|	
Name	Manish Shashikant Jadhav
UID	2023301005
Subject	Computer Communication and Networks (CCN)
Experiment No.	3
Aim	To know about various networking devices, topologies, and designing a network as an admin.
Part 1	**All Networking Devices:** Networking devices can be defined as hardware or software elements that facilitate communication and interaction between devices connected to the computer network. Here's some of the Networking devices as follows: **1. Bridge:** **Function**: It is used for creating a bridge between two LAN segments, passing data packets from one segment to the other. **Working**: It analyzes in packets the destination MAC addresses and transmits only to the intended segment and thus reducing collisions and improving the performance of the network compared to hubs. **Example**: Used to link two small networks in the office.

2. Hubs:

Function: It works as a middle hub for devices to transfer and share data.
It broadcasts all data packets to all other devices present/connected onto the network. As it broadcasts messages, the collision domain of all nodes connected through the hub stays one.

Working: It broadcasts all the incoming data to all the devices connected to it that may cause collisions and in turn down the speed of the network.
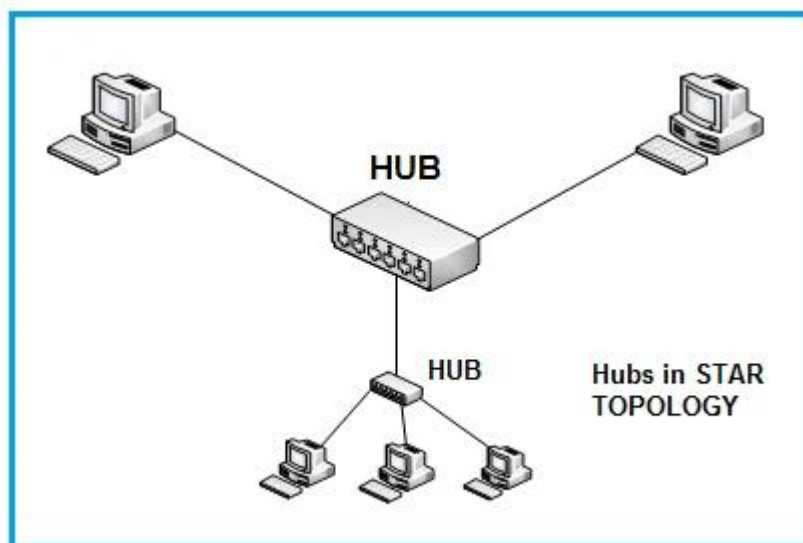

3. L-2 Switch:

Function: it is used for intelligent forwarding of data packets meant for particular devices upon the basis of MAC address, which in turn increases the efficiency of the network and reduces collisions.

Working: This device memorizes the MAC addresses from a table and sends data to the only recipient intended.

Example: It is widely used in residential premises and small enterprises to link other different devices such as computers, printers, as well as gaming consoles.
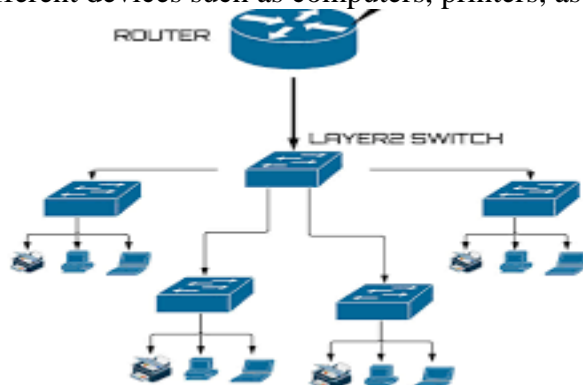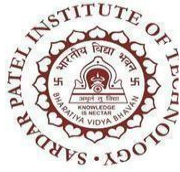
4. L-3 Switch:

Function: It operates on both the Layer 2 (MAC addresses) and Layer 3 (IP addresses) to offer more elaborate routing services.

Working: It can determine the routing using IP address that helps to allow the communication between different subnets or VLANs network.

