# 📡 Complete Computer Networks (CN) Interview Preparation Topics

This list includes \*\*every possible topic\*\*, no matter how small. It's structured for \*\*SDE + Network Engineers + System roles\*\*, and is sufficient to \*\*master all CN interview questions\*\*.

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## ✅ 1. Networking Fundamentals

- What is a Network? Types (LAN, MAN, WAN, PAN)

- Topologies (Star, Bus, Ring, Mesh, Hybrid)

- OSI Model (7 Layers)

- Function of each layer

- Encapsulation and Decapsulation

- TCP/IP Model – comparison with OSI

- Network Protocols Overview

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## ✅ 2. Physical Layer

- Analog vs Digital Signals

- Bit Rate vs Baud Rate

- Nyquist and Shannon’s Theorems

- Transmission Media:

- Guided (Twisted Pair, Coaxial, Fiber Optic)

- Unguided (Radio, Microwave, Infrared)

- Multiplexing (FDM, TDM, WDM)

- Switching (Circuit, Packet, Message)

- Modulation techniques (ASK, FSK, PSK)

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## ✅ 3. Data Link Layer

- Framing (Character Count, Bit Stuffing, Byte Stuffing)

- Error Detection:

- Parity Bits

- Checksum

- CRC (Cyclic Redundancy Check)

- Error Correction:

- Hamming Code

- Flow Control (Stop-and-Wait, Sliding Window)

- ARQ Protocols (Stop-and-Wait ARQ, Go-Back-N, Selective Repeat)

- MAC (Media Access Control):

- ALOHA (Pure, Slotted)

- CSMA/CD, CSMA/CA

- Ethernet (IEEE 802.3)

- Wired LANs, Wireless LANs (Wi-Fi, IEEE 802.11)

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## ✅ 4. Network Layer

- IP Addressing:

- Classes (A, B, C, D, E)

- Private vs Public IPs

- Subnetting & Supernetting

- CIDR (Classless Inter-Domain Routing)

- VLSM (Variable Length Subnet Mask)

- Binary math for subnetting

- IP Fragmentation and Reassembly

- IPv4 vs IPv6

- Routing:

- Static vs Dynamic Routing

- Distance Vector Routing (RIP)

- Link State Routing (OSPF)

- Path Vector (BGP)

- Routing Algorithms:

- Dijkstra’s (LSR), Bellman-Ford (DVR)

- Count-to-Infinity Problem

- Split Horizon, Poison Reverse

- Address Resolution:

- ARP (Address Resolution Protocol)

- RARP (Reverse ARP)

- ICMP (Ping, Traceroute)

- NAT (Network Address Translation)

- DHCP, BOOTP

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## ✅ 5. Transport Layer

- Multiplexing and Demultiplexing

- Process-to-Process Communication

- Ports and Sockets

- UDP vs TCP

- TCP Details:

- 3-Way Handshake

- 4-Way Termination

- TCP Header Fields

- Sequence and Acknowledgement Numbers

- Congestion Control (Slow Start, AIMD, Fast Retransmit/Recovery)

- Flow Control using Sliding Window

- RTT Estimation, Karn’s Algorithm

- UDP:

- Connectionless

- Applications (DNS, VoIP, Streaming)

- Nagle’s Algorithm

- Silly Window Syndrome

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## ✅ 6. Application Layer

- DNS (Domain Name System)

- HTTP/HTTPS:

- HTTP Methods (GET, POST, PUT, DELETE)

- Persistent vs Non-Persistent

- HTTP/1.1 vs HTTP/2 vs HTTP/3

- FTP vs SFTP

- SMTP, POP3, IMAP (Email protocols)

- Telnet, SSH

- DHCP (again at App layer usage)

- SSL/TLS Protocols (Basics of Encryption in Network)

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## ✅ 7. Congestion Control & Quality of Service (QoS)

- Congestion vs Flow Control

- Leaky Bucket Algorithm

- Token Bucket Algorithm

- QoS Metrics: Bandwidth, Delay, Jitter, Packet Loss

- Bufferbloat, RED (Random Early Detection)

- Explicit Congestion Notification (ECN)

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## ✅ 8. Switching & Routing Devices

- Hub vs Switch vs Router vs Gateway vs Bridge vs Modem

- Layer 2 vs Layer 3 Switches

- NAT Routers

- Load Balancers

- Firewalls (Stateful, Stateless)

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## ✅ 9. Wireless & Mobile Networks

- Mobile IP, Handoff

- Wi-Fi Architecture (BSS, ESS)

- Hidden Terminal, Exposed Terminal Problems

- Bluetooth, RFID, ZigBee

- Cellular Networks: 1G to 5G

- 802.11 Standards (a/b/g/n/ac/ax)

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## ✅ 10. Network Security

- Cryptography Basics (Symmetric/Asymmetric)

- SSL/TLS, HTTPS

- Firewalls, IDS, IPS

- VPN (Virtual Private Network)

- IPsec

- DoS vs DDoS Attacks

- Spoofing, Sniffing, MITM

- Authentication Protocols (Kerberos, OAuth, etc.)

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## ✅ 11. Performance & Monitoring

- Bandwidth, Throughput, Latency

- Jitter, Packet Loss

- MTU (Maximum Transmission Unit)

- RTT (Round Trip Time)

- QoS Metrics

- Network Monitoring Tools (Wireshark, Netstat, Traceroute, Ping)

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## ✅ 12. Protocols Summary (across layers)

| Layer | Protocols |

|------------|-----------------------------------------------------|

| Application| HTTP, FTP, DNS, SMTP, DHCP, POP3, IMAP |

| Transport | TCP, UDP |

| Network | IP, ICMP, IGMP, ARP, RARP |

| Data Link | Ethernet, PPP, HDLC, Frame Relay |

| Physical | NRZ, Manchester, DSL, etc. |

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## ✅ 13. Cloud, CDN, and Modern Networking

- CDNs (Akamai, Cloudflare)

- DNS Load Balancing

- SDN (Software Defined Networking)

- Network Function Virtualization (NFV)

- Overlay Networks (VPNs, Tunnels)

- Cloud Networking Basics (AWS VPC, GCP Networking)

- Edge Computing vs Cloud Computing

- Proxy Servers, Reverse Proxies

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## ✅ 14. Miscellaneous & Advanced Topics

- BitTorrent / Peer-to-Peer Networking

- Onion Routing (Tor Network)

- Socket Programming (Basics in C/C++)

- Network Simulation Tools: ns2, ns3, Packet Tracer

- Network Layers in Linux (Netfilter, IP Tables)

- IP Spoofing, DNS Poisoning

- Latency Optimization Techniques (HTTP2 Push, TCP Fast Open)

- Head-of-Line Blocking

- Keep-Alive, Connection Pooling

- Port Forwarding, Tunneling

- MPLS (Multiprotocol Label Switching)

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## ✅ 15. Common Interview Questions

- TCP vs UDP (with use cases)

- DNS lookup process (step-by-step)

- 3-Way Handshake dry-run with SYN/ACK flags

- IP vs MAC Address

- Subnetting a given IP (with mask)

- Explain NAT and Port Forwarding

- OSI vs TCP/IP Model

- HTTP vs HTTPS (certificates, handshake)

- How does a browser load a webpage?

- Difference: Firewall vs Proxy vs IDS

- MTU impact on packet fragmentation

- DNS poisoning or spoofing

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> ⚠️ Let me know if you want this exported as:

> - 📄 Clean printable PDF

> - 📘 Flashcards

> - ⚙️ Coding + Networking problem set

> - 🧠 System design integration notes