P22.

Consider the GBN protocol with a sender window size of 4 and a sequence number range of 1,024. Suppose that at time t, the next in-order packet that the receiver is expecting has a sequence number of k. Assume that the medium does not reorder messages. Answer the following questions:

a. What are the possible sets of sequence numbers inside the sender’s window at time t? Justify your answer.

b. What are all possible values of the ACK field in all possible messages currently propagating back to the sender at time t? Justify your answer.

a. If the receiver acknowledged all the k-1 packages, the sequence numbers will be [k,k+4-1]

​ If the receiver didn't acknowledged all the k-1 packages, the sequence numbers will be [k-4,k-1]

b.[k-4,k-1]

P24.

Answer true or false to the following questions and briefly justify your answer:

a. With the SR protocol, it is possible for the sender to receive an ACK for a packet that falls outside of its current window.

b. With GBN, it is possible for the sender to receive an ACK for a packet that falls outside of its current window.

c. The alternating-bit protocol is the same as the SR protocol with a sender and receiver window size of 1.

d. The alternating-bit protocol is the same as the GBN protocol with a sender and receiver window size of 1.

a. Right. Consider the case of overtime retransmission. The packet may be retransmitted many times due to timeout, so multiple acks can also be obtained. The timeout ack may be received by the sender later, and the serial number may not be in the window when it arrives.

b. Right. Same as a.

c. Right. If the window is 1, each packet must wait for receiving ACK, that is, stop waiting protocol.

d. Right. Same as C.P26.

Consider transferring an enormous file of L bytes from Host A to Host B. Assume an MSS of 536 bytes.

a. What is the maximum value of L such that TCP sequence numbers are not exhausted? Recall that the TCP sequence number field has 4 bytes.

b. For the L you obtain in (a), find how long it takes to transmit the file. Assume that a total of 66 bytes of transport, network, and data-link header are added to each segment before the resulting packet is sent out over a 155 Mbps link. Ignore flow control and congestion control so A can pump out the segments back to back and continuously.

a.

232

b.

In order to transmit the file there have to be at least: 232/536+1=8012999 segments

The size of a segment is 536+66=602 bytes

Total Time=(8012999×602)B/155Mbps=8012999×602×8/155000000=249s