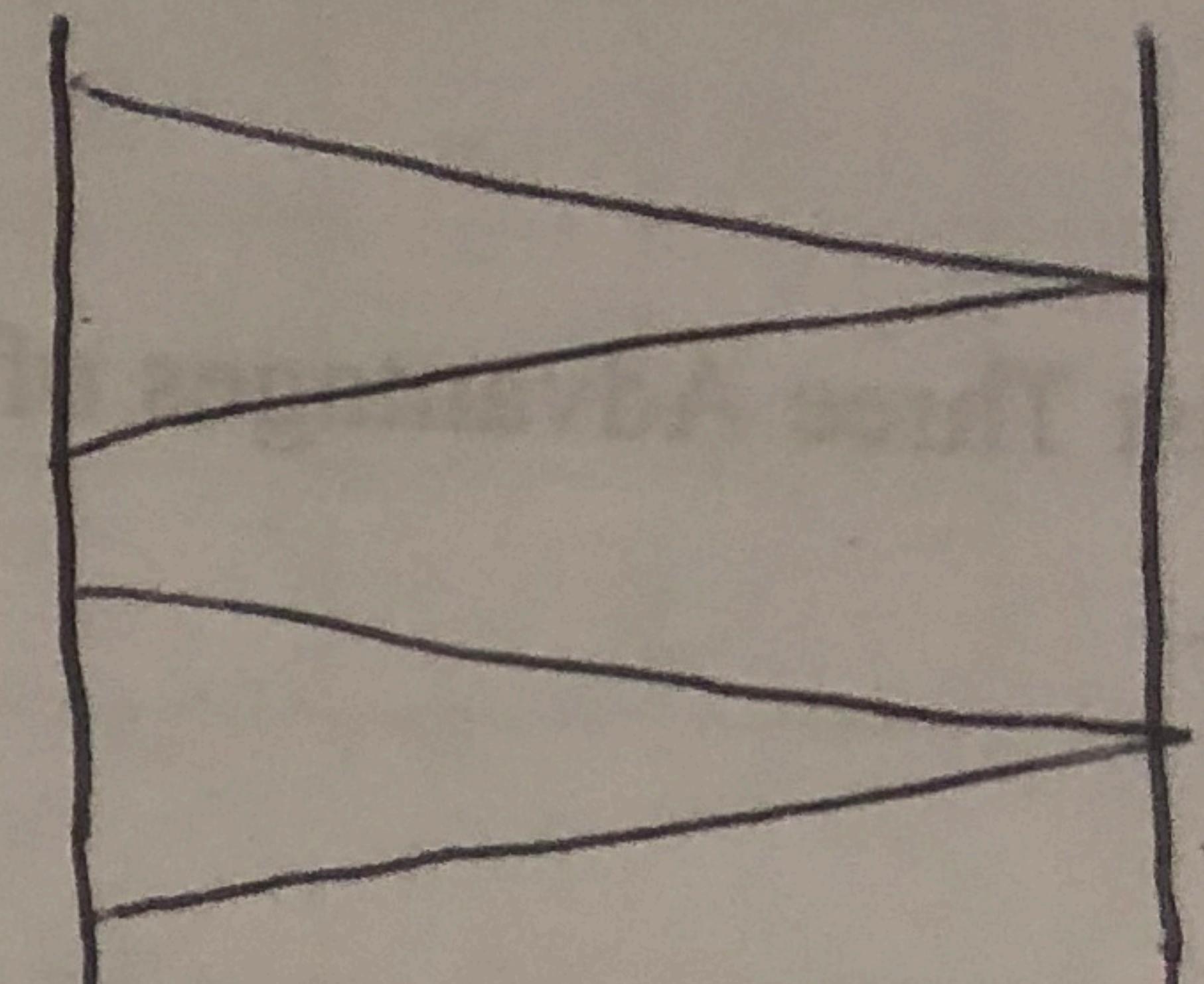
