

ECE 671
Fall '10 – Exam I
Prof. Wolf

Name: _____

ID Number: _____

	Maximum	Achieved
Question 1	10	
Question 2	12	
Question 3	10	
Question 4	10	
Question 5	8	
Total	50	

This exam is closed book, closed notes. One single page handwritten notes is allowed. No electronic devices (other than calculators) are allowed. Be concise, but show your work. Write legibly.

Time: 75 minutes.

Question 1 (10 points):

Answer the following general questions regarding the Internet architecture and its protocols.

- a) What are the main differences between circuit switching and packet switching? (4 points)

- b) Multiplexing and demultiplexing is an important aspect of the Internet architecture and its protocols. Explain why demultiplexing is necessary and describe two examples of how demultiplexing is implemented in Internet protocols. (6 points)

Reason(s) for needing demultiplexing: _____

Example 1: _____

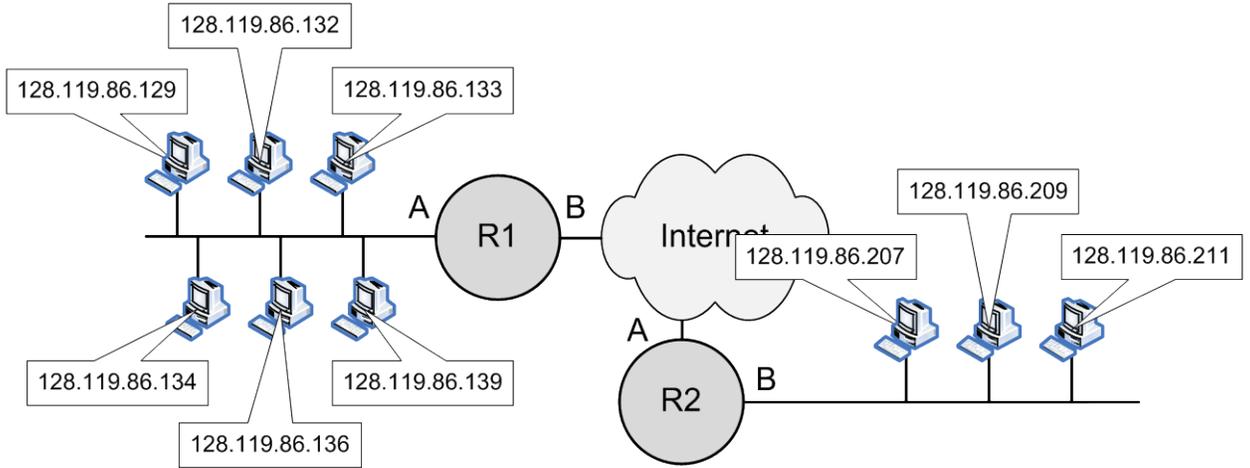
Example 2: _____

- c) Assume the window size is set to 1 segment and that 10% of all packets are dropped by the link and never reach the receiving end-system. Assume acknowledgements are always transmitted correctly. If the retransmission timer is set to 40 ms, what is the average throughput of this protocol variation? (4 points)

Question 3 (10 points):

Answer the following questions regarding IP address allocation and routing tables.

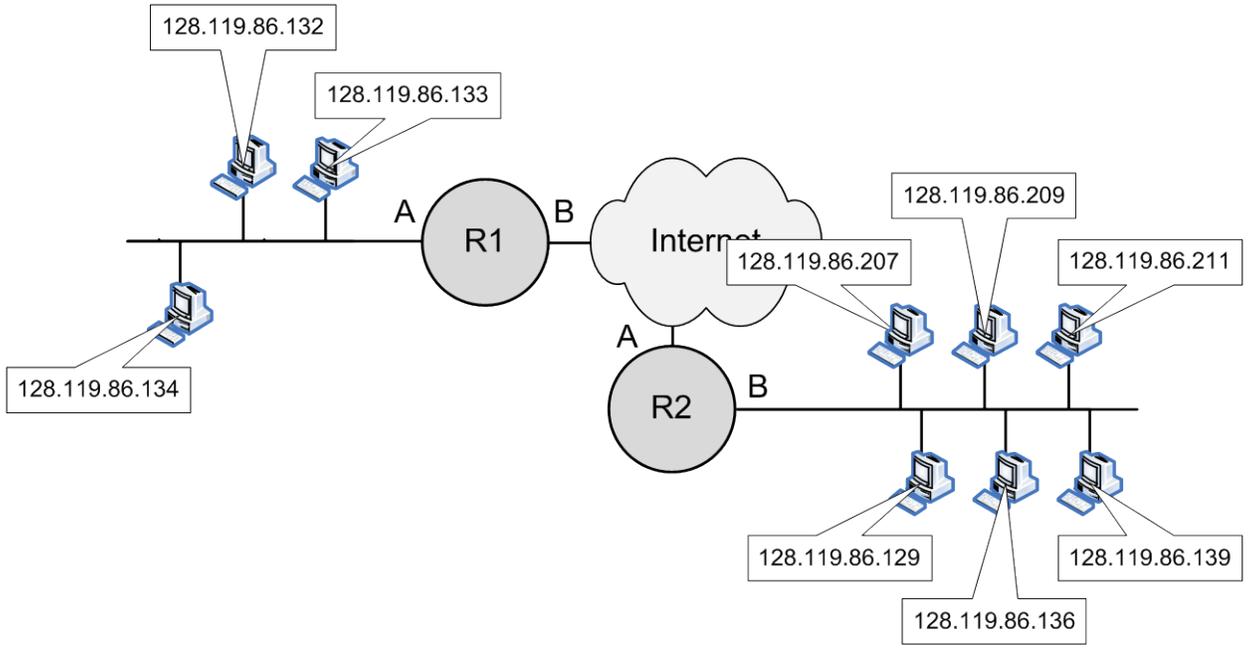
- a) Consider the network topology and IP configuration shown below. Determine the correct and complete entries for the forwarding information bases (i.e., routing tables) for routers R1 and R2. Use the minimum number of necessary entries. You may assume that routers make the appropriate announcements towards the Internet. (5 points)



