

Ques No-1:

- ① what is Data Link layer? Define its sub-layers.
- ② what are the functionality of Data Link layer.
- ③ How does Data Link layer works?

Answer:

Ans to the ques No-1

(a)

Data Link layer:

Data Link Layer is second layer of OSI Layered Model. This layer is one of the most complicated layers and has complex functionalities and responsibilities. Data link layer hides the details of underlying hardware and represents its self to upper layer as the medium to communicate.

Data Link layer has two sub-layers:

① Logical Link control

② Media access control

Logical Link control:

It deals with protocols, flow-control and error control.

Media access control:

It deals with actual control of Media.

(b)

functionality of Data Link layer:

Data Link layer does many task on behalf of upper layer. These are:

① framing:

Data-Link layer task packet from network

layer and encapsulate them into frames. Then it sends each time bit-by-bit on the hardware.

Addressing:

Data-Link layer provides layer-2 hardware address of the machine. Hardware address is assumed to be unique on the link.

Synchronization:

When data frames are sent on the link both machines must be synchronized in order to transfer to take place.

Error-control:

Sometimes signals may have encountered problem in transition and bits are flipped. These errors are detected and attempted to recover actual.

(C)

Data link layer works between two hosts

which are directly connected in some sense.

These direct connection could be point or

broadcast. Systems on broadcast networks are

said to be some link. The work of data

link layer tends to get more complex when

it is dealing multiple hosts on single collision

domain.

Data link layer is responsible for converting

data stream to signal bits by bit to send

that it over underlying hardware. At the

receiving end, Data link layer picks up

data & from formats and hands over to

upper layer.

Ques No: 2

- (a) Define flow control and Error control.
- (b) How can point-to-point flow control flow?
- (c) What are the requirement for error control req mechanism.

Ans to the ques No - 2

(a)

flow control:

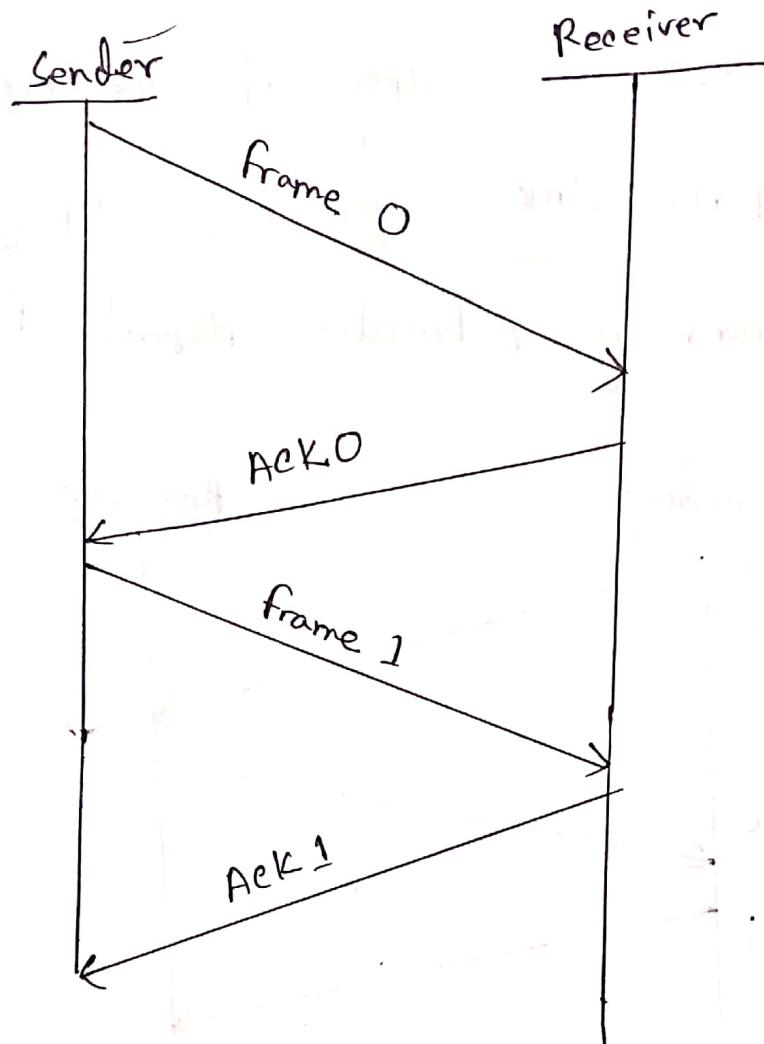
when a data frame is sent from one host to another over a single medium , it is required that the sender and receiver can work at same speed . That is sender sends at a speed on which the receiver can process and accept the data . what if the speed of the sender or .