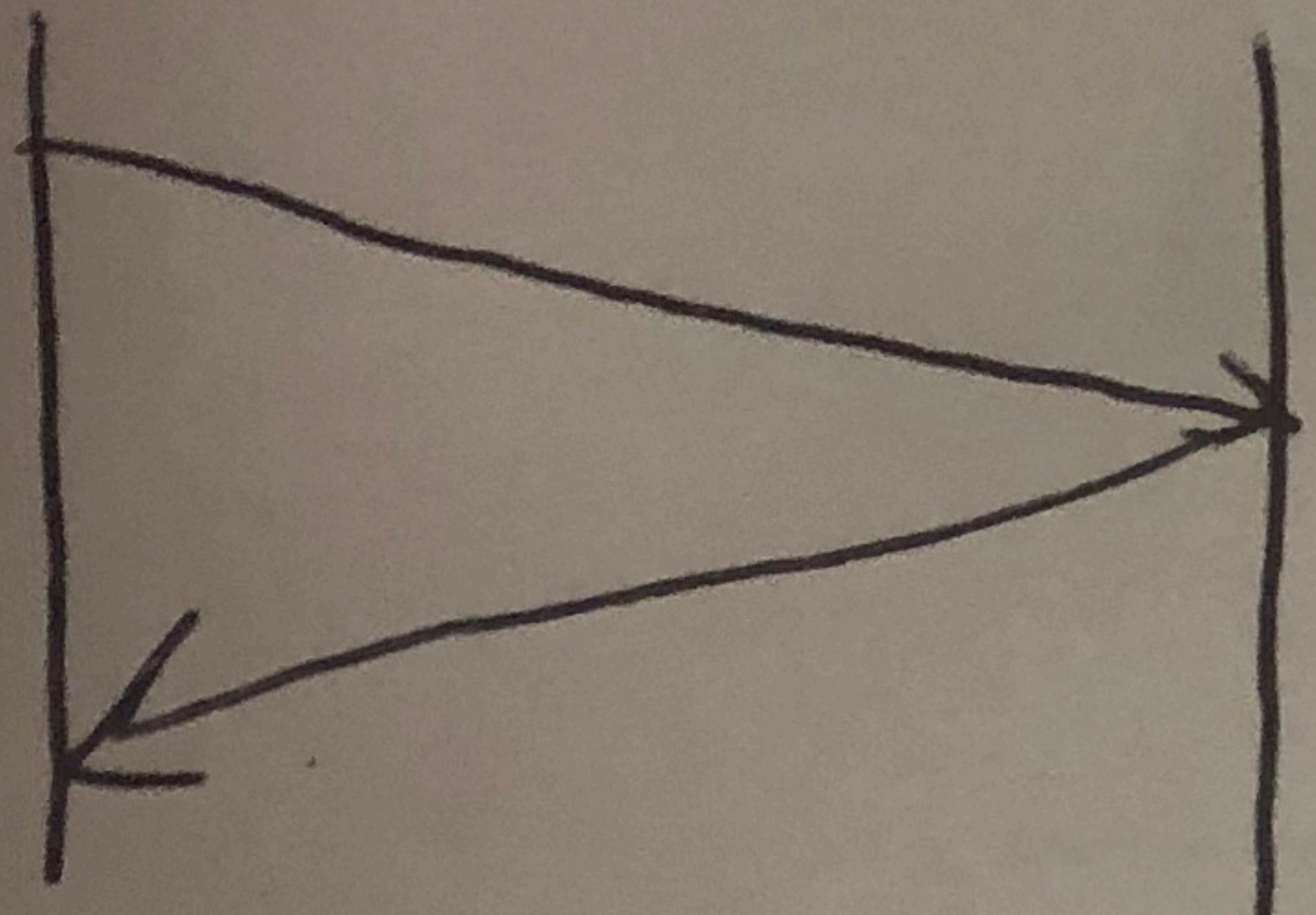


