

1. a) What are node and link? Distinguish between 2 types of link.
- b) What is data link layer? What are the types of Data link layer?
- c) What are the services provided by the data link layer?
2. a) Distinguish between MAC and IP address.
- b) Define three types of addressing in Data link layer.
- c) What is ARP?

3. a) Distinguish between Data link
and Network layer.

b) Distinguish between Frame
and Packet.

c) What are the errors in
Data transmission?

What are the

4. a) Explain two types of error control.

b) What are the error detecting
techniques?

c) What are the error
correction techniques?

5. a) Explain the line discipline of Data in data link layer.

b) Explain Flow control of data.

6. a) What are the functions of Network layer?

b) What are the services of Network layer?

c) Classification of Network addressing.

7. a) What is Routing?

b) Explain Routing Metrics and costs.

c) Three types of Routing (Static, Default, Dynamic)

8. a) classification of Routing Algorithm.

b) Define all Network layer Protocols.

c) How ARP works?

Ans. No - I

What are Node & Link? Distinguish between them.

a) A network node is a connection point that can receive, create, store and data along distributed network routes.

A data link is meant to establish a connection between two devices that need to transfer data between one another.

There are 3 types of link

configuration — Simplex,
Half duplex
Full duplex.

In data link layer there are two categories of link.

- ① Point to Point link
- ② Broadcast link.

P2P	Broadcast
① Link channel is shared between 2 devices.	① Channel shared between multiple devices.
② Secure	② Less secure
③ Uses the full capacity of channel.	③ Less usage of that capacity

What is Data link layer? 2 sub-layers of it.

1. b) Data link layer is responsible for converting data stream to signal bit by bit and to send over the underlying hardware. At receiving end, data link layer picks up data from hardware which are in form of electrical signals, assembles them in recognizable frame format, and hands over to upper layer.

Data link layer has 2
sub-layers :

- ① Logical link control
- ② Media access control.

1. c) What are services between
provided by Data Link Layer?

Ans: Services provided by data
link layer ~~are~~ are given
below —

- ① Framing & Link access
- ② Reliable delivery
- ③ Flow control
- ④ Error detection
- ⑤ Error correction
- ⑥ Half-duplex & Full-duplex.

Ans. NO - 02

2. a) Difference between MAC and IP address.

Ans.

MAC	IP
I Media Access control address.	I Internet Protocol address.
II Operates in Data link layer.	II Operates in Network layer
III 6 bytes Hexadecimal address.	III 4 byte / 16 byte address
IV NIC Manufacturer provides MAC address.	IV ISP provides IP address
V Device with MAC address can be retrieved by ARP protocol.	V Device with IP address can be retrieved by RARP protocol

Q. b) Define 3 types of addressing
in Data Link Layer.

Ans: Some link-layer protocols
define 3 types of addresses -

① Unicast Address : Each host or interface of a router is assigned a unicast address.
Unicast means one-to-one communication. A frame with a unicast address destination is destined only for one entity ~~in~~ the link.

② Multicast Address : Some link-layer protocols define multicast

addresser. It means one-to-many communication. However, the jurisdiction is local (~~not~~ inside the link).

(iii) Broadcast Address : Broadcasting means one-to-all communication.

A frame with a destination broadcast address is sent to all entities in the link.

2. c) What is ARP ?

Ans. Address Resolution Protocol (ARP) is procedure for mapping a dynamic internet protocol address (IP) to a permanent physical address in a local area network (LAN).

Ans. No - 03

3. a) Distinguish between Data link and Network layer.

Ans.

Data link	Network layer
① It allows communication between any two PCs inside a local area network.	① It allows communication between PCs from different network.
② It makes use of MAC address	② It uses IP IP address.

3. b) Distinguish between Frame & Packet.

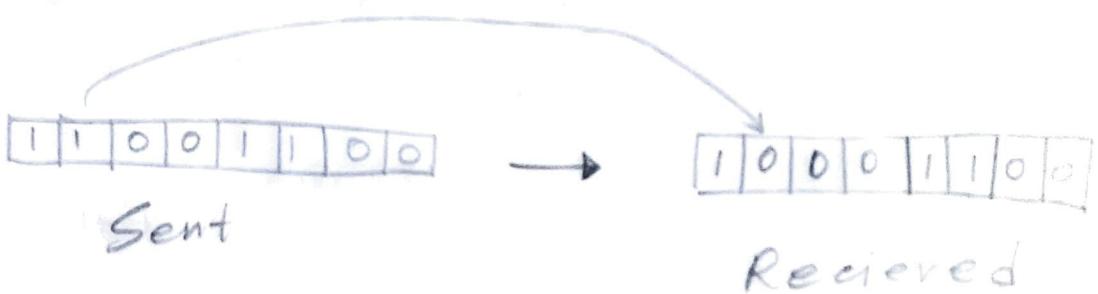
Ans: Difference between Frame and Packets are :

