

CS:352 Fall 21 Mid Term 1 Name: NETID: RUID:

Two Pages, Front and Back. Total Time: One Hour. 14 Questions.

Questions 1-8: 3 Points Each; Questions 9-10: 10 Points Each; Question 11-14: 14 Points Each.

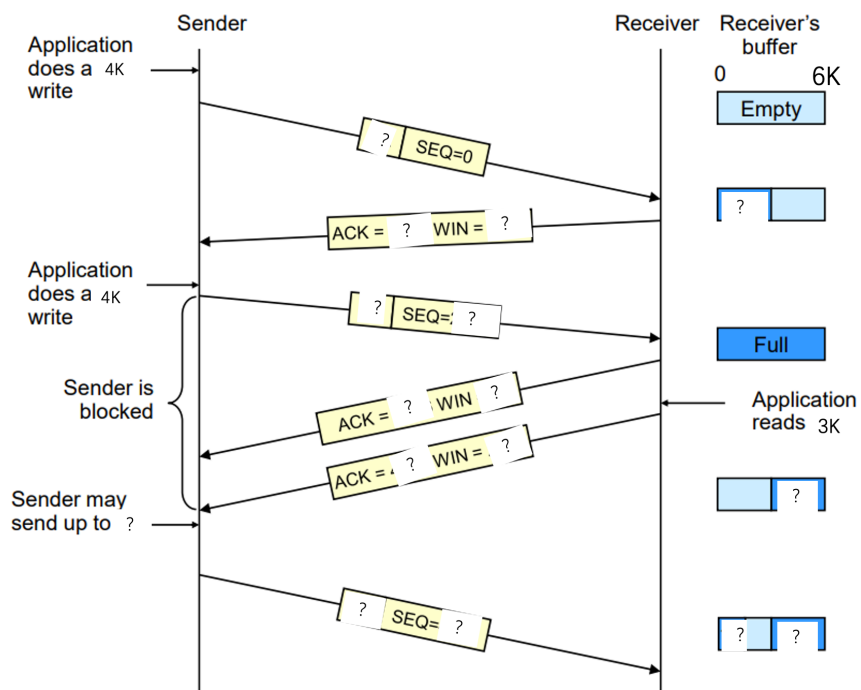
1. List Seven Layers of ISO/OSI Reference Model and Five Layers of Internet Protocol Stack and explain how Internet Protocol Stack model implements the function of ISO/OSI Reference Model.
2. Explain the difference between Flow Control and Congestion Control.
3. Explain why TCP connection needs two double handshakes instead of one double handshake.
4. Differentiate between Non-persistent HTTP and Persistent HTTP
5. Differentiate between circuit-switched network and packet-switched network

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

7. How can one tell there is a network congestion?

8. How can a protocol keep the unknown network bottleneck link busy?

9. Please finish the 16 “?” 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 RTT_1, \dots, RTT_6 . 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, $M = 10^6$), 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?

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 ?

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.