Error-control:

when data-frame is transmitted , there is probability that data-frame may be lost in the transmit or it is received corrupt . In both cases , the receiver does not receive the correct data frame and sender does not work know anything

(b)

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

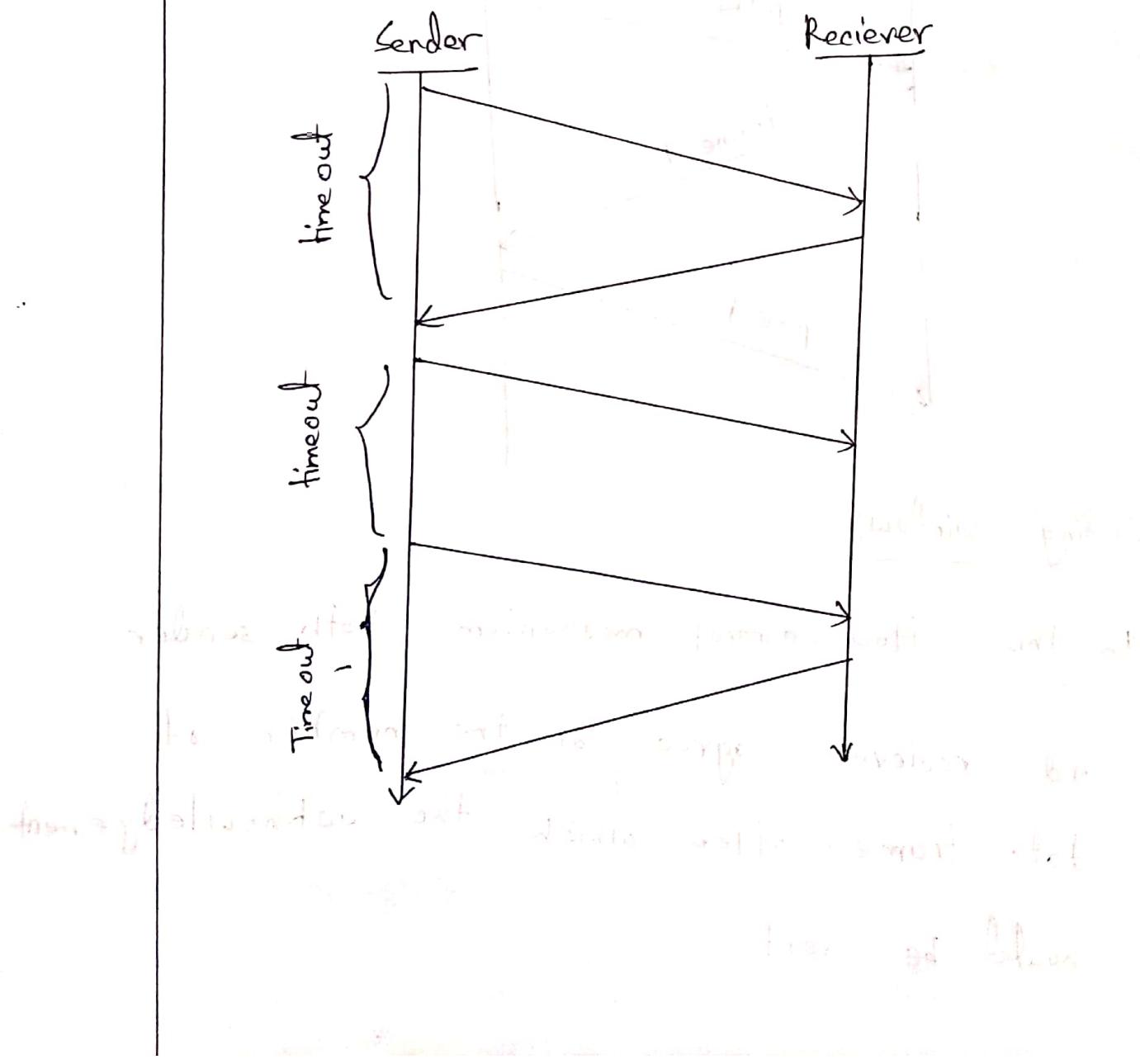


Sliding window:

In this flow control mechanism both sender and receiver agree on the number of data frames after which the acknowledgement should be sent.

