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Computer Networks
Assignment -)

→ Write short notes on:-

1] Repeaters:-

Repeaters are network devices operating at physical layer of OSI model that amplify or regenerate an incoming signal before transmitting it.

They mainly help in expanding coverage area of the networks.

They are also known as signal boosters.

Types :-

→ As per signal; they are classified in two types:-

1] Analog Repeaters:-

They only amplify analog signals.

2] Digital Repeaters:-

They only amplify digital signal.

→ As per networks, they are classified in two types:-

1] Wired Repeaters:-

Used in wired LAN's

2] Wireless Repeaters:-

Used in wireless LAN's

→ According to domain of LAN's, they are classified as:-

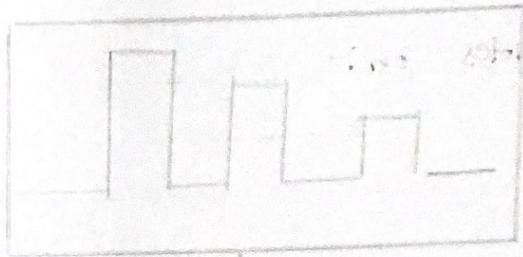
1] Local Repeaters :-

Connect LAN segments separated by short distances.

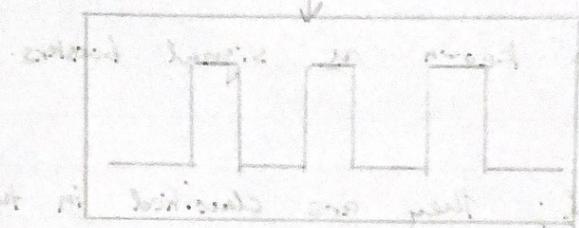
2] Remote Repeaters:-

Connect LAN segments that are far from each other.

Diagram for Repeater:



Attenuated
Signal



Regenerated
Signal

Advantages :-

- Simple to install and increase coverage of the network.
- They are cost effective.

Disadvantages :-

- Cannot connect dissimilar networks
- Cannot differentiate between signal and noise

2] Hubs:-

Hubs are networking devices operating at a physical layer of the OSI model. They are generally used to connect computers in a LAN.

Features :-

- Hub operates in the physical layer.
- It cannot filter data. It is a non-intelligent network device that sends messages to all ports.
- Transmission mode is half duplex.
- They are passive devices and do not have any software associated with it.
- Since they lack intelligence to compute best path for transmission of data packets, inefficiencies or wasteage may occur.