R1	
Prefix	Port

R2	
Prefix	Port

- b) Consider the modified network topology and IP configuration shown below. Note that three of the end-systems have moved. Determine the correct and complete entries for the forwarding information bases (i.e., routing tables) for routers R1 and R2. Use the minimum number of necessary entries. You may assume that routers make the appropriate announcements towards the Internet. (5 points)

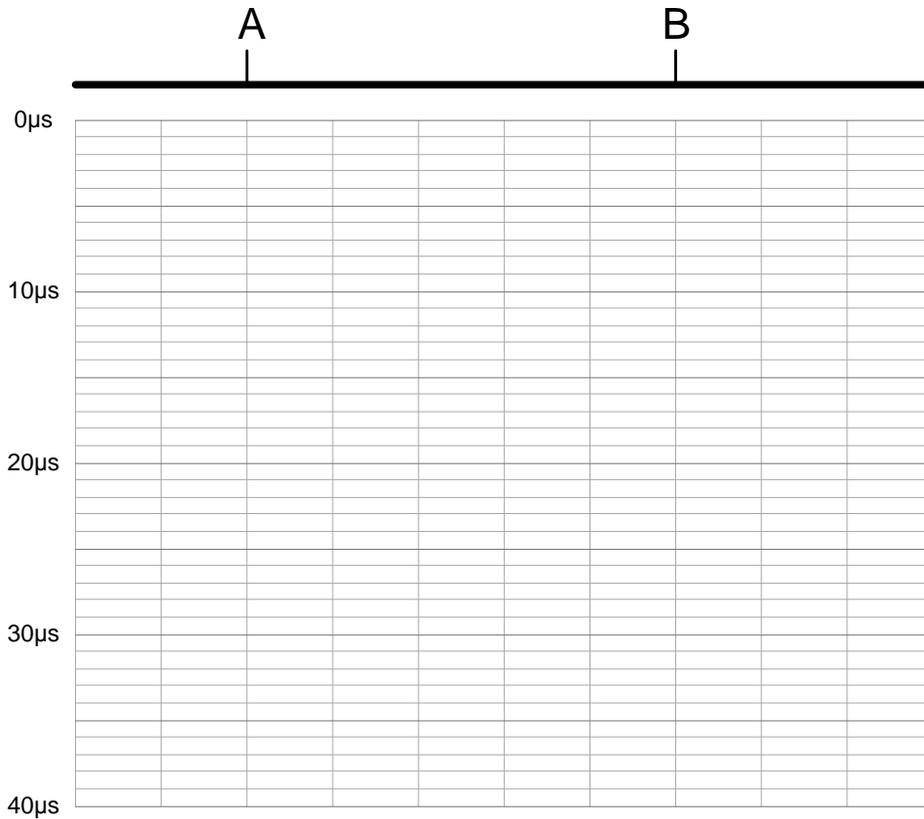


R1	
Prefix	Port

R2	
Prefix	Port

Question 4 (10 points):

Answer the following questions regarding a hypothetical CSMA/CD protocol. Consider two stations that are 5 meters apart on a shared 10 meter long wire. The propagation speed of signals in this wire is 1 meter / microsecond (=1000km/s). The data rate of the link is 10 Mbps. Both stations need to transmit 200 bits. Assume that station A starts transmitting at time $0\mu\text{s}$. Station B – after checking that the channel is clear – starts transmitting at time $3\mu\text{s}$. Assume that in case of a collision a station stops transmitting instantaneously (no jam signal). In case of a collision, station A chooses to back off for $12\mu\text{s}$ and B chooses to back off for $0\mu\text{s}$. Determine the times of the events listed below. You may solve the problem graphically or by calculation. (10 points)



Station A detects a collision at time $t=$ _____

Station B detects a collision at time $t=$ _____

Station A starts retransmission at time $t=$ _____

Station B starts retransmission at time $t=$ _____

Question 5 (8 points)

Consider a hypothetical stop-and-wait protocol for reliable data transfer. Assume the channel between the end-systems does not introduce bit errors, but may lose packets. That is, if a packet makes it to the other side, it is guaranteed to be error free. The channel also can introduce arbitrary delays (but maintains FIFO order). Determine which features are necessary for a *minimal* reliable protocol and explain why. (8 points)

Feature: checksum – Required? (yes/no) _____

Explain why or why not this feature is necessary: _____

Feature: ACK – Required? (yes/no) _____

Explain why or why not this feature is necessary: _____

Feature: NAK – Required? (yes/no) _____

Explain why or why not this feature is necessary: _____

Feature: timer at sender – Required? (yes/no) _____

Explain why or why not this feature is necessary: _____

Feature: sequence numbers – Required? (yes/no) _____

Explain why or why not this feature is necessary: _____
