

CSE 5344: Computer Networks

Spring 2022

Quiz 3

Student Name and Signature:.....

Date: Friday, April 8, 2022

Time: 2:00 - 2:30 PM

Quiz 3

Instruction: - It is a closed book quiz; do not use any resources; do not look left/right. If anyone found looking left/right, his/her submission will not be graded.

For the following questions, fill-in-the-blanks and/or circle the correct answers.

1. What benefits do the pipelined protocols have over the non-pipelined (e.g. rdt 3.0)?
(2 Points)

...The pipelined protocols increases the channel utilization efficiency by sending more packets back to back even if the previously sent packets are yet to be acknowledged.

2. Write the differences between Go-Back-N and Selective Repeat in terms of the parameters given in the table
(4 Points)

	ACK Packets	Timer initiated at Sender
Go-Back-N	Receiver sends only Cumulative ACKs	Sender has timer for oldest unacked packet
Selective Repeat	Receiver send individual ACK for each packet	Sender sets the timer for each unacked packet

3. In TCP, Sequence Number is assigned to
(1 Point)
a) Every bit in the data stream
b) Every byte in the data stream
c) Every segment in the data stream
4. In case of packet loss, there is duplicate ACK (of the last packet received at the receiver) sent back to the sender in
(1 Point)
a) Go-Back-N
b) Selective Repeat
c) Both (a) and (b)
d) None of the above

5. In Selective Repeat protocol, consider window size $N = 8$ (i.e. pkt0 – pkt7). While sending the packets one after another, the receiver does not receive packet pkt5. In this case (4 Points)

- a) The sender would wait to receive ack5 before sending remaining packets (pkt6 – pkt7)
- b) The sender would keep sending the remaining packets (pkt6 - pkt7)
- c) The receiver would send duplicate ack corresponding to the last packet that was received correctly
- d) The receiver would continue acknowledging the packets received after pkt5 with their corresponding ack number
- e) Both (a) and (c)
- f) Both (b) and (d)

6. In TCP, receive window is used for flow control..... (1 Point)

7. In TCP bidirectional (full-duplex) communication, what does Acknowledgement number indicate? (1 Point)

.....it indicates the seq# of next byte expected from the other side

8. Consider a data stream of 100KB and maximum segment size of 1KB. Find the following parameters: (4 Points)

- a) Total number of segments: ...100.....
- b) Range of sequence number assigned to third segment: ...2000 – 2999

9. Write in bullet points how TCP RTT (round trip time) is calculated. (5 Points)

Answer:

- TCP collects several sampleRTT and finds its average to calculate estimatedRTT
- As the time progresses, there arrives new sampleRTT
- Using the new sampleRTT and the current estimatedRTT, it calculates new estimatedRTT using the following formula

$$\text{EstimatedRTT} = (1 - \alpha) * \text{EstimatedRTT} + \alpha * \text{SampleRTT}$$

Where, $\alpha = 0.125$

That estimatedRTT is actually the RTT of that instance

10. For large deviation between sampleRTT and estimatedRTT, the TimeoutInterval should be (1 Point)

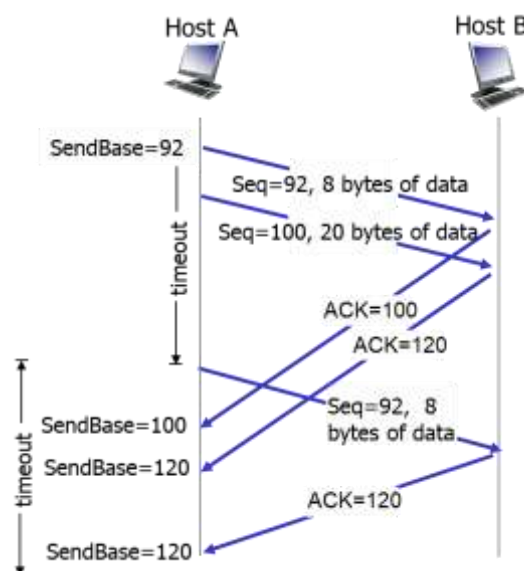
- a) Large
- b) small
- c) kept constant

11. TCP fast retransmit relies upon ...(three) duplicate ACKs (1 Point)

12. In TCP flow control, the receiver controls sender by advertising free buffer space. Assume that the receiver advertises that there is no buffer space available (i.e. $rwnd = 0$), due to which the sender understands that it cannot send any more packets. Then, how does the sender resumes communication when it has to send packet to receiver, or the sender cannot communicate with the receiver at all afterwards? Write in no more than 2-3 lines.
(2 Points)

...After receiving $rwnd = 0$, the sender still keeps sending one data byte segments, which the receiver acknowledges. After sometime, the buffer will begin to empty and acknowledgment will contain a non-zero $rwnd$. The sender would then start sending packets according to latest $rwnd$ value.

13. The following diagram shows a TCP retransmission scenario when there is *premature timeout*.



In above case, we note that the sender sends back to back two packets with sequence number 92 and 100, however it does not receive ACK for both these packets within the timeout window. After the timeout window, the sender resends the first packet and initiates the timer, however it does not send the packet with `Seq = 100`, why?
(3 Points)

Answer: It is because the ACK for second packet (with `seq#100`) arrives at sender within the new timeout window, so the sender understands that the packet with `seq# 120` is already received, and thus there is no need to retransmit this packet.