JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY

COMPUTER NETWORKS (15B11CI511)

BTECH 5TH SEM 2019

TUTORIAL-5

TRANSPORT LAYER-I (27th Aug- 2nd Sep 2019)

SHORT ANSWER QUESTIONS

Q1. **[CO1]** 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.

Q2. **[CO2]** In a reliable transfer protocol, can a sender tell the difference between a lost data packet and a lost ACK?

Q3. **[CO3]** How many sequence numbers are needed in a pipelined reliable transfer protocol to avoid ambiguity when the window size is *w*?

Q4. **[CO1]** Explain why for SR, $receive\ window \leq \frac{sequence\ \ num\ \ range}{2}$

Q5. **[CO1]** Consider a 5-bit sequence number. If the sequence number starts with 0, what is the sequence number of the 100th packet?

Q6. **[CO1]** Using a 5-bit sequence number, what is the maximum size of the send and receive windows for each of the following protocols:

a. Stop-and-Wait

b. Go-Back-N

c. Selective-Repeat

LONG PROBLEMS

Q7. **[CO3]** Suppose that a sender and a receiver are to perform reliable data delivery.

a. In a Go-Back-N protocol, the window size is 6. Frames with sequence numbers 1, 2, 3, 4 and 5 have been sent. The sender just received an ACK for frame 1. Frames 6, 7, 8, 9 and 10 are waiting to be sent. Draw the time diagram showing this scenario.

b. Which frame(s) can the sender send before it must wait for the next ACK from the receiver? Explain

c. Sometime later, the sender transmitted frames 20, 21, 22, 23, 24, and 26; however, frame 22 got lost. If Go-Back-N is used, what frame(s) would the sender have to retransmit? Explain.

d. Suppose the same situation as above but sender and receiver use Selective-Repeat. What frame(s) would the sender need to retransmit? Explain.

e. Can Selective-Repeat use cumulative ACKs? Explain

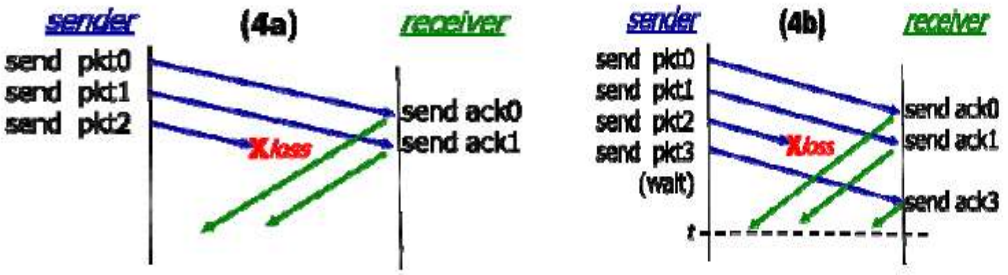
Q8. **[CO3]** Host A is sending a 10,000-byte file to Host B using a sliding window protocol. Packets are limited to 1000 bytes each, packets are numbered by packet number starting at 1, and the window size is 5 packets. Packet 3 is lost.

a. Which packets are retransmitted if Host A and Host B are using the Go-Back-N protocol?
b. Which packets are retransmitted if Host A and Host B are using the Selective Repeat protocol?

Q9. **[CO3]** Assume we need to design a Go-Back-N sliding window protocol for a network in which the bandwidth is 100 Mbps and the average distance between the sender and receiver is 10,000 km. Assume the average packet size is 100,000 bits and the propagation speed is $2x10^8 m/s$. Find

a. the maximum size of the send and receive windows
b. the number of bits in the sequence number field
c. an appropriate timeout value for the timer (that determines packet loss at the sender)

Q10. **[CO2]** (a.) Consider the sliding window protocol in Figure (4a) to the right. Does this figure indicate that Go-Back-N is being used, Selective Repeat is being used, or there is not enough information to tell? Explain your answer briefly.



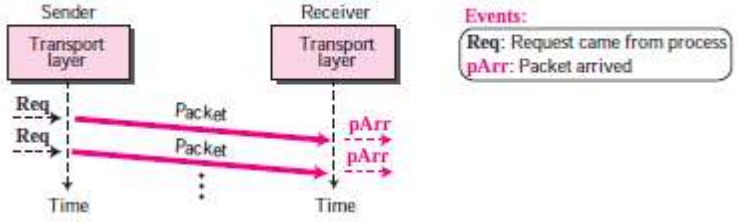
(b.) Consider the sliding window protocol Figure (4b) to the right. Does this figure indicate that Go-Back-N is being used, Selective Repeat is being used, or there is not enough information to tell? Explain your answer briefly.

