

**Malla Reddy College of Engineering & Technology**

(Autonomous Institution- UGC, Govt. of India)

(Affiliated to JNTUH, Hyderabad, Approved by AICTE, NBA &NAAC with ‘A’ Grade)

**Computer Networks**

1. **What is a computer network?***Answer:* A set of connected computers that share resources and data via communication channels.
2. **List the uses of computer networks.**  
   *Answer:* Resource sharing, communication, distributed processing, data centralization.
3. **Explain types of networks by scale**.  
   *Answer:* PAN, LAN, MAN, WAN—differ by geographic coverage.
4. **Compare TCP/IP and OSI models.***Answer:* TCP/IP has 4 layers (Application, Transport, Internet, Network Access); OSI has 7 layers from Application to Physical.
5. **Why do we use layered models?**  
   *Answer:* To manage complexity, modularize functionality, and standardize interfaces.
6. **Explain guided vs. unguided media.***Answer:* Guided (cables: twisted pair, coaxial, fiber); unguided (wireless: RF, microwave).
7. **What is circuit switching vs. packet switching?***Answer:* Circuit reserves path; packet shares network, more efficient and robust.
8. **Define bandwidth and latency.***Answer:* Bandwidth = max data rate. Latency = delay for one packet.
9. **Explain attenuation and noise.***Answer:* Attenuation weakens signals; noise adds unwanted random signals.
10. **What’s modulation?***Answer:* Converting digital data into signals suitable for transmission (ASK, FSK, PSK).
11. **Name primary functions of the Data Link Layer**.  
    *Answer:* Framing, error detection/correction, flow control, reliable delivery.
12. **Explain parity and CRC error detection.***Answer:* Parity adds bit; CRC uses polynomial division to detect errors.
13. **What is the stop-and-wait protocol?***Answer:* Sender waits for ACK after each frame. Simple but inefficient.
14. **Define sliding window protocols.***Answer:* Allow multiple frames in flight; controlled by window size and ACK logic.
15. **What is ALOHA protocol?**  
    *Answer:* Random access; two versions: pure (unslotted) and slotted.
16. **How CSMA/CD works?***Answer:* Carrier Sense Multiple Access with Collision Detection used in Ethernet.
17. **Explain CSMA/CA.**  
    *Answer:* Collision Avoidance used in Wi-Fi; uses RTS/CTS to reserve channel.
18. **Name collision-free MAC protocols.**  
    *Answer:* Token Ring, TDMA, FDMA, polling systems.
19. **Describe Ethernet frame structure**.  
    *Answer:* Preamble, destination MAC, source MAC, type, payload, CRC.
20. **Explain MAC sublayer function.***Answer:* Coordinates access to shared medium and addresses Ethernet frames.
21. **State Network layer responsibilities.***Answer:* Routing, logical addressing, packet forwarding, congestion control.
22. **Difference: Connectionless vs. Connection-oriented networks.***Answer:* Connectionless: each packet routed independently. Connection-oriented: path setup (e.g., virtual circuit).
23. **What is shortest path routing?***Answer:* Uses Dijkstra’s to compute minimum distance paths.
24. **Explain distance vector routing.***Answer:* Routers share distance vectors; Bellman-Ford ensures convergence; count-to-infinity problem exists.
25. **Define count-to-infinity problem.***Answer:* In DV routing, faulty route info loops and distances grow to infinity.
26. **What is link-state routing?**  
    *Answer:* Routers flood link-state info and compute shortest paths with Dijkstra.
27. **Explain hierarchical routing.**  
    *Answer:* Divides network into regions for scalability; routers only need local info.
28. **Describe path-vector routing (BGP).***Answer:* Each AS advertises full path list of AS hops, detects loops.
29. **Explain IPv4 addressing and subnetting.***Answer:* 32-bit; subnetting divides into network/host. CIDR uses variable-length prefixes.
30. **Why transition to IPv6?***Answer:* Larger address space, built-in auto-configuration, better security, no fragmentation at routers.
31. **What are ARP and RARP?***Answer:* ARP: IP → MAC resolution. RARP: MAC → IP (historical).
32. **Define fragmentation in IP.***Answer:* Splitting large packets into smaller ones to meet MTU limits.
33. **What is congestion control?***Answer:* Mechanisms to reduce load when network is overburdened.
34. **Explain CIDR and supernetting**.  
    *Answer:* CIDR aggregates IP blocks to reduce routing table size (e.g., /20 covers four /22 subnets).
35. **Describe IPv6 features.***Answer:* 128-bit addresses, simplified header, auto-configuration, improved routing.
36. **Mention transport layer services.***Answer:* End-to-end communication, reliability, multiplexing, flow/congestion control.
37. **Explain UDP and its features**.  
    *Answer:* Lightweight, connectionless, no reliability—used in real-time apps (DNS, video).
38. **What is the TCP three-way handshake?***Answer:* SYN → SYN-ACK → ACK to establish connection.
39. **Describe TCP sliding window.***Answer:* Controls flow; window size adjusts based on network conditions and ACK.
40. **How does TCP provide reliability?***Answer:* ACKs, sequence numbers, retransmission on timeout, checksums, flow control, congestion avoidance.
41. **Explain TCP congestion control.***Answer:* Algorithms like slow start, congestion avoidance, fast retransmit/recovery adjust cwnd.
42. **How is a TCP connection terminated?***Answer:* Via four-step exchange: FIN → ACK → FIN → ACK.
43. **Explain elements of transport protocol design.**  
    *Answer:* Addressing, connection management, reliability, flow/congestion control.
44. **What is crash recovery in TCP?***Answer:* After crash, TCP uses sequence numbers and retransmissions to resume.
45. **Difference between UDP and TCP.***Answer:* UDP is connectionless and unreliable; TCP is connection-oriented and reliable.
46. **How do sliding window protocols function?***Answer:* Both sender and receiver maintain windows to track frames in flight and ACKed.
47. **Why use a layered model?***Answer:* Modularity, interoperability, ease of troubleshooting.
48. **What trade-offs exist in network design?**  
    *Answer:* Speed vs. cost, simplicity vs. functionality, centralized vs. distributed control.
49. **Explain IPv4 to IPv6 transition mechanisms.***Answer:* Dual-stack, tunneling (6in4), translation (NAT-PT).
50. **Why are multiple routing algorithms used?***Answer:* To balance scalability, convergence speed, overhead, and response to network changes.