Example: Utilized in larger and denser networks that necessitate timely routing between different parts.
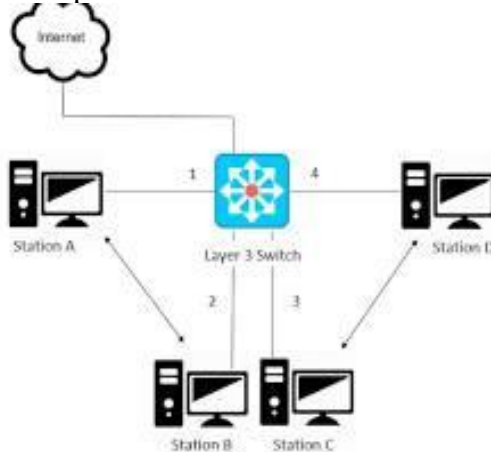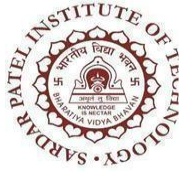

5. Router:

Function: It is employed as a router managing traffic between networks based on IP addresses, as a gateway between them.

Working: It is a type of routing that analyzes packet headers, establishing the optimal path to the destination network and sending the data accordingly.

Example: It interfaces to your home network and helps you to get internet access, which is very important for the online connectivity.

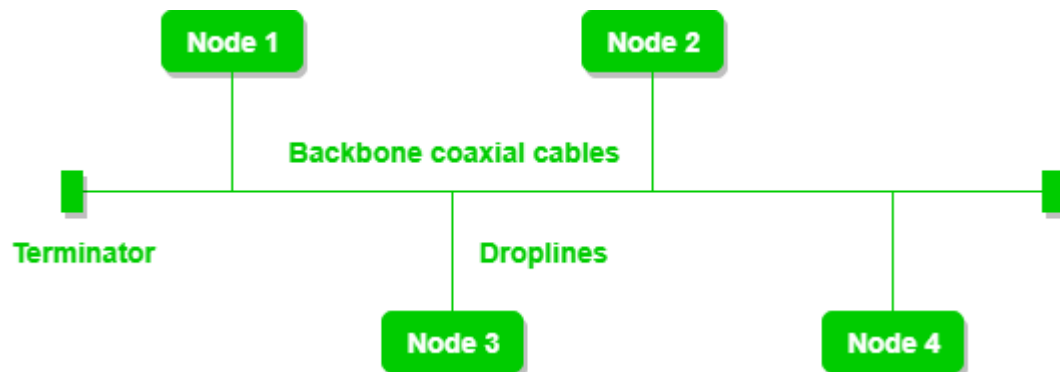|	
	6. Wifi-Router: **Function**: It Integrates the ability to route and a wireless access point that allows wireless devices to connect to the network and the internet. **Working**: It Broadcasts a Wi-Fi signal that devices can connect to, which enables data to be transmitted and received wirelessly. **Example**: Offers home and business in the world of wireless internet connectivity.
Part 2:	**Network Topology:** ## 1)Bus Topology:- Bus topology is a network type in which every computer and network device is connected to a single cable. **Advantages**: - Bus topology is simple to set up and cost-effective because it requires less cabling compared to other topologies. - Easy to Expand: Adding new devices to the network is straightforward in bus topology, making it easy to expand the network.\

Disadvantages:
- Bandwidth is shared among all devices, and as more devices are added, the available bandwidth for each device decreases.
- If the central bus cable fails, the entire network can go down, making it less reliable than other topologies.
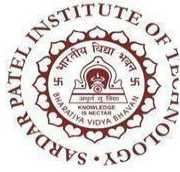
2)Ring Topology:-
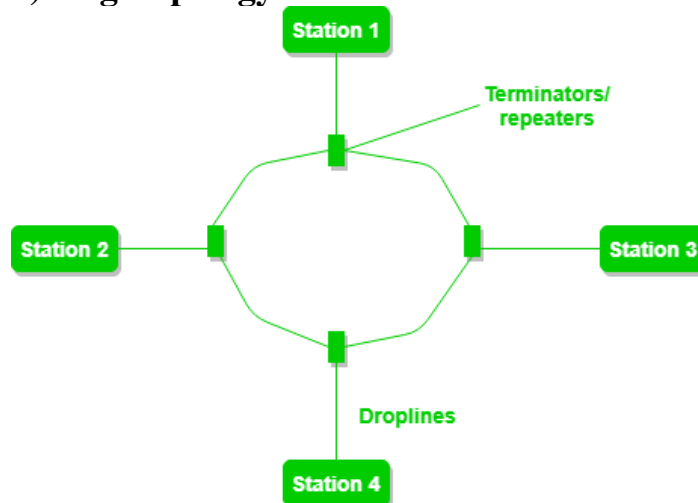
In Ring Topology, each computer is connected to exactly two other computers.

