1. Explain in your own words what a network protocol is.

- A **network protocol** is a set of **rules and standards** that devices follow to communicate with each other on a network.
- It ensures data is sent, received, and understood correctly between devices.
- Without protocols, devices would not understand each other's messages.
- Examples include **HTTP (for web browsing)**, **TCP/IP (for reliable data transfer)**, and **FTP (for file transfer)**.

Example:

When you open a website, your browser and the web server communicate using **HTTP**, a protocol that defines *how requests and responses are formatted*.

2. Why might a star topology be preferred over a bus topology in an office?

- **More reliable:** If one cable or device fails in a star topology, the rest of the network keeps working. In a bus topology, one cable failure can bring down the entire network.
- **Better performance:** Each device has its own connection to the central switch, reducing collisions and improving speed.
- **Easier to troubleshoot:** Faults can be located quickly because each device is individually connected.
- **Easier to expand:** Adding new devices is simple—just connect another cable to the switch.

Example:

In an office, if one employee's computer stops working, a **star topology** ensures the rest of the employees are not affected.

3. Why is the OSI model helpful if the internet uses TCP/IP?

- It provides a **universal reference framework** to understand how networking works, regardless of the protocol used.
- Helps **standardize communication** between different vendors and technologies.
- Useful for **troubleshooting**, because problems can be isolated layer by layer.

- Aids in **teaching and learning** networking concepts in a structured way.

Example:

If a website isn't loading, the OSI model helps you check:
Is it a **physical cable issue** (Layer 1)?
An **IP routing issue** (Layer 3)?
Or an **application error** (Layer 7)?

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4. Explain a real-world scenario where UDP would be preferable over TCP.

- UDP is preferred when **speed matters more than reliability** and small packet losses are acceptable.
- Used in **live streaming**, **online gaming**, **VoIP calls**, and **real-time video conferencing**.
- No connection setup or acknowledgment makes communication **faster and lower latency**.

Example:

During a **live cricket match stream**, if one frame is lost, the viewer doesn't want the stream to stop and retry—so UDP is better.

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5. What role does SSL/TLS play in network security?

- SSL/TLS **encrypts data** during transmission, protecting it from eavesdroppers.
- Ensures **authentication**, confirming the server (and sometimes client) is legitimate.
- Provides **data integrity**, preventing tampering during transit.
- Forms the foundation of **HTTPS**, securing websites.

Example:

When you log in to a banking website using **https://**, SSL/TLS ensures your password is encrypted so attackers cannot read it.

References

Kurose, J. F., & Ross, K. W. (2021). Computer Networking: A Top-Down Approach (8th ed.). Pearson.
Tanenbaum, A. S., & Wetherall, D. J. (2011). Computer Networks (5th ed.). Pearson Education.
Forouzan, B. A. (2017). Data Communications and Networking (5th ed.). McGraw-Hill Education.
Stevens, W. R., Fenner, B., & Rudoff, A. M. (2004). UNIX Network Programming, Volume 1 (3rd ed.). Addison-Wesley.
Rescorla, E. (2018). The Transport Layer Security (TLS) Protocol Version 1.3. RFC 8446, IETF.