

TOP 30 MOST IMPORTANT QUESTIONS

Computer Network - Mumbai University

Subject Code: 48891 | Semester V

Based on comprehensive analysis of previous year question papers (2022-2024), here are the **30 most important questions** that have high probability of appearing in your exam:

SECTION A: NETWORK FUNDAMENTALS (10 Marks Questions)

1. OSI & TCP/IP Reference Models (Appeared 6 times)

Explain OSI/ISO reference model with a neat diagram and compare it with TCP/IP reference model. Discuss the functions of each layer and list protocols at each layer.

2. Software Defined Networking (SDN) (Appeared 8 times)

What is SDN? Explain SDN architecture along with Operations of control and data planes. Discuss the advantages of SDN over traditional networking and explain the role of controllers.

3. Sliding Window Protocol (Appeared 6 times)

Explain sliding window protocol using GO Back-N technique with suitable example. Also discuss Selective Repeat protocol and compare both approaches with diagrams.

4. IP Addressing (Appeared 7 times)

Explain IPv4 classful and classless addressing with their differences. State disadvantages of classful addressing. Explain CIDR notation with examples.

5. CSMA/CD Protocol & Channel Allocation (Appeared 4 times)

What is Channel Allocation problem? Explain CSMA/CD protocol in detail. **Problem:** A network with CSMA/CD has 100 Mbps bandwidth and 25.60 microsecond maximum propagation delay. What is the minimum frame size?

6. CRC Error Detection (Appeared 4 times)

A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is $x^4 + x^2 + 1$. What is the actual bit transmitted? If the third bit is inverted, how will the receiver detect this error? Show all calculations.

7. NOX and POX Controllers (Appeared 4 times)

Elaborate the architectures of NOX and POX controllers of SDN with their comparison. Discuss the components, features, programming language support, and use cases of both controllers.

8. Distance Vector Routing (Appeared 3 times)

What is Routing? What are desirable characteristics of routing algorithms? Explain distance vector routing with suitable example. Discuss the Bellman-Ford algorithm and count-to-infinity problem.

9. Link State Routing (Dijkstra's Algorithm) (Appeared 2 times)

Explain Link State Routing (Dijkstra's algorithm) as shortest path routing with suitable example. Show step-by-step calculation for a given network topology.

10. Transmission Media (Appeared 4 times)

Describe the different guided transmission medias used in the network. Illustrate with diagram the details for Co-axial cable and state comparative characteristics with fiber optics and twisted pair cables in terms of bandwidth, cost, attenuation, and applications.

11. Cisco PPDIOO Methodology (Appeared 3 times)

Explain in brief Cisco PPDIOO Network design Methodology. Discuss all six phases: Prepare, Plan, Design, Implement, Operate, and Optimize with their objectives and deliverables.

12. Cisco SONA Architecture (Appeared 4 times)

Elaborate Cisco SONA (Service Oriented Network Architecture) in detail. Explain the three layers: Network Infrastructure, Interactive Services, and Application layer with diagrams.

13. Cisco Hierarchical Model (Appeared 2 times)

Explain in brief classic three-layer Hierarchical model for network design by Cisco. Discuss the functions of Core layer, Distribution layer, and Access layer with advantages.

14. Subnetting (Appeared 2 times)

What is subnetting? Given the class C network 192.168.10.0, use the subnet mask 255.255.255.192 to create subnets and calculate:

- (i) Number of subnets created
- (ii) Hosts per subnet
- (iii) IP address of first host, last host and broadcast address of each subnet

15. TCP Three-Way Handshake & Connection Management (Appeared 2 times)

Explain Three Way Handshaking for connection establishment and TCP connection management with suitable diagrams. Also explain TCP connection release using four-way handshake.

16. Pure and Slotted ALOHA (Appeared 2 times)

What is ALOHA? Explain Pure ALOHA and Slotted ALOHA in detail with throughput analysis. Derive the maximum throughput for both protocols and compare their efficiency.

17. Data Link Layer Design Issues (*Appeared 3 times*)

What are the different DLL (Data Link Layer) design issues? Describe them in brief. Enumerate the main responsibilities of the DLL including framing, error control, flow control, and MAC.

18. IPv4 Header Format (*Appeared 1 time but important*)

Explain IPv4 header format with a neat diagram. Describe each field including Version, Header Length, Type of Service, Total Length, Identification, Flags, Fragment Offset, TTL, Protocol, Header Checksum, Source and Destination addresses.

19. TCP Flow Control (*Important for Transport Layer*)

Elaborate TCP flow control mechanism with example. Explain the sliding window mechanism in TCP and how it prevents receiver buffer overflow.