(c)

There are three types of techniques available which Data-link layer may deploy to control the errors by Automatic Repeat Request:



The following:

- a) The sender maintains a timeout counter.
- b) When a frame is sent the sender starts the time out counter.
- c) If acknowledgement of frame comes in time the sender transmits the next frame.

Ques No-3:

- a) What is the Error Detection? Write the type of error.
- b) Define Parity check and cycle Redundancy check (CRC).
- c) How the errors can be corrected?

Ans to the ques No - 3

(a)

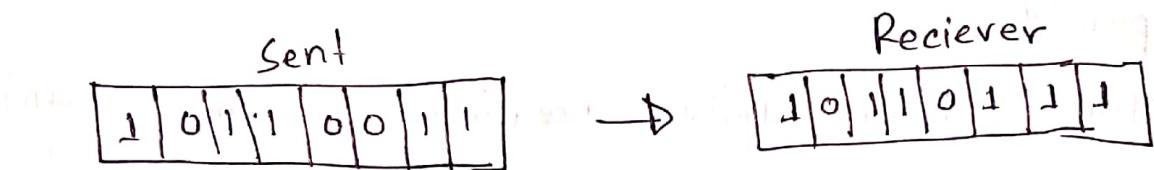
Error detection:

Error detection is the detection of errors caused by noise or other impairments during transmission from the transmitter to the receiver. Error correction is the detection of errors and reconstruction of the original.

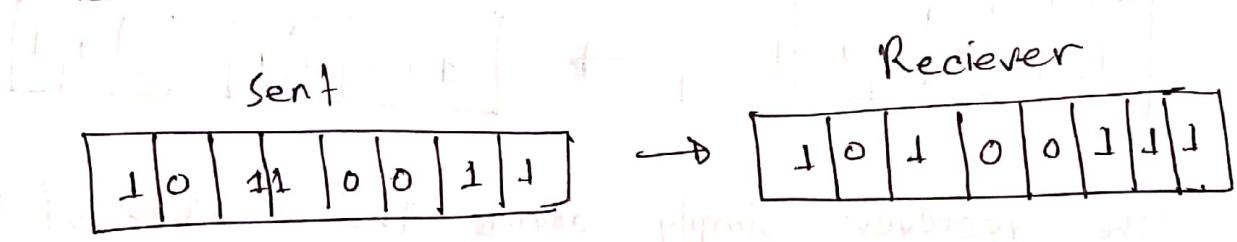
Ques 3) There are three types of errors?

- ① Single bit error.
- ② Multiple bit error.
- ③ Burst error.

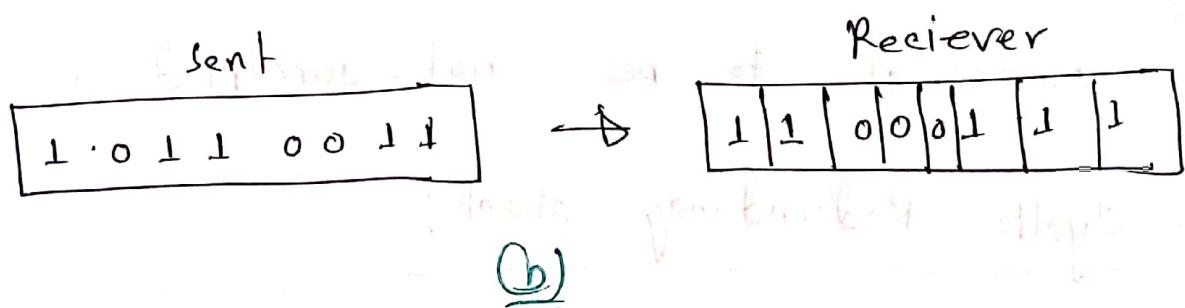
① Single bit error:



② Multiple bits error:



③ Burst error:

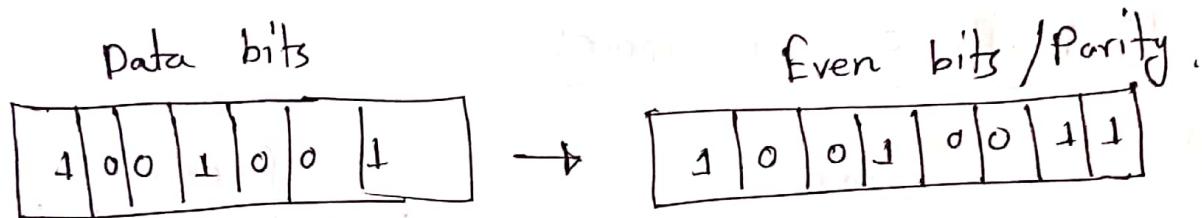


Parity check:

One extra bit is sent along with the original bit to make number of 1s either even

in case of even parity or add in case of odd parity.

The sender while creating a frame, counts the number of 1s in it. For example:



The receiver simply counts the number of 1s in a frame. If the count of 1s is even and even parity is used, the frame is considered to be not-corrupted.

Cyclic Redundancy Check:

CRC is different approach to detect if

the receiver frame contains valid data.

This technique involves binary division of the data bits being sent.

Sender

Reciever

Divisor

$$\begin{array}{r}
 \text{Divisor} \quad 11 \\
 \boxed{\text{Dividend}} \quad 101 \\
 \hline
 101 \quad 1101 \\
 \hline
 101 \quad 110 \\
 \hline
 101 \quad 110 \\
 \hline
 101 \quad 101 \\
 \hline
 101 \quad 10 \\
 \hline
 101 \quad 0
 \end{array}$$

$$\begin{array}{r}
 111 \\
 \hline
 101 \quad 1100110 \\
 \hline
 101 \quad 110 \\
 \hline
 101 \quad 111 \\
 \hline
 101 \quad 101 \\
 \hline
 101 \quad 000
 \end{array}$$

CRC

No error

(c)

Error Correction:

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

- ① Backward error correction.
- ② forward error correction.

The first one Backward error correction is simple and can only be efficiently used where retransmitting may is not expensive.

To correct the error in data frame the receiver must know exactly which bit in the frame is corrupted. To locate the bit in error redundant bit are used as parity bits for error.

for m data bits r redundant bits are used. r bit can provide 2^r combinations of information.

$$2^r \geq m+r+1$$

Ques - 4:

- (a) what is Network layer ? what it tasks ?
- (b) what are functionality of layer -3 ?
- (c) what are feature of network layer ?

Ans to the ques No-4

(a)

Network layer:

The network layer is the third layer of the OSI model. It handles the service requests from the transport layer and further forwards the receiver request to the data link layer.

The network layer task the responsible for routing packets from source to destination within

or outside a subnet. Two different subnet may have different addressing schemes or non compatible addressing types. Some with protocols two different subnet may be operating on different protocol which are not compatible with each other.

(b)

Layer-3 functionalities:

Devices which work on Network Layer mainly focus on routing. Routing may include various task aimed to achieve a single goal.

- ④ Addressing devices and networks.
- ④ Populating routing tables or static routes.

- ④ Queueing incoming and outgoing data and then forwarding them according to quality of service.
- ④ Internetworking between two different subnet
- ④ Delivering packets to destination with best efforts.
- ④ Provides connections oriented and connection less mechanism.

(c)

Network layer features:

- with its standard functionalities layer-3 can provides various os:
- ④ Quality of service management
- ④ Load balancing and Link management.

Ques No-4:

④ Security

④ Interrelation of different protocols and subnets with different schema.

④ Different logical network design over the physical network design.

④ L3 VPN and tunnels can be used to provide end to end dedicated connectivity.

Ques No-5:

① what is network addressing ? Explain .

② Define IP, IPX, and Apple Talk . explain itself .

③ Define DNS and gateway explain briefly .

Ans to the ques No-5

(a)

Network addressing:

network addressing is one of the major tasks of Network layer. Network address always logical these are software based addresses which can be changed appropriate configurations. A network address always points to host/node/server or it can represent a whole network. Network address is always configured on network interface card and is generally mapped by system.