Packet	Frame
① Encapsulated unit created at the Network layer of OSI model.	① Encapsulated unit created at the data link layer of the OSI.
② Ex - IP-packet	② Ex: Ethernet frame
③ Packet contains source and destination IP addresses along with top layer data.	③ Frame contains source and destination MAC addresses along with Top layer data.
④ Segment is encapsulated within a packet. Hence Segment is the data part.	④ Packet is encapsulated within a frame. Hence Packet is data part.
⑤ Thus, a packet typically contains logical address information.	⑤ A frame typically contains physical address information.

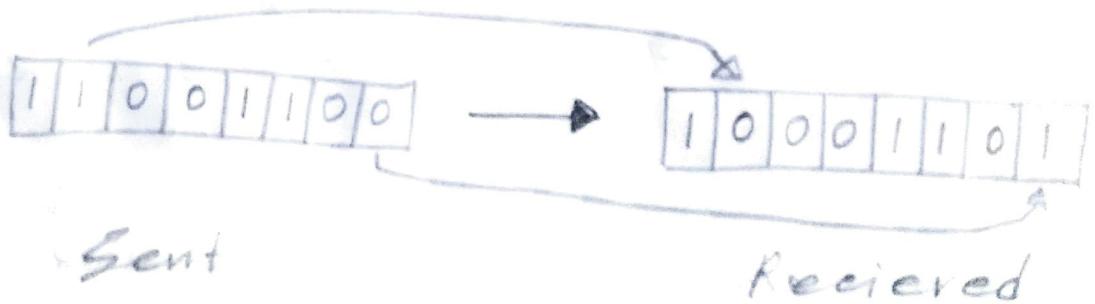
3. c) What are the errors in Data transmission?

Ans. There are 3 types of Error in Data transmission —

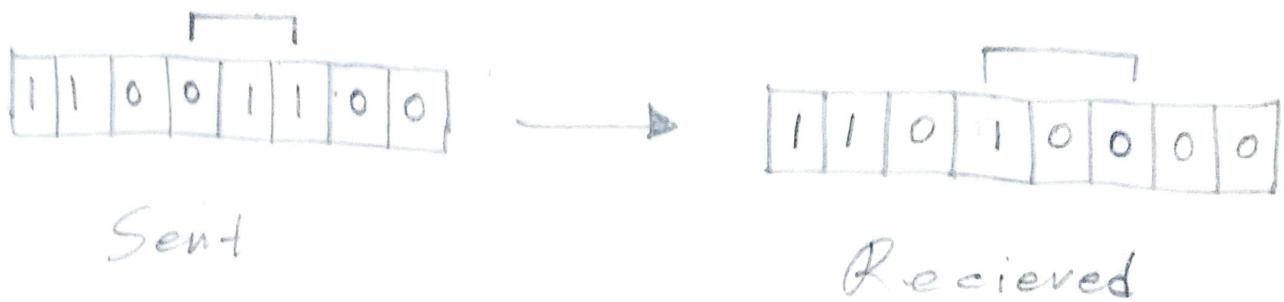
① Single bit error : In a frame, there is only one bit, anywhere though, which is corrupted.



② Multiple bit error : Frame is received with more than one bits in corrupted state.



(III) Burst errors: Frame contains more than one consecutive bits corrupted.



4. a) What are the two types of Ecosystem control mechanism.

Ans: There are two possible Error control mechanism —

- ① Error detection
 - ② Error correction

4. b) What are the error detection techniques?

Ans: The most popular error detecting techniques are —

- ① Single parity check
- ② Two dimensional parity check
- ③ checksum
- ④ cyclic redundancy check

4. c) What are the error correction techniques ?

Ans. In the digital world, error correction can be done in two ways :

① Backward Error Correction:

When the receiver detects an error in the data received, it requests back \Rightarrow the sender to retransmit the data unit.

⑪ Forward Error Correction: When the receiver detects some error in the data received, it executes error-correcting code, which helps it to auto-recover and to correct some kinds of errors.

5. a) Explain the line discipline of data in Data link layer.