20. Routing Protocols Classification (*Important*)

Differentiate between Routed and Routing protocols. Also depict the classification of routing algorithms into Interior Gateway Protocols (IGP) and Exterior Gateway Protocols (EGP). Explain RIP, OSPF, and BGP.

SECTION B: SHORT NOTES (5 Marks Questions)**21. TCP vs UDP** (*Appeared 6 times*)

Differentiate between TCP and UDP protocols with suitable examples. Create a comparison table covering connection type, reliability, speed, ordering, error checking, overhead, and applications.

22. DNS (Domain Name System) (*Appeared 4 times*)

Write notes on DNS and explain components of DNS in detail. Discuss DNS hierarchy, DNS servers (Root, TLD, Authoritative), DNS records (A, AAAA, CNAME, MX, NS), and DNS query process.

23. Hamming Code & Parity Check (*Appeared 3 times*)

A 4-bit data bits with binary value 1010 is to be encoded using even parity Hamming code. What is the binary value after encoding? Explain the error detection and correction mechanism with formulas.

24. Network Devices (*Appeared 3 times*)

Explain Repeater, Hub, Bridge, Switch & Routers with their functionalities and differences. Discuss the OSI layer at which each device operates and their use cases.

25. NAT (Network Address Translation) (*Appeared 3 times*)

Write a short note on NAT (Network Address Translation) with its working principle. Explain different types: Static NAT, Dynamic NAT, and PAT (Port Address Translation).

26. LAN, MAN, WAN (*Appeared 5 times*)

Explain LAN, MAN and WAN with their characteristics and differences. Discuss geographical coverage, data transfer rates, ownership, error rates, and typical technologies used.

27. Circuit vs Packet Switching (*Appeared 2 times*)

Compare and contrast Circuit switched network and Packet switched network. Discuss connection setup, resource allocation, efficiency, delay, and applications.

28. Connection Oriented vs Connectionless (*Appeared 2 times*)

Compare and contrast between Connection oriented protocol vs Connectionless protocol. Give examples like TCP (connection-oriented) and UDP (connectionless).

29. IPv4 vs IPv6 (*Appeared in comparison questions*)

Compare and contrast between IPv4 vs IPv6 addressing schemes. Discuss address size, header format, address representation, security features, and transition mechanisms.

30. Network Topologies (*Appeared 2 times*)

List and describe the different network connection topologies with diagrams. Discuss Bus, Star, Ring, Mesh, Tree, and Hybrid topologies with their advantages and disadvantages.

ADDITIONAL IMPORTANT SHORT TOPICS

31. OpenFlow Messages & Controllers (*Appeared 2 times*)

Write a short note on OpenFlow messages and OpenFlow Controllers of SDN. Explain Controller-to-Switch messages, Asynchronous messages, and Symmetric messages.

32. DHCP (*Appeared 2 times*)

Write a short note on DHCP (Dynamic Host Configuration Protocol). Explain DORA process (Discover, Offer, Request, Acknowledge).

33. Static vs Dynamic Routing (*Important*)

Compare Static routing and Dynamic routing with advantages and disadvantages.

34. FTP, SMTP, Telnet (*Application Layer*)

Write short notes on FTP (File Transfer Protocol), SMTP (Simple Mail Transfer Protocol), and Telnet.

35. TCP Timers (*Appeared in combined questions*)

Explain TCP Timers including Retransmission Timer, Persistent Timer, Keep-alive Timer, and Time-Wait Timer.

IMPORTANT FORMULAS & CALCULATIONS

CSMA/CD Minimum Frame Size:

$$\text{MinimumFrameSize} = 2t_{\text{Propagation Delay}} \times t_{\text{Bandwidth}}$$

ALOHA Throughput:

- **Pure ALOHA:** $S = G \times e^{-2G}$, Max throughput = 18.4%
- **Slotted ALOHA:** $S = G \times e^{-G}$, Max throughput = 36.8%

Hamming Code:

- For m data bits, r parity bits: $2^r \geq m + r + 1$

Subnetting:

- Number of subnets = 2^n where n = number of borrowed bits
- Hosts per subnet = $2^h - 2$ where h = number of host bits

STUDY STRATEGY

1. **Priority 1** (Must Know): Questions 1-10 - These are 10 marks questions with highest frequency
2. **Priority 2** (Very Important): Questions 11-20 - Frequently asked 10 marks questions
3. **Priority 3** (Important): Questions 21-30 - 5 marks short notes with high frequency
4. Focus on numerical problems: CRC, Hamming Code, CSMA/CD, Subnetting
5. Practice drawing diagrams: OSI/TCP-IP layers, Network topologies, SDN architecture
6. Learn comparison tables: TCP vs UDP, IPv4 vs IPv6, Circuit vs Packet switching

Best of luck for your exam!