There are different kinds of network addresses

① IP

② IPX

③ AppleTalk.

(b)

IP:

The Internet Protocol (IP) is the principal communications protocol in the internet protocol suite for relaying datagrams across network boundaries. IP has the task of delivering packets from the source host to the destination host solely based on the IP addresses in the packet headers.

IPX:

IPX stands for Internet Packet Exchange.

IPX is a networking protocol from Novell that interconnects networks that use Novell's network client and servers. IPX is a datagram or packet protocol. IPX works at the Network layer of communication protocols and is connectionless.

AppleTalk:

AppleTalk is discontinued proprietary suite of networking protocols developed by Apple Inc. for their Macintosh computers. AppleTalk includes a number of features that allow local area networks to be connected with no prior setup or the need for a centralized router or server of any sort.

(c)

The domain name system is one of the foundations of internet, yet most people outside of networking probably don't realize they use it every day to do their jobs, check their email or waste time on their smartphone.

DNS is a directory of main names that match with numbers. The numbers in this case are IP addresses which computer use to communicate with each other.

A gateway is a hardware device that acts as a gate between two networks.

It may be router, firewall server

Ques No-6:

- (a) what is router and routing ? How it works?
- (b) what is unicost routing ? write a diagram to describe it.
- (c) what are the protocols of unicost routing?

Ans to the ques No-6

(a)

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 . Routing is done by special network devices called routers or it can be done by means of software processing .

A router always configured with some default route. A default route tells the router where to forward a packet if there is no route found for specific destination.

- ① Hop Count
- ② Bandwidth
- ③ metric
- ④ Prefix-length
- ⑤ Delay.

(b)

Unicast routing:

Most of traffic on the internet known as unicast data or unicast traffic is sent with specified destination. Routing data over the internet is called unicast.

routing.

Diagram.

