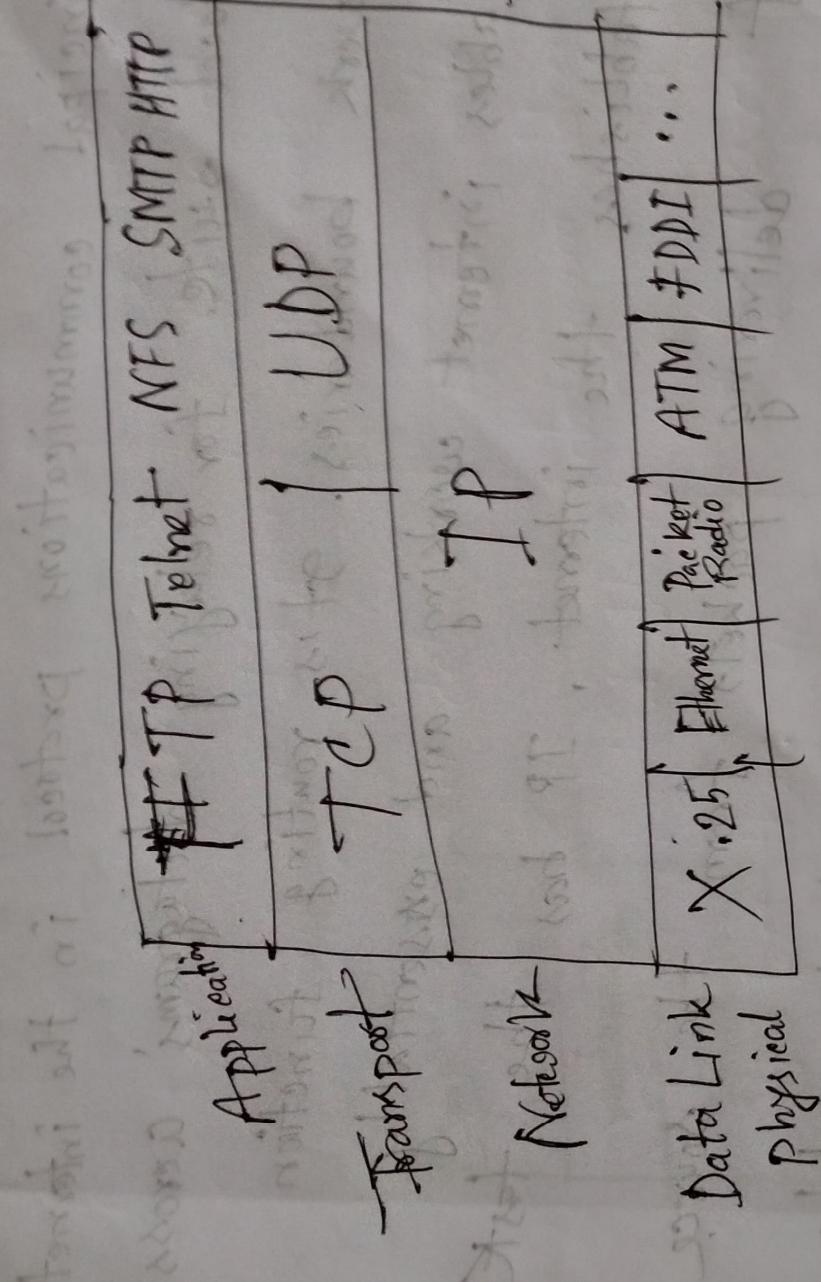


Q8.

(a) Explain Internet Protocols with figure.

Ans: The Internet Protocol (IP) is the

principal communications protocol in the internet protocol suite for relaying datagrams across network boundaries. It is routing function enables internet working and essentially establishes the internet. IP has of delivering packets from the source to the destination host solely host based on the IP address in the packet headers. Internet Protocol (IP) refers to a set of rules that govern how data packets are transmitted over a network.



- b) Describe two key Network Layer functions.
- What service model for "channel" transporting datagrams from sender to receiver?
- Ans:
- Forwarding: Move packets from router's input to appropriate router output.

~~2.5 Routing:~~ determine route taken by packets from source to destination.

- forwarding algorithms

~~2.6 Connection service:~~ Before datagram flows, two end hosts and intervening routers establish virtual connection (vc).

- Needed in some network architectures

ATM, frame relay

→ Network vs transport layer connection service

- * network : Between two hosts (may also involve intervening routers in case of vcs)

- * transport : between two processes.

Example services for

- individual datagrams & for a flow of datagrams -

to guaranteed delivery

- ✓ guaranteed delivery with less than 40 msec delay.

bandwidth to flow.

restrictions on changes in inter-packet spacing.

in inter-packet spacing.

no flow control needed.

no connection setup required.

(,5V)

bandwidth consumed frequency