CN_QUESTIONS

1. In a corporate office, all systems suddenly lose connectivity because a central networking device has failed. Individual device cables are intact.
    Identify the **topology used** and explain why the entire network went down. Suggest one improvement.

2. A military communication network must remain operational even if several links fail. High reliability is more important than cost.
    Which **topology** is most suitable? Explain how it ensures fault tolerance.

3. What is **mesh topology**? Explain why it is considered highly reliable.

4. A small office uses a single device to connect all computers, but users experience frequent collisions and poor performance.
    Identify the device being used and explain why the problem occurs. Suggest a better alternative.

5. An organization wants to divide its LAN into two segments to reduce congestion while still using MAC-based forwarding.
    Which network device should be used? Explain its role.

6. A company has two networks with different IP ranges and wants to enable communication between them.
    Which device is required and why?

7. Given a large enterprise network, analyze how **gateways, routers, and switches** work together to enable seamless communication.

8. An application is running but users cannot access it. Explain how you would troubleshoot this issue using the OSI model.

9. **What happens when data flows from Layer 7 to Layer 1?**Explain.

10. Data is being transmitted but arrives corrupted or incomplete. Identify possible OSI layers involved and justify your answer.

11. A network works locally but fails when accessing remote servers. Explain which OSI layer is responsible and why.

12. Explain the OSI reference model. Why is it important in computer networks?

13. A network administrator is given the network **192.168.30.0/24** and needs to create **8 equal subnets**.

    Determine the **new subnet mask**, **number of hosts per subnet**, and list the **first two subnets with their network and broadcast addresses**.

14. An organization has the network **192.168.50.0/24** and requires subnets for **60, 25, and 10 hosts**.
    Design an appropriate **subnetting scheme** using variable-length subnet masks (VLSM) and justify your allocation.

15. A user types **www.example.com** in a browser, but the website does not load even though the server is running.

Analyze the **DNS resolution process** and identify at which stage the failure might have occurred.

16. Explain, with justification, why **DNS is designed as a distributed and hierarchical system** instead of a single centralized database.

17. A laptop frequently moves between different networks (home, office, and public Wi-Fi).
    Analyze how the **dynamic nature of DHCP and lease mechanism** ensures seamless IP address assignment in this scenario.

18. In a network, a DHCP server has both **static and dynamic databases**.
    Analyze how the server decides whether to assign a **permanent or temporary IP address** to a client.

19. A company has its DHCP server located on a different subnet from the clients.
    Explain the role of a **DHCP relay agent** and analyze how it enables DHCP communication across networks.

20. During IP address assignment, multiple DHCP servers respond to a client.
    Analyze how the **DORA process** ensures that only one server finally assigns the IP address.

21. Explain how the **NAT table** is used to correctly deliver incoming Internet traffic to the appropriate internal device.

22. Analyze how **NAT helps conserve IPv4 addresses** while also improving network security.

23. A real-time video conferencing application experiences delay when TCP is used.
    Analyze why **UDP is more suitable than TCP** for this application despite the lack of reliability.

24. A file transfer application requires that data arrive **accurately and in sequence**, even over unreliable networks.
    Analyze how **TCP mechanisms** (acknowledgements, retransmissions, and in-order delivery) satisfy this requirement.

25. Given two applications—**online gaming** and **email transfer**—analyze and justify the choice of **UDP for one and TCP for the other** based on protocol features.

26. A wired Ethernet network experiences frequent collisions during peak traffic hours.
    Analyze how **CSMA/CD detects and resolves collisions**, and explain why this problem is rare in modern switched Ethernet networks.

27. What is **HTTPS**? How does it differ from HTTP?
28. List any **four differences between HTTP and HTTPS**.
29. What is meant by the **request–response model** in web communication?
30. Explain the **role of SSL/TLS** in HTTPS.
31. Define a **socket**. What are the two parameters to which a socket is bound?
32. Explain the **client–server model** in socket programming, mentioning the responsibilities of each.
33. List and explain any **four socket API functions** used on the **server side** in TCP socket programming.
34. What is a **WebSocket**? Mention any two key features of WebSocket communication.
35. Explain the **connection lifecycle of a WebSocket** from handshake to close.
36. Differentiate between **HTTP and WebSocket** based on connection type and communication model.