Diagram for Hub:-

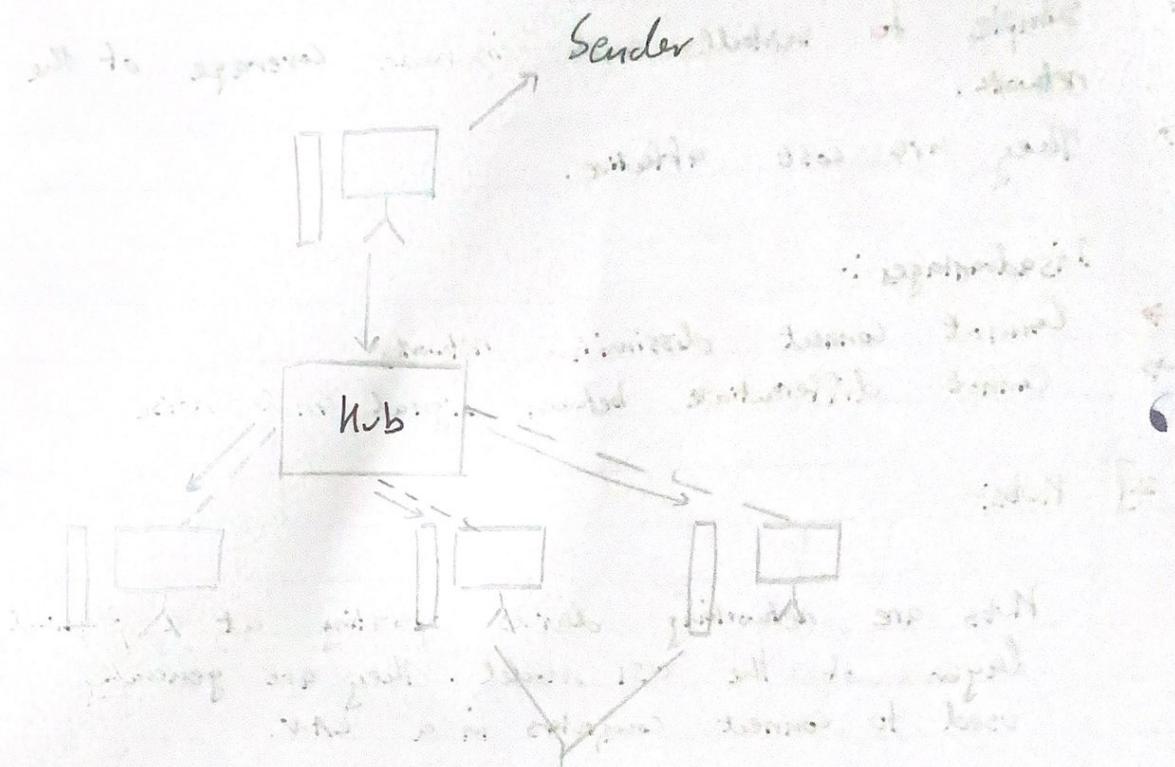


Diagram for Switch:-
In this diagram, there is a central box labeled 'Switch'. Four lines extend from the switch to four computer monitors arranged in a square. The top-left monitor is labeled 'Sender' and the other three are labeled 'Receivers'. Arrows point from the 'Sender' monitor to the switch and from the switch to each of the three 'Receivers' monitors.

Types of Hubs:-

Hubs are of 3 types :-

Passive Hubs :-

They connect nodes in a star configuration by collecting wiring from nodes. They broadcast signals over the network without amplifying or regenerating them. As they cannot extend the distance between nodes, they limit the size of the LAN.

Active Hubs :-

They amplify and regenerate incoming electrical signals before broadcasting them. They have their own power supply and serve both as a repeater as well as a connecting centre. They can increase maximum distance between nodes thus, amplifying the LAN.

Intelligent Hubs :-

They are active hubs that provide additional network management facilities. They can perform a variety of functions like network management, switching, providing flexible data rates, etc.

3] Bridges :-

Bridges are used to connect two subnetworks that use interchangeable protocols. They combine two LAN's to form an extended LAN. The main difference between bridge and repeater is that bridge has penetrating efficiency.

Working :-

A bridge accepts all packets and amplifies all of them to the other side. They are intelligent devices that allow passing of only selective packets from them. A bridge only passes the those packets addressed from a node in one network to another node in other network.

