University of San Francisco

CS486: Network Security

Examination I

- This exam must be done **individually**.
- Your solution must be uploaded to Canvas by **October 1st at 10:00 pm**.
- All your solutions must be in one file exam1.{pdf, doc(x), txt}.
- Include your name and student ID at the top of the document.
- Total Points: 100
- No extension will be granted and submissions after October 1st 10:00 pm will receive no credit.

Student's Name: _____

Student's ID: _____

Professor: Dr. Vahab Pournaghshband

Question	Score
Problem 1 (10)	
Problem 2 (15)	
Problem 3 (15)	
Problem 4 (15)	
Problem 5 (15)	
Problem 6 (15)	
Problem 7 (15)	
Total	

Q.1) 2.5/2.5/2.5/2.5=10 points

True or False:

True False : Data may be sent in a packet with only ACK bit is set.

True False : Data may be sent in a packet with only FIN bit is set.

True False : Data may be sent in a packet with only SYN bit is set.

True False : Data may be sent in a packet with both SYN and ACK bits are set.

Q.2) 15 points

Given a transmission link with data rate 200 Mbps and a distance of 1500 miles. Assume 1000 packets of length of 1000 bytes being sent. What is the packet train transmission time?

Q.3) TCP.

7.5/7.5=15 points

a) You are to design a timeout for TCP acknowledgment system. What is the minimum value (lower-bound) for the timeout of a reliable transmission protocol? Why?

b) There are two ways to terminate a TCP connection, what are they?

Q.4) 3/4/4/4=15 points

In a client/server application, C (client) and S (server) are communicating over a TCP connection. C has already reliably received all bytes up through byte 258. Assume, the client then sends two segments back-to-back to the server. The first contains 20 and the second segment contains 50 bytes of data. Assume in the first segment, the source port number is 14501, the destination port number is 22. S sends an acknowledgment whenever it receives a segment from C.

a) What is the sequence number in the first segment?

b) In the second segment sent from the server to the client, what are the sequence number, source port number, and destination port number?

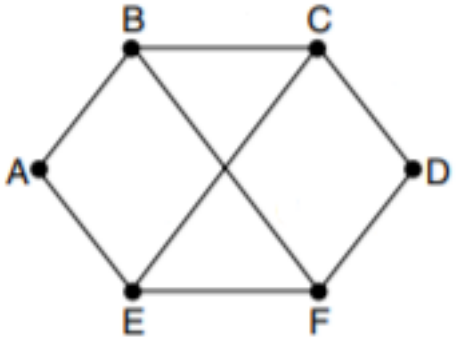
c) Assume both segments arrive reliably and in-order. What are the ACK number, source port number, and destination port number, in the last ACK segment the server sends to the client?

d) If the first segment is lost and the second segment arrives at the server, what is the ACK number in the ACK segment the server sends to the client?

Q.5) 15 points

Consider the network of Figure 1. Distance vector routing is used, and the following vectors have just come in to router C: from B: (5, 0, 8, 12, 6, 2); from D: (16, 12, 6, 0, 9, 10); and from E: (7, 6, 3, 9, 0, 4). The cost of the links from C to B, D, and E, are 6, 3, and 5, respectively. What is C's new routing table? Give both the outgoing line to use and the cost.

Figure 1: A network.



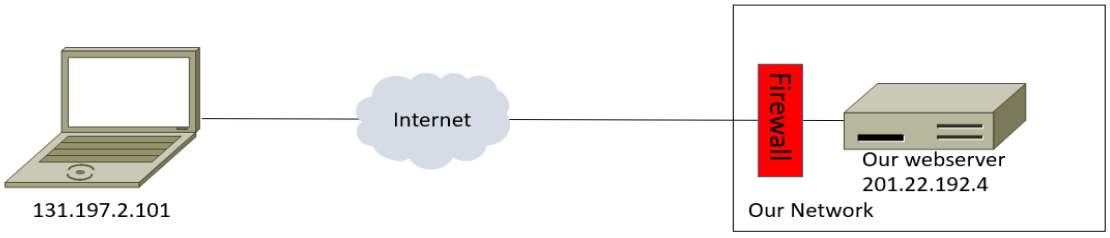
Destination	Outgoing Link	Cost
A		
B		
C		
D		
E		
F		

Q.6) Firewall Policies

4/5/6=15 points

Below is a firewall implementation.

Source (Address:Port)	Destination (Address:Port)	Protocol	Action
131.179.2.101:*	201.22.192.4:80	TCP	Drop
			Drop
*	*	*	Allow



a) What is the default policy?

b) In one sentence, describe what does the first policy in this firewall implementation entail? (HTTP: port 80)

c) Fill in the second policy rule so that no-one from the outside would be able to ssh to any machine inside our internal network. (SSH: Port 22)

Q.7) 15 points

Suppose TCP is used over a lossy link that loses one segment during the 4th, 8th, 12th, 16th RTT. Assume that there is no variance of RTT. Show how congestion window varies over time by filling in the following table. Assume that (1) initially the congestion window is 1 segment and threshold is 32 segments (2) fast retransmission and fast recovery algorithm are NOT used (3) receiver's window is always larger than the congestion window (4) when received ACK, sender will send data immediately (5) if the congestion window reaches the threshold during an RTT, it won't further increase during that RTT (6) while computing threshold round it up to the nearest integer (for example 2.5 is rounded 3) and (7) the numbers shown in the table for RTT_i are the values of the congestion window and threshold immediately after the ith RTT.

RTT_i	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
congwin																		
threshold																		