(c.) Consider Figure (4b) again. Suppose the sender and receiver windows are of size N = 4 and suppose the sequence number space goes from 0 to 15. Show the position of the sender and receiver windows over this sequence number space at time *t* (the horizontal dashed line).

(d.) Give a list of all possible future events at the sender resulting from the ACKs currently propagating from receiver to sender at time *t*. For each of these events, indicate the action take at the sender (only).

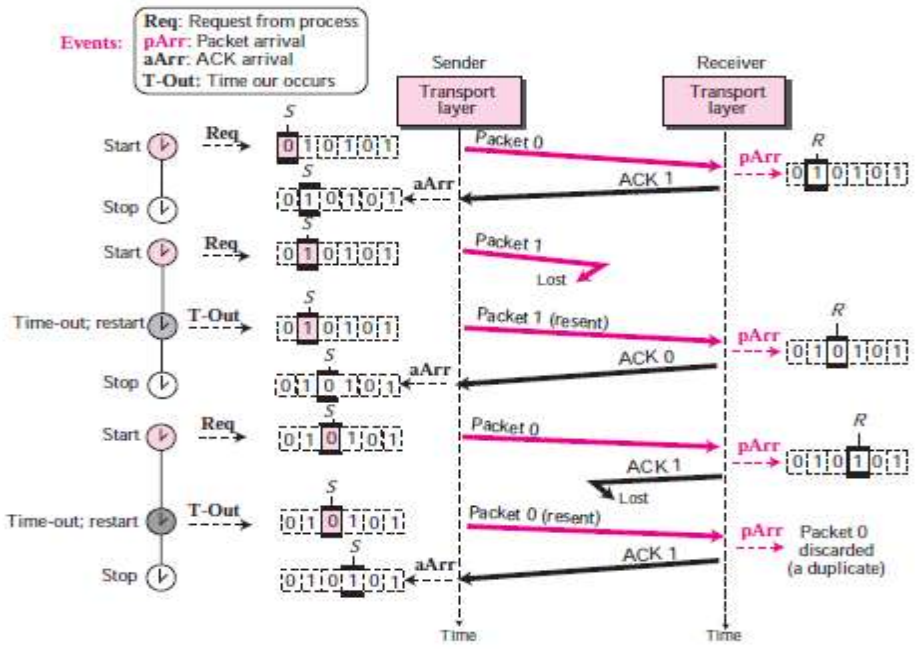
Q11. **[CO3]** Redraw Figure 13.18 with 5 packets exchanged (0, 1, 2, 3, 4). Assume packet 2 is lost and packet 3 arrives after packet 4.

Figure 13.18 *Flow diagram for Example 13.3*



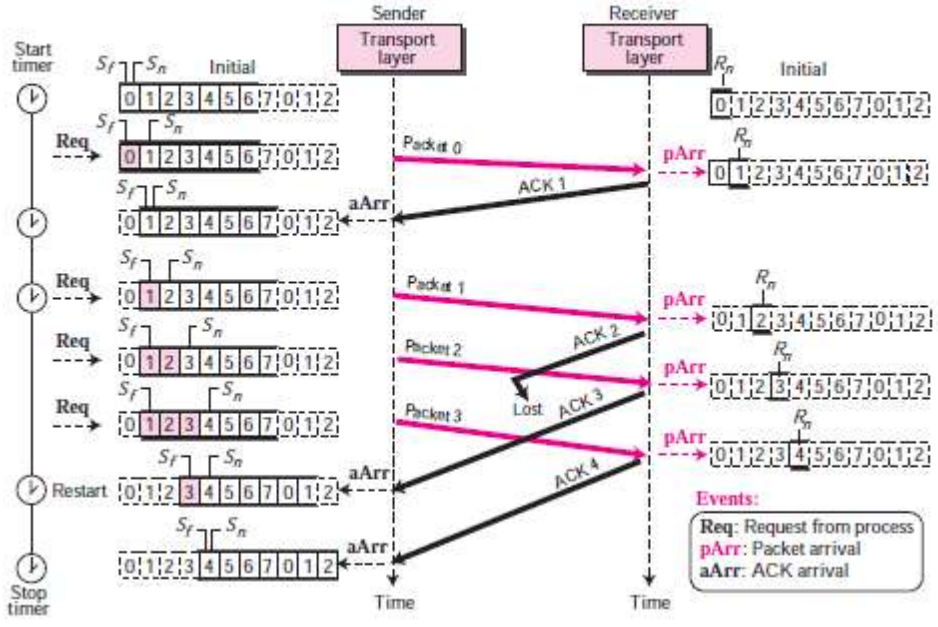
Q12. **[CO3]** Create a scenario similar to Figure 13.21 in which the sender sends three packets. The first and second packets arrived and acknowledged. The third packet is delayed and resent. The duplicate packet is received after the acknowledgment for the original to be sent.