Types of Bridges:-

There are two types of bridges:-

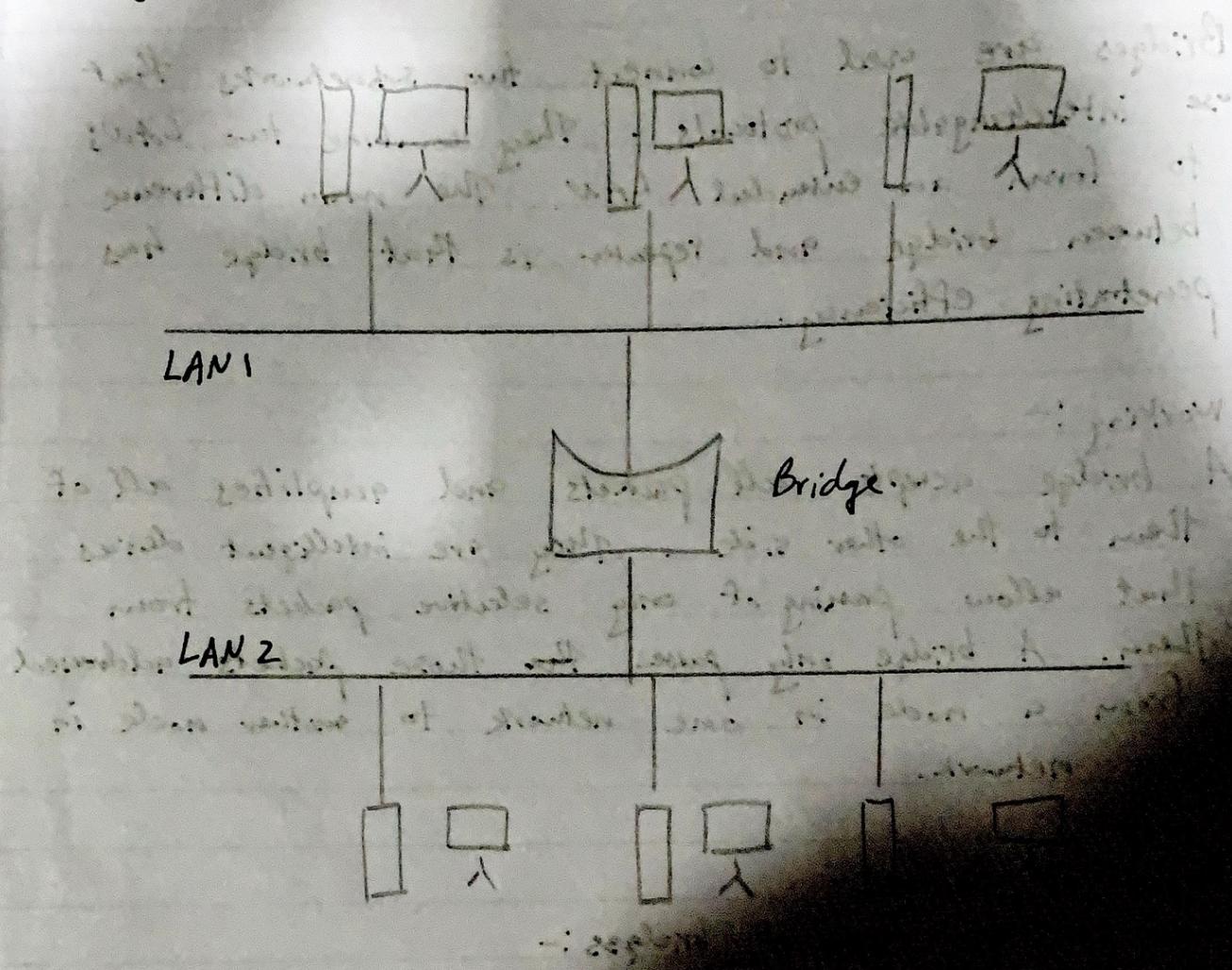
1] Transparent Bridges:-

Also called as learning bridges. A Bridge constructs its table of terminals addresses on its own as it implements connecting two LAN's. It facilitates the source location to create its table. It is self updating. It is a plug and play bridge.

2] Source Routing Bridge:-

These type of bridges is used to prevent looping problems.

Diagram for Bridge:-



Uses of Bridges are:-

- Divide large busy networks into multiple smaller and interconnected networks to improve performance.
- Bridges can increase physical size of a network.
- Used to connect a LAN segment through a synchronous modem relation to another lan segment in a remote area.

(ii) Switches:-

Switches are devices which operate at layer 2 or a data link layer of the OSI model. They connect devices in a network and use packet switching to send, receive or forward data packets or data frames over the network.

Features:-

- It is an intelligent network device that can function as a multiport device network bridge.
- It uses MAC address to send data packets to selected destination ports.
- It uses package switching technique to receive and forward data packets from the source to the destination device.
- It supports unicast, multicast and broadcast communications.
- They can perform error checking before forwarding data.