Ans. Line discipline is a functionality of the data link layer that provides the co-ordination among link systems. It determines which device can send and when it can send the data.

Line discipline can be achieved in two ways —

① ENQ/ACK

② Poll/Select

① ENQ/ACK : ENQ/ACK stands for Enquiry/Acknowledgement is used when there is no wrong receiver available on the link and having a dedicated path between the two devices so that device capable of receiving the transmission is the intended one.

~~ENQ/ACK~~ A

ENQ/ACK coordinates which device will start transmission and whether the recipient

is ready or not.

⑪ Poll/Select : The poll/select method

of line discipline works with those topologies where one device is designated as a primary station, and other devices are secondary stations.

5. b) Explain the Flow control of Data.

Ans: Flow control is a set of procedures that tells the sender how much data it can ~~be~~ transmit before the data overwhelms the receiver.

The receiving device has limite

speed and limited memory to store the data. Therefore, the receiving device must be able to inform the sending device to stop the transmission temporarily before the limits are reached. It requires buffers, a block of memory for storing the information until they are processed.

Two methods have been developed to control the flow of data :

- ① Stop-and-wait
- ② Sliding window

① Stop and wait: This flow control mechanism forces the sender after transmitting a data frame to stop and wait until the acknowledgement of data frame sent is received.

② Sliding Window: In this flow control mechanism, both sender and receiver agree on the number of data-frames after which the acknowledgement should be sent.

6. a) What are the functions of network layer?

Ans: The main functions performed by the Network layer are :

① Routing

② Logical Addressing

③ Internetworking

④ Fragmentation

6.b) What are the services of Network layer ?

Ans. Services provided by the Network layer are —

- ① Guaranteed delivery
- ② Guaranteed delivery with bounded delay.
- ③ In-order packets.
- ④ Guaranteed max jitter.
- ⑤ Security services.

6. c) Explain the classification of Network addressing.

Aus: An IP address is 32 bit long. An IP address is divided into sub-classes :

- ① Class A
- ② Class B
- ③ Class C
- ④ Class D
- ⑤ Class E

An IP address is divided into two parts

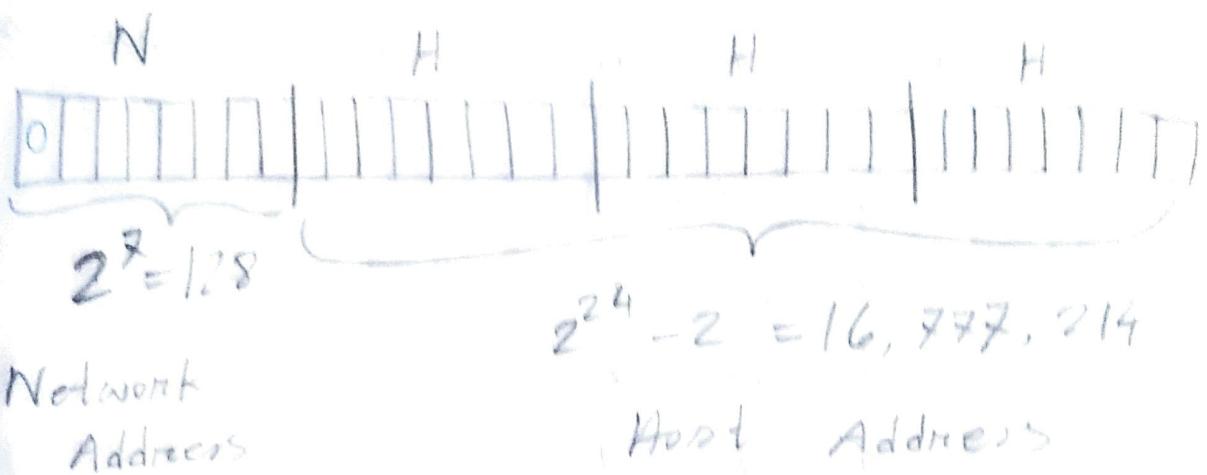
① Network ID : It represents the number of Networks.

② Host ID : It represents the number of hosts.