Advantages:
- The central hub in star topology makes it easy to manage and troubleshoot the network since all communication passes through a central point.
- It's easy to expand a star network by adding more devices without affecting the overall network performance.
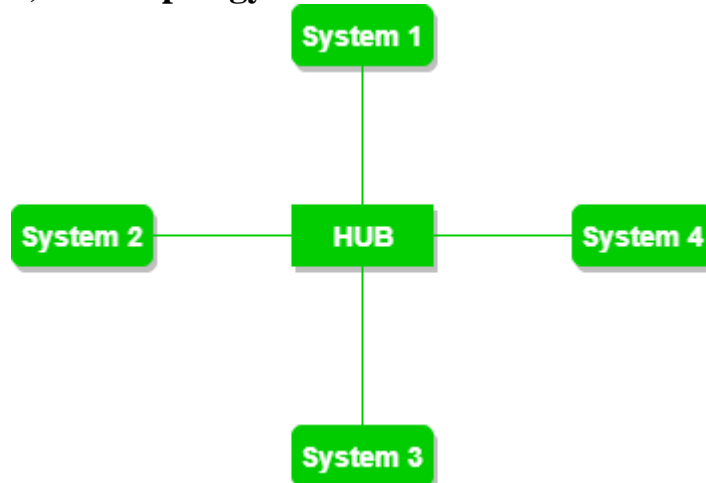
Disadvantages:
- Dependency on Central Hub: If the central hub fails, the entire network can go down. This makes the network reliability dependent on the hub's functionality.
- The initial setup cost of a star topology is higher due to the need for a central hub.

3)Star Topology:-

In Star Topology, all the nodes are connected to a centralized hub. In this, Centralized Hub is 'The Server' and other peripheral devices are 'Clients'.

Advantages:
- Mesh topology provides high fault tolerance because multiple paths exist between devices. If one path fails, alternative routes can be used for communication.
- The redundancy in mesh topology makes it highly reliable, as the failure of one link does not disrupt the entire network.

Disadvantages:
- Implementing a mesh network can be complex and expensive due to the numerous connections required between devices.
- As the number of devices increases, managing and configuring the connections in a mesh topology can become challenging.

4)Mesh Topology:-
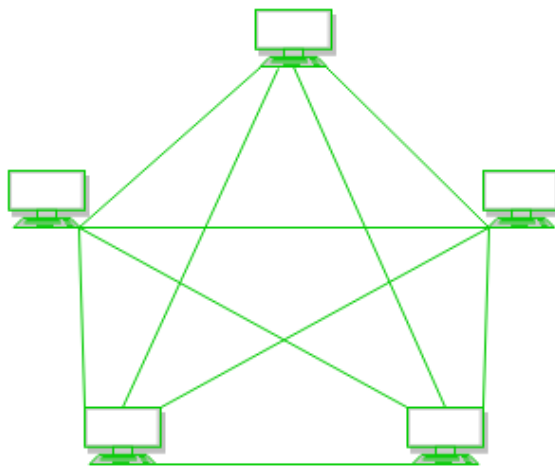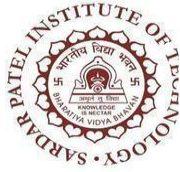
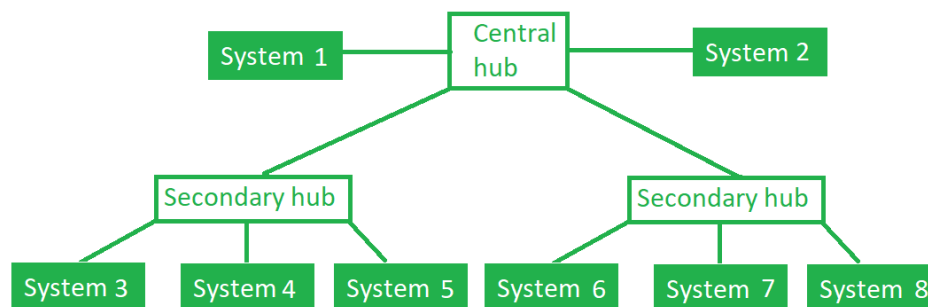In Mesh Topology, all the nodes are interconnected with each other.

