Sheet4

1) In One-Bit Sliding Window, if node A sends packet 1A to node B, node B receives packet 1A and it sends packet 1B to node A together with ACK 2A. Suppose node A sends packet 2A to node B, node B receives packet 2A but it does not have a packet to send to node A. Will the protocol fail? Why or why not?
   It depends on how it handles the from_network_Layer(&buffer) if no data is available.
   If it returns false or if it freezes until it receives data.
2) In a Go-Back-N protocol, the window size is 6. Frames with sequence number 1, 2, 3, 4 and 5 have been sent. The sender just received an ACK for frame 1. And frames 6, 7, 8, 9 and 10 are waiting to be sent.
   a. Which frame(s) can the sender send before it must wait for the next ACK from the receiver? Explain.
      Frames (2,3,4,5,6,7) .
   b. Some time later, the sender transmitted frames 20, 21, 22, 23, 24, and 25; however, frame 22 got lost. If Go-Back-N is used, what frame(s) would the sender have to retransmit? Explain.
      Frames (22,23,24,25).
   c. Suppose the same situation as in b) but sender and receiver use Selective Repeat with window size=6. What frame(s) would the sender need to retransmit? Explain.
      Frames (22 only).
3) Does Selective-Repeat use cumulative ACKs? Why? .
   yes, it uses accumulative acks to deal with loss of acks if the reverse channel is noisy.
4) What are the trade-offs between Go-Back-N and Selective-Repeat?

Go back N uses less buffer size and it is more efficient for bandwidth occupation if the channel is not noisy. If the channel is noisy the probability of extra channel overhead increases.
The selective repeat is the exact opposite , it is preferred over Go Back N in case of noisy channel and buffer size availability.

5) In Go-Back-N, if there is no reverse traffic, will the protocol fail? Why or why not?
   According to the algorithm , yes it fails. The send function is only invoked if network layer is available. Otherwise the other node will time out and resend last frame over and over again.
6) In Selective-Repeat, if there is no reverse traffic, will the protocol fail? Why or why not?
   No , it will not fail. As the there are timers for acks, if time passes and the nodes doesn't find data to send to the other node, the ack timer will go off, and it will send an ack immediately. The ack timer should be less than the retransmission timer plus the required sending time.
7) In Go-Back-N, sender window size (maximum outstanding frames) must be MAX_SEQ and not MAX_SEQ+1.Why?
   Example in the slides
8) In Selective-Repeat, why the NR_BUFS (window sizes) are defined (MAX_SEQ+1)/2 and not MAX_SEQ?
   Example in the slides
9) If a transmission channel drops packets at a high rate, which protocol will yield better performance: Go-Back-N or Selective-Repeat?
   Selective repeat

10) in Selective-Repeat, is it a good design to have ACK timer<<retransmit timer or the reverse (ACK timer>>retransmit timer)?

Ack timer << retransmission timer to avoid wasted packets.

11) for a sliding window protocol, A 1000km long cable(both ways) operates a 1MBPS. If the round trip delay is 10 microsec/km. and the frame size is 1kB, then how many bits are required for sequence number?

Distance= 1000 km

B=1*10^6 Byte per second

2T_p=10 *10^-6 sec per each KM. // the round trip delay = 2 T_p

L=1*1000 B.

Find WS ?

WS=(T_t+2T_p) / T_t

T_t=L/B = 1000/10^6 = 10^-3 sec

2T_p= 2T_p per each km * Distance

2T_p= 10 *10^-6 * 1000= 10^-2 sec.

WS= (10^-3 + 10^-2)/ (10^-3) =0.011/0.001=11

M= ceil(log2(WS))= 4 bits

12) Frames of 1000 bits are sent over a 10^6 bps in a half duplex link between two hosts. The round trip delay is 25ms. What is the minimum number of bits that will be required to represent the sequence numbers distinctly? Assume that no time gap needs to be given between transmission of two frames.

L=1000 bit

B=10^6 bit per sec

2T_p=25 m sec // the round trip delay = 2 T_p

T_t=L/B= 1 m sec

WS=(T_t+2T_p) / T_t

WS=26/1=26

M=5 bits.