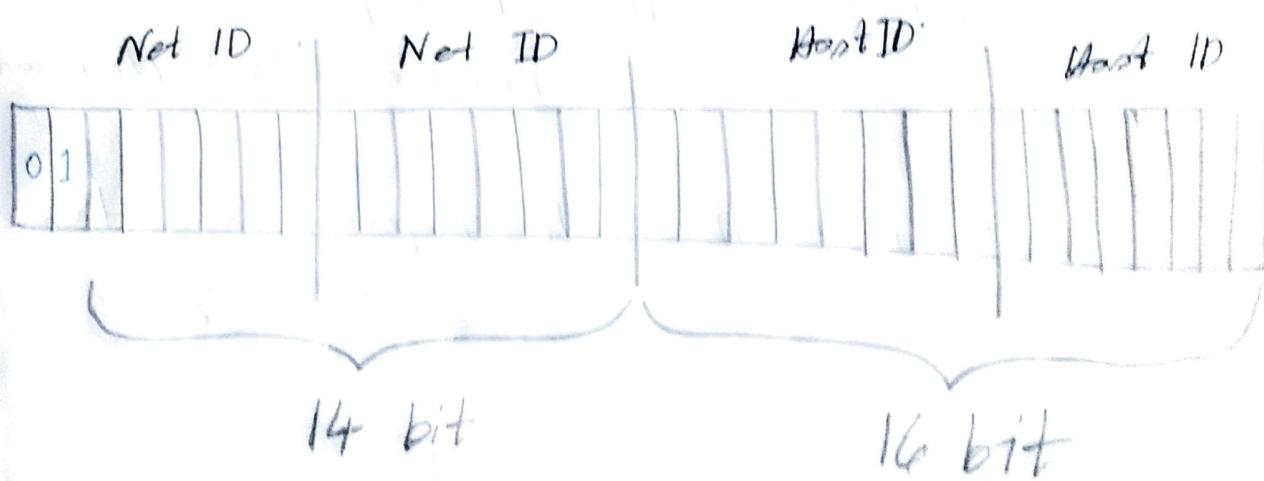
Explanation of classes :



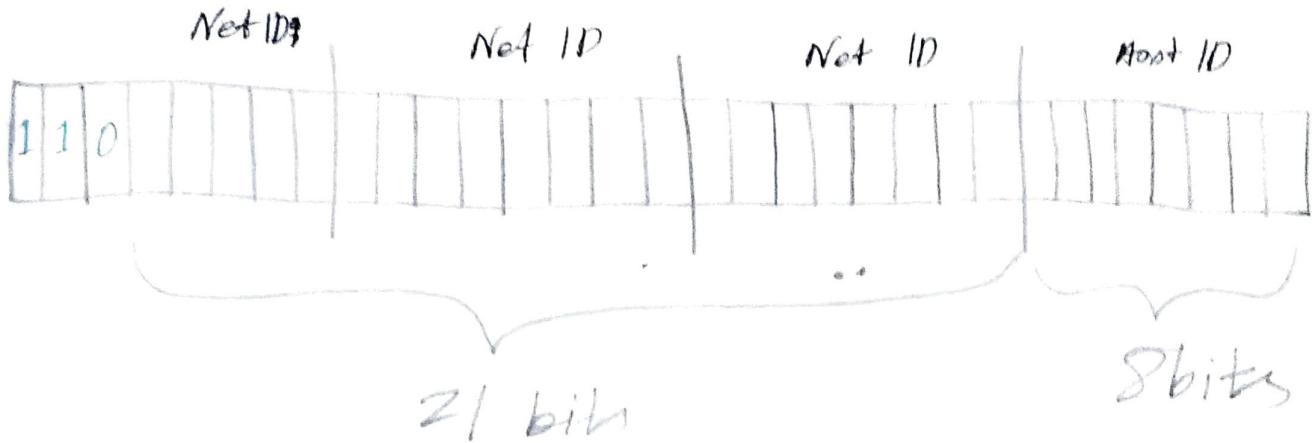
① Class A : Network ID is 8 bit long and host ID is 24 bits long



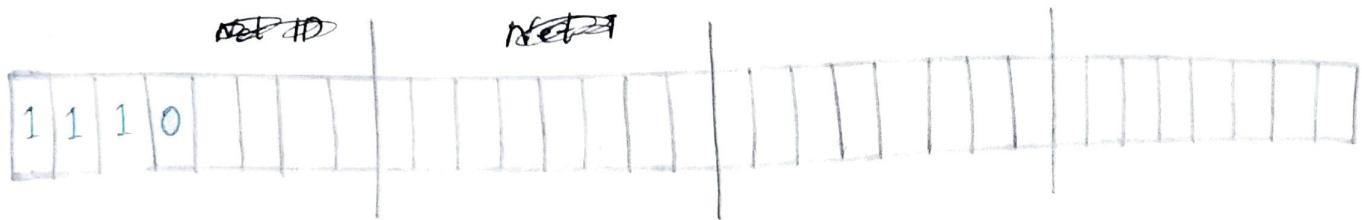
② Class B :



