

- Q1 How Software-defined WAN (SD-WAN) is making WAN architectures agile?
- Q2 Which waves are used in wireless LAN communication? What are the frequencies used for WLANs and standards used?
- Q3 What is TCP IP Model? Give examples of protocols for each layer.
- Q4 What is the IETF standard documents for? Read about the Transport Layer Security (TLS) Protocol Version 1.3 and give your comments.
- Q5 What is the difference between transmission and propagation delay?
- Q6 What is the difference between network applications and application layer protocols?
- Q7 Give five examples of application layer protocols and their port numbers.
- Q8 A message M of 7.5×10^6 bits long is to be sent from host A to B through two switches. Each link is 1.5 Mbps. Each switch uses store-and-forward packet switching.
- How long does it take to move the message without segmentation from the source host to the first packet switch? What is the total time to move the message from source to the destination host?
 - Message M is segmented into 5000 packets, with each packet being 1500 bits long. How long does it take to move the first packet from source to the first switch? When the first packet is being sent from the first switch to the second switch, the second packet is being sent from the source host to the first switch. At what time will the second packet be fully received at the first switch?
 - How long does it take to move the file from source host to destination host when message segmentation is used? What is the advantage and disadvantage of message segmentation?
- Q9 Consider two hosts, A and B, connected by a single link of rate R bps. Suppose that the two hosts are separated by m meters, and suppose the propagation speed along the link is s meters/sec. Host A is to send a packet of size L bits to Host B.
- Ignoring processing and queuing delay, obtain an expression for the end-to-end delay.
 - Suppose $s=2.5 \times 10^8$ meters/sec, $L=120$ bits, and $R=56$ kbps. Find the distance m so that the propagation delay equals transmission delay.
- Q10 There are 200 computers in a lab which are attached to an Ethernet 10 Mbps with a coaxial cable of 1500 m. The packets are 800 bits long. The propagation speed is 2×10^8 m/sec. On average how many packets can each computer send per second?

Q1 Define bandwidth, data rate and throughput. Compare LAN and WAN on these parameters.

Q2 What is the role of flow control in data link layer? Compare it with transportation layer.

Q3 What is the role of error control in the data link layer? Compare it with transportation layer.

Q4 For the bit stream 11010100, draw the waveforms for binary encoding, RZ unipolar, RZ bipolar, NRZ-L, NRZI, NRZM, Manchester, and Differential Manchester encoding.

Q5 In a CRC error-detecting scheme, choose $P(x) = x^4 + x^2 + 1$. Encode the bits 11011010111.

Q6 Examine Go-back-N and Selective Repeat protocols for sequence number k. Examine the protocols for the different scenarios of window sizes. Draw diagrams to explain your answer.

Q7 Examine Go-back-N and Selective Repeat protocols from the perspective of acknowledgements.

- Q1 Frames arrive randomly at a 100-Mbps channel for transmission. If the channel is busy when a frame arrives, it waits its turn in a queue. Frame length is exponentially distributed with a mean of 10,000 bits/frame. For each of the following frame arrival rates, give the delay experienced by the average frame, including both queuing time and transmission time.
- (a) 90 frames/sec. (b) 900 frames/sec. (c) 9000 frames/sec.
- Q2 A group of N stations share a 56-kbps pure ALOHA channel. Each station outputs a 1000-bit frame on average once every 100 sec, even if the previous one has not yet been sent (e.g., the stations can buffer outgoing frames). What is the maximum value of N ? What is the role of error control in the data link layer? Compare it with transportation layer.
- Q3 A large population of ALOHA users manages to generate 50 requests/sec, including both originals and retransmissions. Time is slotted in units of 40 msec. (a) What is the chance of success on the first attempt? (b) What is the probability of exactly k collisions and then a success? (c) What is the expected number of transmission attempts needed?
- Q4 Explain bit-map protocol. How long does a station, s , have to wait in the worst case before it can start transmitting its frame over a LAN that uses the basic bit-map protocol?
- Q5 Explain binary count-down protocol. In the binary countdown protocol, explain how a lower-numbered station may be starved from sending a packet.
- Q6 Explain adaptive tree-walk protocol. Sixteen stations, numbered 1 through 16, are contending for the use of a shared channel by using the adaptive tree-walk protocol. If all the stations whose addresses are prime numbers suddenly become ready at once, how many bit slots are needed to resolve the contention?
- Q7 Consider five wireless stations, A, B, C, D, and E. Station A can communicate with all other stations. B can communicate with A, C and E. C can communicate with A, B and D. D can communicate with A, C and E. E can communicate A, D and B. (a) When A is sending to B, what other communications are possible? (b) When B is sending to A, what other communications are possible? (c) When B is sending to C, what other communications are possible?
- Q8 Ethernet frames must be at least 64 bytes long to ensure that the transmitter is still going in the event of a collision at the far end of the cable. Fast Ethernet has the same 64-byte minimum frame size but can get the bits out ten times faster. How is it possible to maintain the same minimum frame size?
- Q9 Describe the protocol used for Bluetooth connection. A disadvantage of Bluetooth's profiles is that they add significant complexity to the protocol. How can these profiles be an advantage from the perspective of the applications? Bluetooth device can be in two piconets at the same time. Is there any reason why one device cannot be the controller in both of them at the same time? What is the maximum size of the data field for a 3-slot Bluetooth frame at basic rate? Explain your answer. Compare physical layer protocols with the Bluetooth.
- Q10 What does fast Ethernet mean. Explain various types of fiber based fast Ethernet standards?