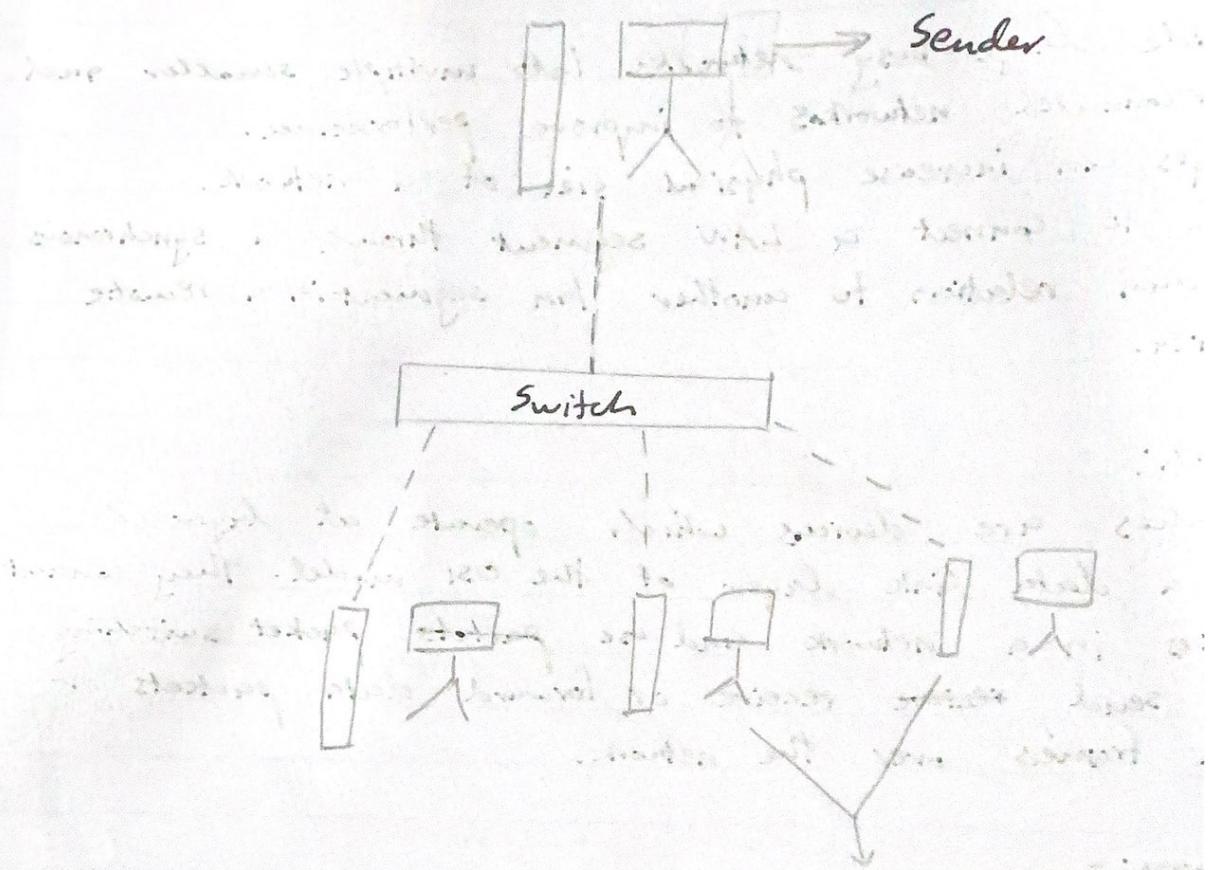
Types:-

There are 4 types of switches:-

i) ~~Managed~~ Unmanaged switches:-

Inexpensive switches commonly used in home networks and small businesses.

Diagram for Switch:-



Switches are electronic devices that connect multiple computer networks or local area networks together. They work like a multi-port repeater or hub, but unlike hubs, they can connect different segments of a network. A switch receives a signal from one port, checks its destination address, and then forwards the signal to the appropriate port. This allows multiple devices to share a single connection to a network without interfering with each other. Switches are used in both wired and wireless networks. They are also used in telephone systems to route calls between different locations. In a local area network, a switch connects multiple computers and printers to a single point of access to the internet. This allows all devices to share the same bandwidth and reduces the chance of interference between devices. Switches are also used in larger networks, such as corporate intranets and the Internet, to manage traffic and improve performance.

They can be set up by simply plugging in to the network and they start instantly operating. When more devices are to be ~~added~~ added, more switches are simply added by this plug and play method.

2] Managed Switches :-

(Costly) switches that are used in organisations with large and complex networks. They have higher security levels, better precision control and complete network management.

3] ~~etc~~

3] LAN Switch :-

They connect devices in the internal LAN of an organization. They are also referred as ethernet or data switches. These switches are particularly helpful in reducing network congestions or bottlenecks.

4] PoE Switch :-

Power over Ethernet switches are used in PoE Gigabit Ethernets. PoE technology combines data and power transmission over the same cable so that devices connected to it can receive both electric electricity as well as data over the same line.