Advantages:
- Each device in a ring topology has equal access to resources and can communicate directly with its neighbors, reducing contention.
- Ring topology is relatively easy to install and manage, making it suitable for small to medium-sized networks.

Disadvantages:
- If a single connection or device fails, it can disrupt the entire network, making it less fault-tolerant.
- Expanding a ring network can be challenging, and the addition of new devices may affect the overall network performance.

5)Tree Topology:-

In Tree Topology, all the nodes are directly or indirectly connected to main bus cable. It is the combination of Bus Topology and Star Topology.

Advantages:
- Tree topology is easily scalable by adding more branches or leaves to the network without affecting the entire structure.
- The hierarchical structure makes it easier to manage and organize, especially in large networks.
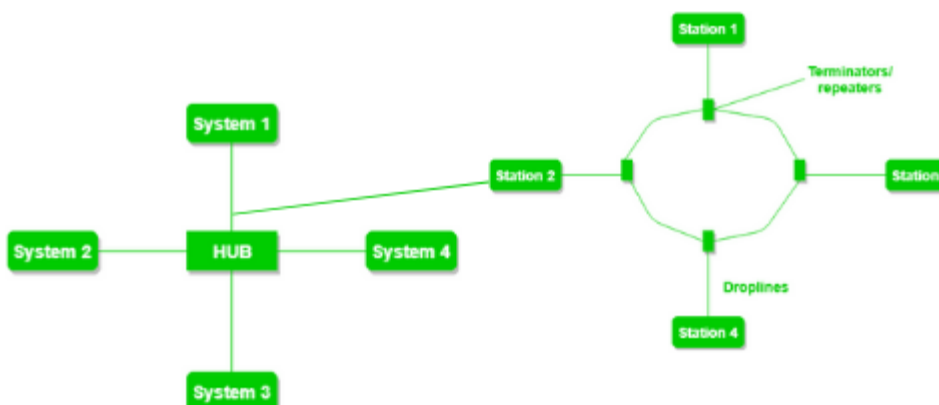
Disadvantages:
- The failure of central nodes can disrupt communication within their branches, affecting a significant portion of the network.
- As the network grows, the complexity of managing and maintaining the tree topology increases.

6)Hybrid Topology:-

      In Hybrid Topology, a computer topology is combination of two or more topologies.

Advantages:
- Hybrid topology allows for combining the strengths of different topologies to create a more flexible and efficient network.
- Depending on the specific combination, hybrid topologies can offer scalability and reliability by mitigating the weaknesses of individual topologies.

Disadvantages:
- Designing and implementing a hybrid topology can be complex and may require skilled professionals.
- The cost of setting up a hybrid network can be higher due to the combination of different topologies and the necessary equipment.

Part 3:

Network Design: **Scenario: Airport Network Design**

    1. Access Layer:

Devices: Access switches

Topology: Star Topology

Justification: The access layer is the first point of contact for end devices such as passenger kiosks, check-in counters, and boarding gates. A star topology simplifies cable management, isolates faults, and makes it easier to manage individual connections.

    2. Distribution Layer:

Devices: Distribution switches, routers, VLANs

Topology: Hierarchical (Collapsed Core)

Justification: The distribution layer aggregates traffic from multiple access layer switches. Using VLANs helps segregate different types of traffic, such as passenger data, airline operations, security, and maintenance. A hierarchical structure allows for efficient traffic
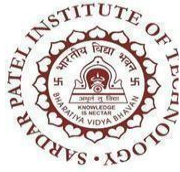
management and facilitates future expansion.