Figure 13.21 *Flow diagram for Example 13.4*



Q13. **[CO3]** Create a scenario similar to figure 13.21 in which the sender sends two packets. The first packet is received and acknowledged, but the acknowledgement is lost. The sender resends the packet after time-out. The second packet is lost and resent.

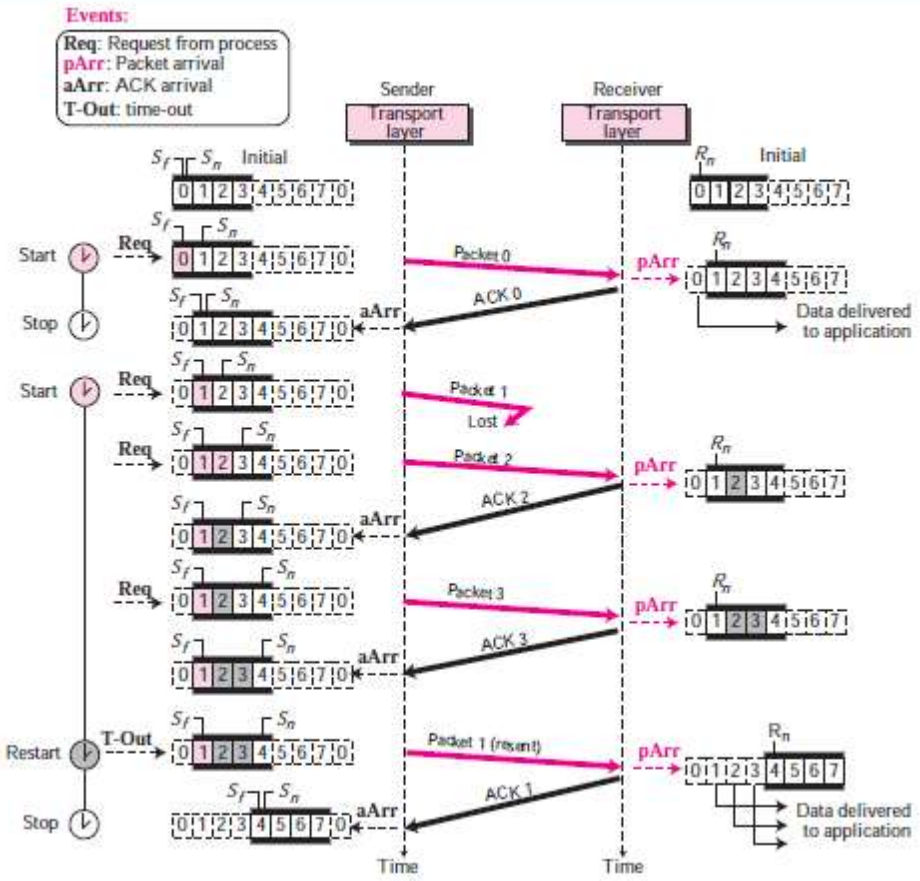
Figure 13.28 *Flow diagram for Example 13.7*



Q14. **[CO3]** Redraw Figure 13.28 if the sender sends 5 packets (0, 1, 2, 3, and 4). Packets 0, 1, and 2 are sent and acknowledged in one single ACK, which arrives at the sender site after all packets have been sent. Packet 3 is received and acknowledged in a single ACK. Packet 4 is lost and resent.

Q15. **[CO3]** Redraw Figure 13.34 if the sender sends 5 packets (0, 1, 2, 3, and 4). Packets 0, 1, and 2 are received in order and acknowledged, one by one. Packet 3 is delayed and received after packet 4.

Figure 13.34 *Flow diagram for Example 13.10*



Acknowledgement:
The questions have been prepared from :
1. "TCP/IP Protocol Suite" 4th Edition Chapter 13 by Forouzan
2. Course websites of different universities