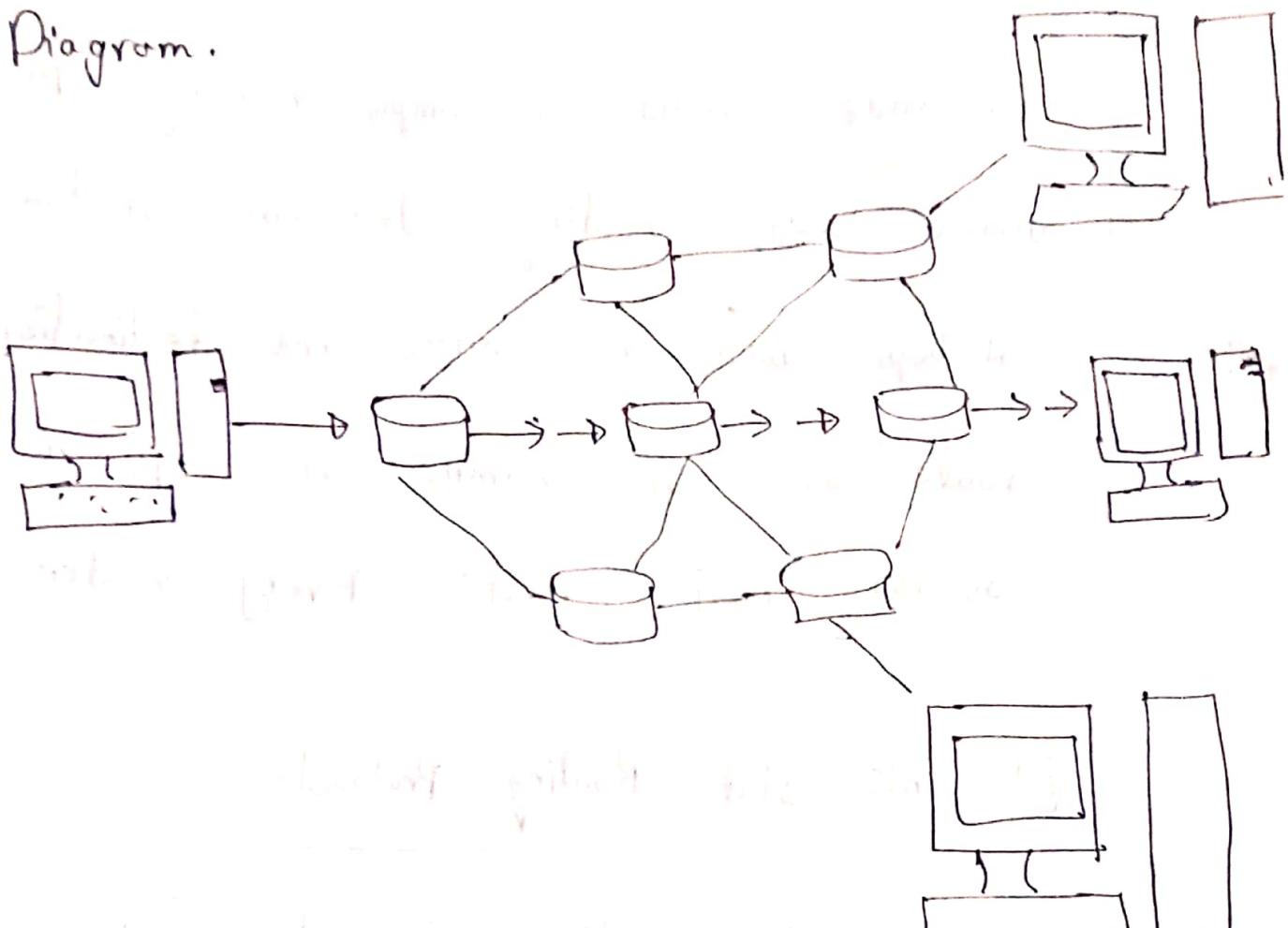


fig: Diagram of unicast routing.

Unicast Routing Protocols:

There are two kinds of routing protocols available to route unicast packets.

① Distance Vector Routing Protocol:

Distance vector is simple routing protocol which takes routing decision on the number of hops between source and destination. A route of less number of hops is considered as the best route. Every router advertises.

② Link state Routing Protocol:

Link state Routing Protocol is slightly complicated than Distance vector. It takes into account the state of link of all the routers in a network.

Following features of link state protocol:

Ques No-7

- (a) What is internetworking? How does it work?
- (b) what are the routing algorithm.
- (c) what is Broadcast Routing? How does it work?

Ans to the ques No-7

(a)

Inter networking:

In real world scenario, networks under same administration are generally scattered geographically. There may exist requirement of connecting two different network of same kind as well as different kinds. Routing between two network is called

internetworking.

Networks can be considered different based on various parameters such as protocol topology, layer-2 network and addressing schema.

(b)

Routing Algorithm:

The routing algorithm is as follows:

Flooding:

Flooding is simplest method forwording. When a packet is received by the routers send it to all the interface except the one

On which it was received. This creates too much burden on the network and lots of duplicate packets wandering in the network.

Shortest Path:

Routing decision in networks are mostly taken on the basis of cost between source and destination. Hop count plays major role here.

Common shortest path algorithm:

① Dijkstra's algorithm

② Bellman Ford algorithm

③ Floyd Warshall algorithm.

(C)

Broadcast routing:

By default the broadcast packet are not routed and forwarded by the routers on any network. Routers create broadcast domains. But it can be configured to forward broadcast in some special cases.

Broadcast routing can be done in two ways:

- ① A router creates a data packet and then sends it to each host one by one. In this case the router creates multiple copies.
- ② Secondly, when router receives a packet to be broadcasted.

Ques No-8:

- (a) what is Tunneling? Describe briefly.
- (b) what is multicast Routing? write a diagram to describe how does it work?
- (c) Write the protocol of multicast routing.

Ans to the ques No-8

(a)

Tunneling:

If there are two geographically separate networks.

which want to communicate with each other

they may deploy a dedicated line between

or they have to pass their data through

intermediate networks.

Tunneling is a mechanism by which two or more networks communicate with each other by passing intermediate networking complexities.