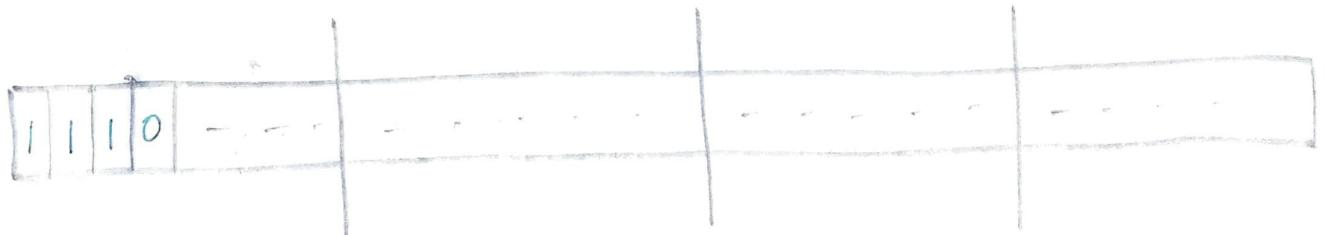
iii) Class C :



iv) Class D : Here, Network ID bits are not defined.



v) Class E : Hence, also Net ID and Host ID are not defined.



Q.a) What is routing?

Ans: When a device has multiple paths to reach a destination, it always selects one path by preferring it over others. This selection process is termed as routing.

Q.b) Explain routing Metrics and costs.

Ans: Routing metrics and costs are used for determining the best route to the destination. The factors used by the protocols to determine the shortest path, these factors are known as metric.

The most common metrics values are given below:

① Hop Count: It specifies the number of passes through internetworking devices such as a router, a packet must travel in a router to move from source to the destination.

② Delay: It is time taken by the router to process, queue and transmit a diagram to an interface.

③ Bandwidth: The capacity of the link is known as a bandwidth of the link. It is measured in terms of bits per second.

④ Load: Load refers to the degree to which the network resource of the link such as router or network link is busy. The load changes with respect to the change in the traffic.

v) Reliability: It depends on the network link, and its value is measured dynamically. Some networks go down more often than others.

Q.c) Explain the types of Routing.

Ans. Routing can be classified into three categories :

- ① Static routing (Non-adaptive)
- ② Default routing
- ③ Dynamic routing (Adaptive)

① Static routing : It is a technique where the administrator manually adds the routes in a routing table.

⑪ Default routing: Here, a router is configured to send all the packets to the same hop device and it doesn't matter whether it belongs to a particular network or not.

⑫ Dynamic Routing: It is ~~process~~ a technique in which a router adds a new route in the routing table for each packet in response to the changes in the condition or ~~table~~ topology of the network.

8. a) Classification of Routing Algorithm

Ans. The routing algorithm is divided into two categories :-

- ① Adaptive Routing Algorithm
- ② Non-adaptive Routing Algorithm

① Adaptive Routing Algorithm: It is also

known as Dynamic routing algorithm.

This makes decisions based on the topology and network traffic. It can be of

3 types -

- ① Centralized Algorithm.
- ② Isolated algorithm.
- ③ Distributed algorithm.

② Non-adaptive Routing Algorithm: It is called static routing algorithm. It doesn't take decision based on the network topology or network traffic.

This can be of 2 types :-

① Flooding

② Random walks.

8. b) Define all Network Layer Protocols.

Ans. TCP/IP supports the following protocols:

① ARP : Address Resolution Protocol is used to associate an IP address with the MAC address. There are two types of ARP entries —

① Dynamic entry

② Static entry

② RARP : Reverse Address Resolution Protocol is similar to ARP. This protocol is used to obtain IP address from a server.

III) ICMP : Internet Control Message

Protocol is a network layer protocol used by hosts and routers to send the notifications of IP datagram problems back to the sender.

IV) IGMP : Internet Group Message

Protocol is used by hosts and routers to support multicasting and to identify the hosts in a LAN that are the members of a group.

8. c) How ARP works ?

Ans: If the host. wants to know the physical address of another host on its network, then it sends an ARP Query packet that includes the IP address

and broadcast it over the network. Every host on the network receives and processes the ARP ~~network~~ packet, but only the intended recipient recognizes the IP address and sends back the physical address. The host ~~is~~ holding the datagram adds the physical address to the cache memory and to the datagram header, then sends back to the sender.

