1. What is a socket?

A **socket** is an endpoint for sending or receiving data across a network.
It combines an **IP address + port number**.

---

2. Difference between TCP and UDP?

TCP	UDP
Connection-oriented	Connectionless
Reliable	Unreliable
Slow	Fast
Uses ACK, retransmission	No ACK
Example: HTTP, FTP	Example: DNS, Video streaming

---

3. What is an IP address?

A unique **logical address** assigned to a device to identify it on a network.

---

4. What is the role of the port number?

It identifies the **specific process/service** on a device.
Example: Port 80 = HTTP.

---

5. What is an Echo Server?

A server that returns the **same message** it receives from the client.

---

6. What is Datagram?

A **self-contained packet** sent using UDP, without connection establishment.

---

7. Why is UDP faster than TCP?

Because **UDP does not use connection setup, acknowledgements, or retransmissions**.

8. What is RTT (Round Trip Time)?

The time taken for a message to go from **client → server → client**.

---

9. What is Sliding Window Protocol?

A flow-control protocol where the sender can send **multiple frames** before waiting for ACKs, based on **window size**.

---

10. What is checksum?

An error-detection mechanism used to identify **corrupted data**.

---

11. What is Routing?

The process of selecting the **best path** for data packets from source to destination.

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12. What is Distance Vector Routing?

Each router shares its **distance to all destinations** with its neighbors.

---

13. What is Link State Routing?

Routers share **complete topology information** and compute shortest path using **Dijkstra's algorithm**.

---

14. What is a broadcast message?

A message sent to **all nodes** in a network (e.g., 255.255.255.255).

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15. What is a multicast?

Sending data to a **group of devices** using multicast IP (224.0.0.0 – 239.255.255.255).

---

16. What is ARP?

Address Resolution Protocol – converts **IP address → MAC address**.

17. What is SMTP?

Simple Mail Transfer Protocol – used for **sending emails**.

---

18. What is Ping used for?

To test **reachability** and **network latency** using ICMP Echo messages.

---

19. What is Traceroute used for?

To identify the **path/hops** a packet takes to reach a destination.

---

20. What is a protocol?

A set of **rules and standards** for communication between network devices.

---

21. Why do we use threads in client-server programs?

To allow the server to **handle multiple clients simultaneously**.

---

22. What is the difference between IPv4 and IPv6?

IPv4	IPv6
32-bit	128-bit
4 billion addresses	Huge address space
Dotted decimal notation	Hexadecimal

---

23. What is congestion?

When **network traffic exceeds capacity**, causing packet loss.

---

24. What is MTU?

Maximum Transmission Unit – largest size of data that can be transmitted in a frame.

25. Why do we use ACK in TCP?

To confirm the **successful delivery of data**.

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26. What is packet loss?

When network packets are **dropped** due to errors or congestion.

---

27. What is a subnet?

A smaller network created by **dividing a larger network** using subnet masks.

---

28. What is a firewall?

A security device/software that controls **incoming and outgoing traffic**.

---

29. What is client-server architecture?

A model where the **client requests** a service and the **server provides** it.

---

30. What is DNS?

Domain Name System – converts **domain names (google.com)** into **IP addresses**.

---

31. What is the 3-way handshake in TCP?

It is the TCP connection establishment process using:

1. **SYN**
2. **SYN + ACK**
3. **ACK**

---

32. What is flow control?

A technique used to **match the speed of sender and receiver** so receiver does not get overloaded.

---

33. What is congestion control?

It prevents the **network** from being overloaded by reducing the sending rate during congestion.

---

34. What is meant by reliability in TCP?

TCP provides:

- Retransmission

- Acknowledgements

- Sequence numbers

- Checksum
  This ensures **reliable delivery**.

---

35. What is a sequence number?

A unique number assigned to each TCP segment to **reorder packets** and detect **lost data**.

---

36. What is a datagram socket?

A socket used for **UDP communication** where data is sent as independent packets.

---

37. What is a stream socket?

A socket used for **TCP communication**, which provides a continuous byte stream.

---

38. What happens if packets arrive out of order in UDP?

UDP **does not reorder** packets.
The **application** must handle it if needed.

---

39. What is TTL (Time To Live)?

A value in every packet that indicates how many **hops** it can travel before being discarded.

---

40. What is a hop?

Every time a packet passes through a **router**, it increases the hop count by 1.

---

41. What is ARQ (Automatic Repeat Request)?

A mechanism where sender retransmits lost or corrupted frames.

Examples:

- Stop-and-Wait ARQ
- Go-Back-N ARQ
- Selective Repeat ARQ

---

42. What is Go-Back-N?

A sliding window protocol where if one frame is lost, the sender **retransmits that frame + all following frames**.

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43. What is Selective Repeat?

A sliding window protocol where only **lost frames** are retransmitted.

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44. What are the functions of the Network Layer?

- Routing
- Forwarding
- Addressing
- Packet handling

---

45. What are the functions of the Transport Layer?

- Reliable delivery

- Error control

- Flow control

- Segmentation

---

46. What are ICMP messages?

Control messages used for:

- Ping

- Traceroute

- Error reporting

---

47. What is fragmentation?

Breaking a large packet into smaller pieces to match the **MTU** of the network.

---

48. What is multiplexing?

Multiple applications sharing **one network connection**.

Example:
Web browser, WhatsApp, and YouTube using the same network.

---

49. What is demultiplexing?

Delivering the received data to the **correct application** using port numbers.

---

50. What is bandwidth?

Maximum data transfer rate of a network link.

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51. What is throughput?

Actual data transferred per second.
(Usually less than bandwidth.)

---

52. What is RTT in Ping?

Round Trip Time =
time taken for packet to go **to destination and back**.

---

53. What is DNS query?

A request to resolve a **domain name → IP address**.

---

54. What is subnet mask used for?

To identify **network part** and **host part** of an IP address.

---

55. Why is UDP used in real-time applications?

Because it has:

- No delay

- Low overhead

- Fast communication

Useful for:
Video calls, online gaming, live streaming.

---

56. What is a frame?

A data packet at the **Data Link Layer**.

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57. What are the parts of an Ethernet frame?

- Preamble

- Destination MAC

- Source MAC

- Type

- Data

- CRC

---

58. What is MAC address?

A unique **hardware address** assigned to a network interface.

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59. What is a router?

A device that **routes packets** between different networks.

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60. What is a switch?

A device that forwards frames based on **MAC addresses**.