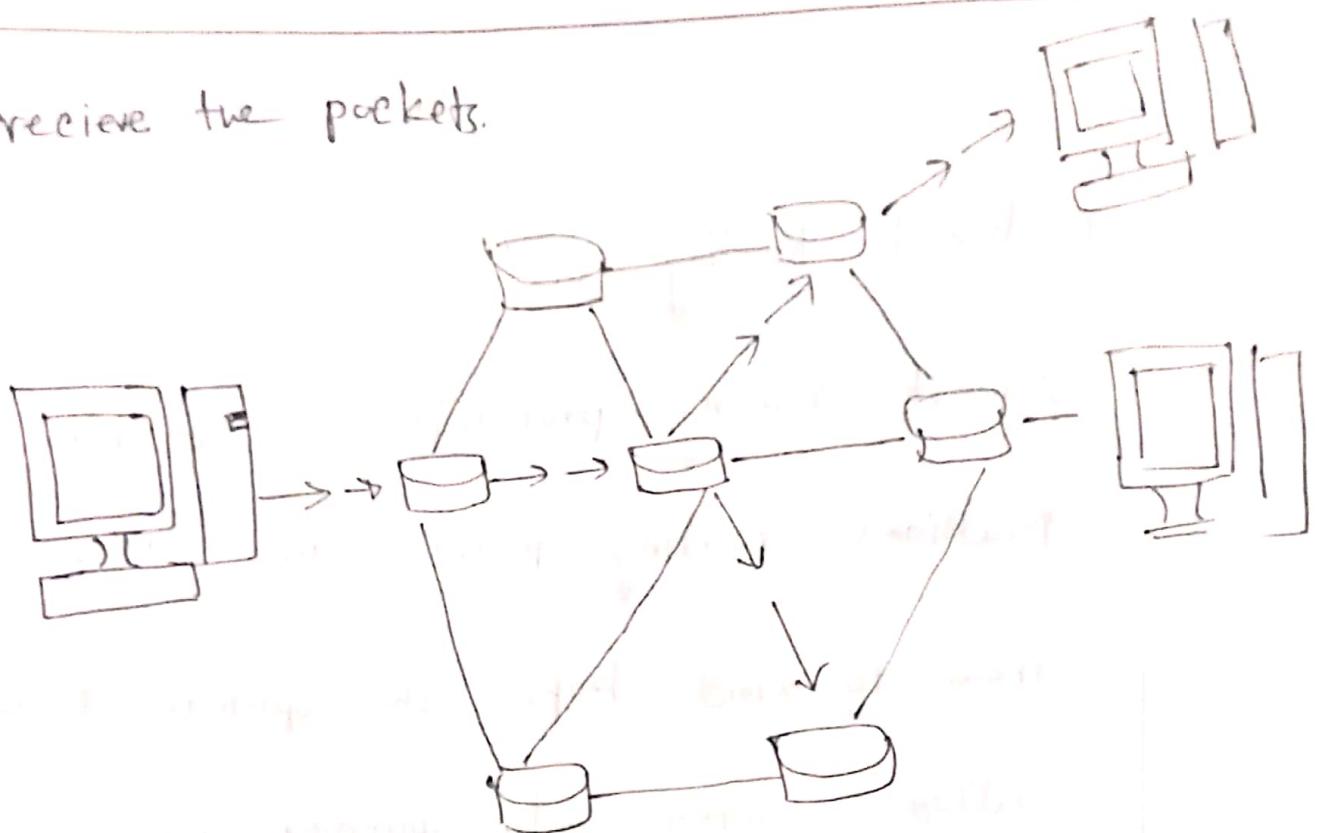
Tunneling is configured at both ends.

(b)

Multicast Routing:

Multicast routing is special case of broadcast routing with significance, different and challenges. In broadcast routing packets are sent to all nodes even if they do not want it. But in Multicast routing the data is sent to only nodes which wants to

receive the packets.



The router must know that there are

nodes, which to receive multicast packets

then only it should forward. Multicast routing

works spanning tree protocol to avoid

looping.

(C)

Multicast Routing Protocols:

Unicast routing protocols use graphs while multicast routing protocols use trees. Spanning tree to avoid loops. The optimal tree is called shortest path spanning tree.

• DVMRP - Distance Vector Multicast Routing Protocol.

• MOSPF - Multi cost Open Shortest Path First.

• CBT - Core Based Type

• PIM - Protocol Independent Multicast

Protocol Independent Multicast is commonly

used now. It has two flavors:

- ① PIM Dense Mode
- ② PIM Sparse Mode.