

Data Communication and Computer Network Question Bank

1. Discuss the OSI model and TCP/IP model with functions of all the layers. If the data link layer can detect errors between hops, why do you think we need another checking mechanism at the transport layer?
2. What is the relationship between period and frequency? What does the amplitude of a signal measure? What does the frequency of a signal measure? What does the phase of a signal measure?
3. Categorize the four basic topologies in terms of line configuration. For n devices in a network, what is the number of cable links required for a mesh, ring, bus, and star topology?
4. Assume 6 devices are arranged in a mesh topology. How many cables are needed? How many ports are needed for each device?
5. What is the position of the transmission media in the OSI or the Internet model? Name the two major categories of transmission media, How do guided media differ from unguided media?
6. Differentiate the TCP and UDP protocols at transport layer. What are connection-oriented and connectionless protocol give an example for each with details?
7. List the three traditional switching methods. What are the most common today? Compare and contrast a circuit-switched network and a packet-switched network.
8. What is the network address in a class A subnet with the IP address of one of the hosts as 25.34.12.56 and mask 255.255.0.0?
9. A company is granted the site address 181.56.0.0 (class B). The company needs 1000 subnets. Design the subnets.
10. A 12-bit Hamming code whose hexadecimal value is 0xE4F arrives at a receiver. What was the original value in hexadecimal? Assume that not more than 1 bit is in error.
11. How does a single-bit error differ from a burst error? Discuss the concept of redundancy in error detection and correction. What kind of error is undetectable by the checksum?
12. What are hamming codes? What will be the hamming code for the bit pattern 11001101; if during transmission an error occurs at 7th bit, explain the reasons how this error will be detected.
13. A data stream 10011001110 has to be transmitted over the communication medium. Calculate the CRC for this bit stream using the CRC-4 generator polynomial. (CRC-4 is x^4+x^2+1). Suppose the third bit from the left is flipped during transmission. Show that this error is detected at the receiver side.
14. A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is x^3+1 . What is the actual bit string transmitted? Suppose the third bit from the left is inverted during transmission. How will receiver detect this error?
15. An error correcting code has the following code words: 00000000, 00001111, 01010101, 10101010, 11110000. What is the maximum number of bit errors that can be corrected?
16. Consider a binary code that consists only four valid codewords as given as 00000, 01011, 10101, 11110, Let minimum Hamming distance of code be p and maximum number of erroneous bits that can be corrected by the code be q . What is the value of p and q .
17. Given the dataword 1010011110 and the divisor 10111,
 - a. Show the generation of the codeword at the sender site (using binary division).

- b. Show the checking of the codeword at the receiver site (assume no error).
18. A network with bandwidth of 10 Mbps can pass only an average of 15,000 frames per minute with each frame carrying an average of 8,000 bits. What is the throughput of this network?
 19. What is ARQ explain stop and wait Go-Back-N and Selective Repeat ARQ using flow diagram? Explain the reason for moving from the Stop-and-Wait ARQ Protocol to the G0Back-NARQ Protocol
 20. What are the differences between FDMA TDMA and CDMA? Compare space-division and time-division switches.
 21. Define Random access, Controlled access and Channelization and list all protocols in this category. Explain why collision is an issue in a random access protocol but not in controlled access or channelizing protocols.
 22. A TCP connection is using a window size of 10,000 bytes and the previous acknowledgment number was 22,001. It receives a segment with acknowledgment number 24,001 and window size advertisement of 12,000. Draw a diagram to show the situation of the window before and after receiving aforementioned segment.
 23. A TCP connection is using a window size as 1000 B and the previous acknowledge no. was 22,001. It receives a segment with acknowledgment no 24,001. Draw a diagram to show the situation of the window after and before the acknowledgment is received. If the window size is changed to 11000 B and 9000 B separately, then what will be the situation?
 24. Write down the differences in IPV4 and IPV6. Write the significance of the fields present in IPV4 datagram header format.
 25. A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/28. What is the (the first address, the last address, and total number of addresses in the block)?
 26. Explain Routing protocols in detail. How does a distance vector routing protocol differ from a link state routing protocol and Path vector routing protocol. What is the serious drawback of Distance Vector Routing algorithm? Explain.
 27. What is connection establishment and connection release in transport layer?
 28. Explain the traditional cryptography used for network security and privacy. Explain the different cryptographic algorithms like Caesar, Playfair, and Hill cipher.
 29. An ISP is granted a block of addresses starting with 160.102.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows:
 - 1) The first group has 128 customers; each needs 256 addresses.
 - 2) The second group has customers; each needs 128 addresses.
 - 3) The third group has 128 customers; each needs 64 addresses.
 - 4) Design the sub-blocks and find out how many addresses are still available after these allocations.
 30. What protocol is used in the application layer? Explain the working of protocols like HTTP, FTP, DNS, SMTP, MIME, LDP and DHCP in detail.