5] **Routers:-**

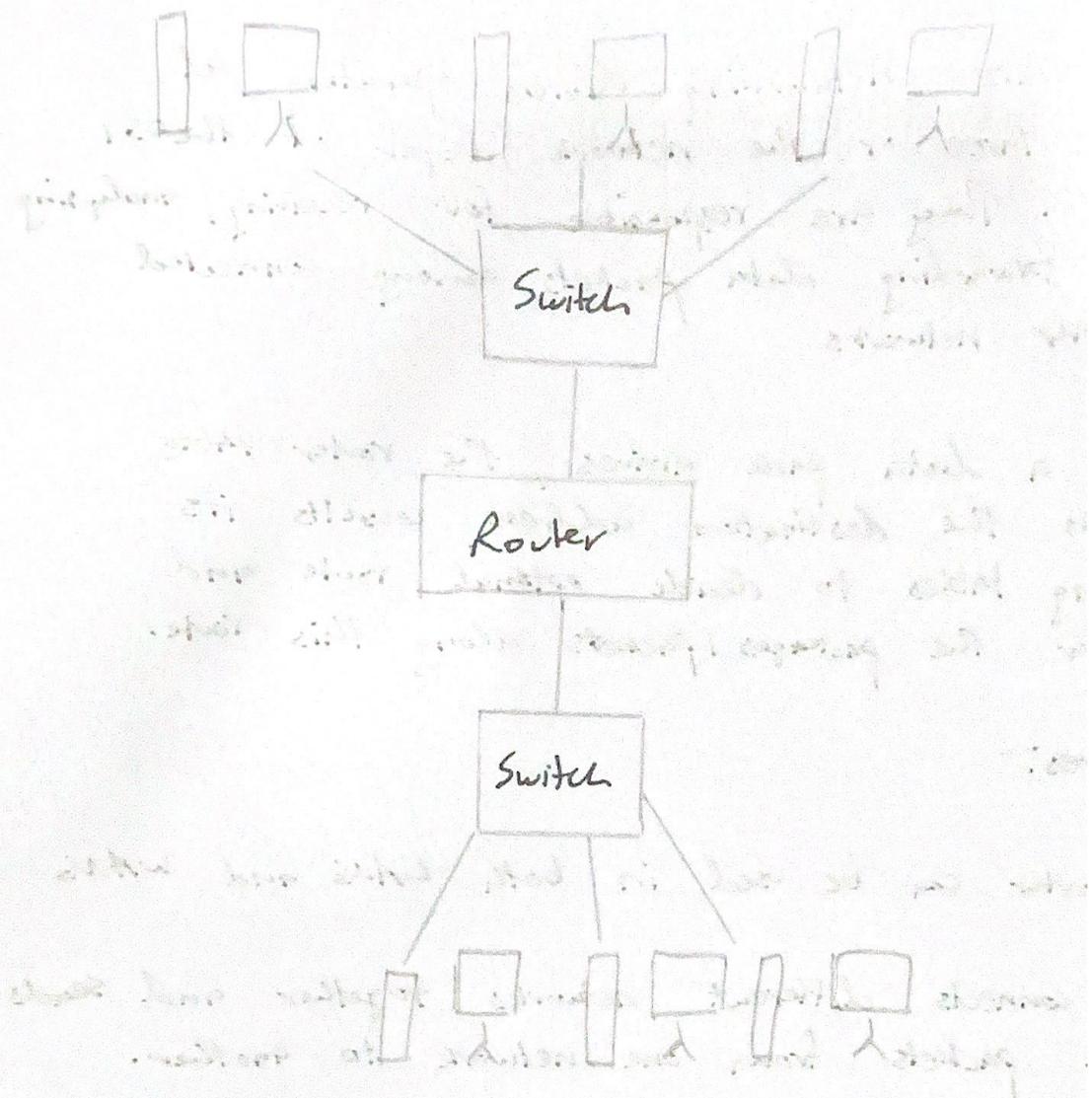
Routers are Networking devices operating at layer three or the network layer of the OSI model. They are responsible for receiving, analysing and forwarding data packets among connected computer networks.

- When a data pack arrives, the router looks into its routing tables to decide optimal route and transfer the packages/packets along this route.

Features:-

- A router can be used in both LANs and WANs
- It connects different networks together and sends data packets from one network to another.
- It transfers data in the form of IP packets. In order to transfer data, it uses IP address mentioned in the destination field.
- Routers provide protection against broadcast storms
- They are more expensive than other devices like hubs, bridges and switches.

Router's Diagram :-



Routing Table :- Used to determine optimal route.

Types of Routing Table:-

→ Static:- Routes are fed in manually and are not refreshed automatically. Suitable for small networks containing 2-3 routers.

→ Dynamic:- The router communicates with other routers using routing protocols to determine the available routes. Suited for larger number networks having large number of routers.

Types of Routers:-

Wireless Routers:- Provide WiFi connection to devices like laptops, smartphones, etc. Range is 100-300 feet for outdoor connections.

Broadband Routers:- Used to connect to internet through telephone and to use voice over Internet Protocol (VoIP). They are provided by the Internet Service Providers (ISP).

Brouters:- Specialised routers that provide functionality of bridges as well.

6] Gateways :-

A gateway is a network node that forms a passage between two networks operating with different protocols. The most common gateways i.e. network gateways operate at layer 3 i.e. network layer of the OSI model. However, a gateway depending on its functionality can operate at any of the seven layers of the OSI model.

Features :-

- Located at the boundary of a network and manages all data that flows in and out from that network.
- Forms passage between two different networks operating with different transmission protocols.
- Uses packet switching techniques to transfer data across the networks.
- It also stores information about routing paths of communicating networks.

Types :-

- 1] Unidirectional - Allow data to flow in only one direction. They can be used as archiving tools.
- 2] Bidirectional - Allow data to flow in both directions. Used as synchronization tools.

Gateways Diagram:-