3. Core Layer:

Devices: Core routers, high-speed switches
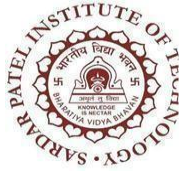**Topology**: Mesh Topology
Justification: The core layer provides high-speed, redundant connectivity between distribution switches. A mesh topology ensures high availability and fault tolerance. It allows for multiple paths between devices, reducing the risk of a single point of failure. This is crucial for critical airport systems that require constant connectivity.
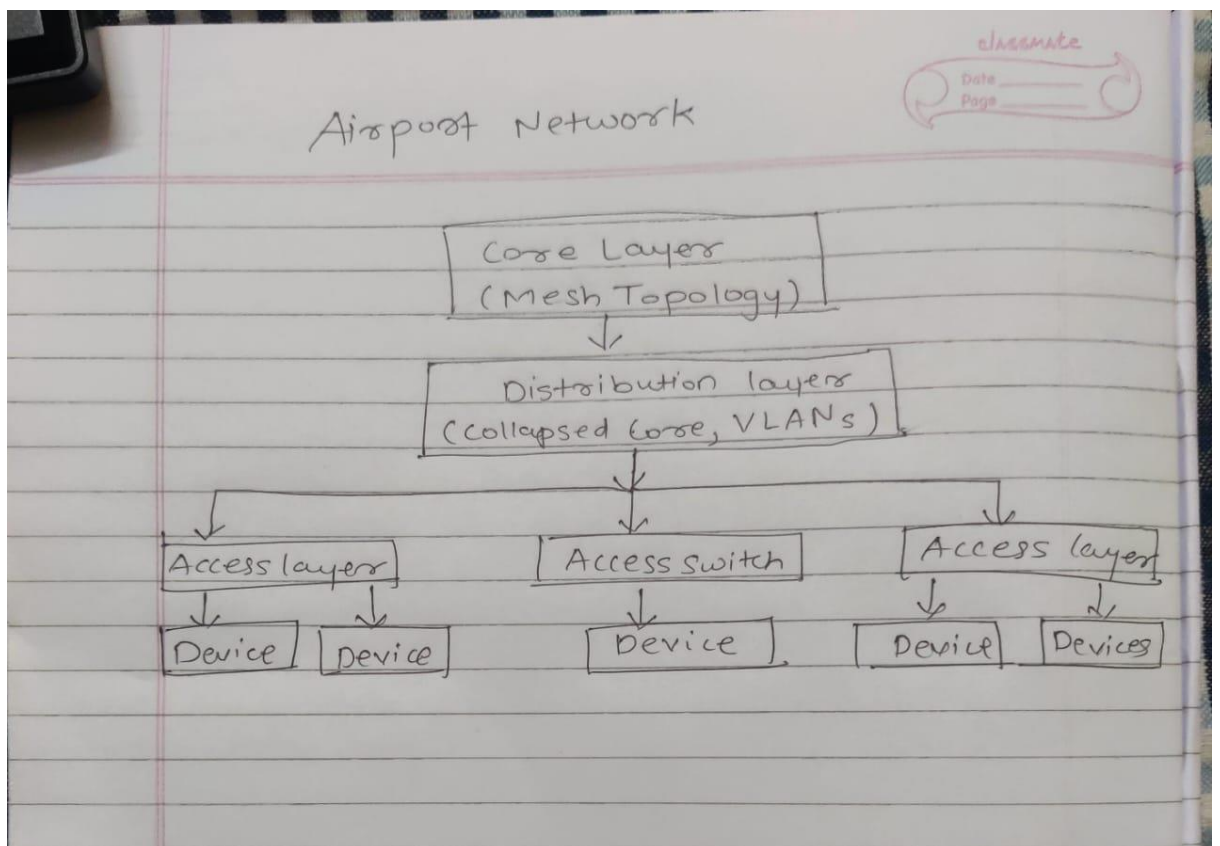
Justifications:

- **Star Topology for Access Layer:** Simplifies cable management, isolates faults, and facilitates easy management of individual connections at passenger kiosks, check-in counters, and boarding gates.
- **Collapsed Core for Distribution Layer:** Hierarchical structure allows efficient traffic management and future scalability. VLANs are used to separate different types of traffic.
- **Mesh Topology for Core Layer**: Provides high availability and fault tolerance by allowing multiple paths between devices. This is crucial for critical airport systems requiring constant connectivity.

This is a simple model and the underlying design may have to look at specific needs such as

	security, redundancy considerations, integration into other systems like surveillance systems, baggage handling or flight control information technology environments. Also, choice of the network devices depends on the amount of traffic which is forecasted and emergence of network security in provision for sensitive data being sought have to be evidenced in protection measures set so that integrity if airport operations is taken.
Conclusion	Hence, by completing this experiment I came to know about various networking devices, topologies, and designing a network as an admin.