6. List Key Differences between Go-Back N and Selective Repeat

Go-Back-N will simply discard all data with greater sequence number after it finds a pack lost. However, Selective Repeat including cumulative ACK and selective ACK. Their goal is that sender should only retransmit dropped/corrupted data.

7. Draw Two Kinds of Handshake Mechanisms for TCP to Establish and Terminate a Connection



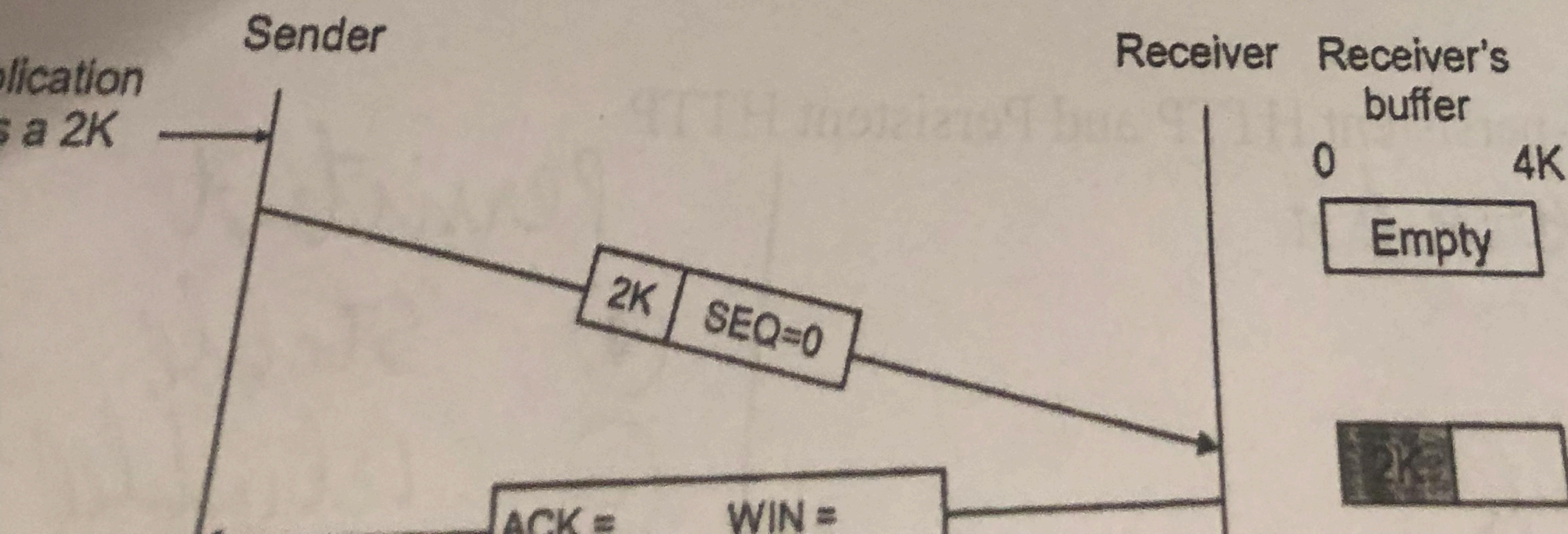
Differentiate between a Flow Control Protocol and a Congestion Control Protocol

Flow Control Protocol

Flow control protocol avoid overwhelming the receiving application, Sender is managing the receiver's socket buffer

Congestion Control avoid overwhelming the bottleneck network link, Sender is managing the bottleneck link capacity and bottleneck router buffers

Please finish the 10 blank fields in the packets based on TCP Flow Control protocol.



10. Please calculate the following SRTT and Timeout Interval based on Initial SRTT and parameters listed.

Initial SRTT = 2 S (two seconds)

$$\alpha = 0.5, \beta = 3$$

RTT Meas.	SRTT	Timeout
2 S	= 2 S	=
3 S	=	=
4 S	=	=
1 S	=	=
5 S	=	=

11. Suppose you click on a link to obtain a Web page in your Web browser. Assume that the IP address for the associated URL is not cached in your local host, and 6 DNS servers are visited before your host receives the IP address from DNS; the successive visits incur an RTT of RTT₁,...,RTT₆. If the Web page associated with the link contains a HTML referencing 11 very small objects on the same server, how much time it will take from when the client clicks on the link until the client receives 11 objects assuming (i) we use Persistent HTTP connection without pipelining or (ii) we use non-persistent HTTP with 5 parallel connections?

12. A TCP connection is established between two hosts A and B connected over 5 links in tandem. The bandwidth of the first link is 1 Mbps (bps=bits per sec, M = 10⁶), and the bandwidth of the next 3 links is $\frac{1}{2}$ of the previous link, and the bandwidth of the last link is $\frac{1}{4}$ of the first link. What is the maximum bandwidth of the connection?

first link: 1Mbps = $1 * 10^6$ bps
second link : 0.5 Mbps
third link: 0.25 Mbps
forth link: 0.125 Mbps
5 link: 0.25 Mbps

13. Consider the GO back N protocol with a sender window size of 5 and a sequence number starting from 1. At some time t , the receiver sends an acknowledgment for 10 (received all packets up to 10). What are the possible sequence numbers of packets in the sender's window at time t ?

10, 11, 12, 13, 14 if the sender have not receive the ACK number from receiver
11, 12, 13, 14, 15 if the ACK transfer very fast, and sender received the ACK number for 10

	35	21
		24
		21
		22

14. A TCP connection with a flow control window of 50 packets uses slow start with a minimum congestion window of 1 with $ss_thresh=40$. How many RTTs are required to send 25 packets (with sequence number 1 through 25), assuming packets with sequence number 6 and 7 are lost and retransmitted. No other packets are lost.

1, 2, 1 lost
1, 1 lost
1, 2, 4, 8, 16
3 RTTs