Q1. If the bandwidth between the sender and receiver is sufficient, and the CPU and buffers are moderate, then which flow control protocol would you suggest using?

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Q3. In what protocols is it possible for the sender to receive an acknowledgment for a packet that falls outside its current window?

1. Stop and Wait
2. Selective Repeat
3. Go back N
4. All of the above

Q4. On a wireless link, the probability of packet error is 0.2. A stop-and-wait protocol is used to transfer data across the link. The channel condition is assumed to be independent from transmission to transmission. What is the average number of transmission attempts required to transfer 100 packets?

Q5. Compute the fraction of the bandwidth that is wasted on overhead (headers and retransmissions) for a protocol on a heavily loaded 50 Kbps satellite channel with data frames consisting of 40 bits header and 3960 data bits. Assume that the signal propagation time from the earth to the satellite is 270 msec. ACK frames never occur. NAK frames are 40 bits. The error rate for data frames is 1%, and the error rate for NAK frames is negligible.

Q6. What is the effect on line utilization if we increase the number of frames for a constant message size?

1. Lower line efficiency
2. Higher line efficiency
3. No change in line efficiency
4. No relation between line efficiency and frame size

Q7. The maximum window size for data transmission using the selective repeat protocol with n-bit frame sequence numbers is-

1. 2^n
2. 2^{n-1}
3. 2^n-1
4. 2^{n-2}

Q8. In SR protocol, suppose frames through 0 to 4 have been transmitted. Now, imagine that 0 times out, 5 (a new frame) is transmitted, 1 times out, 2 times out, and 6 (another new frame) is transmitted. At this point, what will be the outstanding packets in the sender's window?

Q9. Consider a 128 x 10^3 bits/sec satellite communication link with a one-way propagation delay of 150 msec. Selective Retransmission (repeat) protocol is used on this link to send data with a

frame size of 1 KB. Neglect the transmission time of acknowledgment. The minimum number of bits required for the sequence number field to achieve 100% utilization is _____.

Q10. A 3000 km long trunk operates at 1.536 Mbps and is used to transmit 64 byte frames and uses sliding window protocol. If the propagation speed is 6 μsec / km, how many bits should the sequence number field be?

Q11. Compute approximate optimal window size when packet size is 53 bytes, RTT is 60 msec and bottleneck bandwidth is 155 Mbps.

Q12. A sliding window protocol is designed for a 1 Mbps point-to-point link to the moon, which has a one-way latency (delay) of 1.25 sec. Assuming that each frame carries 1 KB of data, what is the minimum number of bits needed for the sequence number?

Q13. Host A is sending data to host B over a full duplex link. A and B are using the sliding window protocol for flow control. The send and receive window sizes are 5 packets each. Data packets (sent only from A to B) are all 1000 bytes long and the transmission time for such a packet is 50 μs. Acknowledgement packets (sent only from B to A) are small and require negligible transmission time. The propagation delay over the link is 200 μs. What is the maximum achievable throughput in this communication?

Q14.Station A uses 32-byte packets to transmit messages to station B using a sliding window protocol. The round trip delay between A and B is 80 msec, and the bottleneck bandwidth on the path between A and B is 128 Kbps. What is the optimal window size that A should use?

Q15. Station A uses 32-byte packets to transmit messages to station B using a sliding window protocol. The round trip delay between A and B is 80 msec and the bottleneck bandwidth on the path between A and B is 128 Kbps. What is the optimal window size that A should use?

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Q21. If transmission delay and propagation delay in a sliding window protocol is 1 msec and 99.5 msec, respectively, then-What should be the sender window size to get the maximum efficiency?
What is the minimum number of bits required in the sequence number field?
If only 7 bits are reserved for sequence numbers, then what will be the efficiency?
Q22. Using stop and wait protocol, the sender wants to transmit 10 data packets to the receiver. Out of these 10 data packets, every 4th data packet is lost. How many packets sender will have to send in total?
Q23. A sender uses the stop-and-wait ARQ protocol for reliable transmission of frames. Frames are of size 1000 bytes, and the transmission rate at the sender is 80 Kbps. The size of an acknowledgment is 100 bytes, and the transmission rate at the receiver is 8 Kbps. The one-way propagation delay is 100 msec.
Assuming no frame is lost, the sender throughput is _____ bytes/sec
Q.24 Consider a MAN with an average source and destination 20 Km apart and a one-way delay of 100 μsec.
At what data rate does the round trip delay equals the transmission delay for a 1 KB packet?
Q25. What is the throughput achievable in stop and wait protocol by a maximum packet size of 1000 bytes and network span of 10 km? Assume the speed of light in the cable is 70% of the speed of light in Vaccum.
Q26A channel has a bit rate of 4 Kbps and a one-way propagation delay of 20 msec. The channel uses the stop-and-wait protocol. The transmission time of the acknowledgment frame is negligible. To get a channel efficiency of at least 50%, the minimum frame size should be
Q27. If the bandwidth of the line is 1.5 Mbps, RTT is 45 msec, and packet size is 1 KB, then find the link utilization in stop and wait.
Q28. The maximum window size for data transmission using SR protocol with 4 bit from the sequence is
Q29. Consider a link of length 1000 km with a 10^9 bps rate connecting a sender and receiver. assume a fixed packet length of 1250 bytes, and the sender always has a packet to send. packet is never lost or corrupted in the connection. what is the necessary window size to achieve 100 % utilization for a sliding window protocol? assume signal propagation is 5 micro sec per km
Q30. Station A needs to send a message consisting of 9 packets to station B using a sliding window (window size 3) and go back n error control strategy. All packets are ready and immediately available for transmission. If every 5th packet that A transmits gets lost (but no ACKs from B ever get lost), then what is the number of packets that A will transmit for sending the message to B?
Q31. Consider a network connecting two systems located 8000 km apart. The bandwidth of the network is 500 x 10^6 bits per second. The propagation speed of the media is 4 x 10^6 meters per second. It is needed to design a Go back N sliding window protocol for this network. The average packet size is 10^7 bits. The network is to be used to its full capacity.

Assume that processing delays at nodes are negligible. Then, the minimum size in bits of the sequence number field has to be _____.

Q32. Consider the sliding window flow-control protocol operating between a sender and a receiver over a full-duplex error-free link. Assume the following:

- The time taken for processing the data frame by the receiver is negligible.
- The time taken for processing the acknowledgment frame by the sender is negligible.
- The sender has an infinite number of frames available for transmission.
- The size of the data frame is 2,000 bits and the size of the acknowledgement frame is 10 bits.
- The link data rate in each direction is 1 Mbps (= 106 bits per second).
- One-way propagation delay of the link is 100 milliseconds.

The minimum value of the sender\'s window size in terms of the number of frames (rounded to the nearest integer) needed to achieve a link utilization of 50% is_____.