Instructor: Dr. Clark   October 9, 2008

CS 3251
Fall 2008 - Midterm Exam

Problem	Possible	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

This test is closed book and closed notes. Answer the questions in the space provided. When answering questions, please state any and all assumptions you are making.

Part 1: Routing (20 points)

1. **(6 pts)** What is the "count to infinity" problem? What protocols (algorithms) might exhibit this problem? How is it overcome?

2. **(6 pts)** What is "domain based routing"?

3. **(8 pts)** Describe the operation of the "traceroute" command. What information does it provide? How does it determine this information?

Part 2: IP Operation (20 points)

Give pseudocode for the IP processing that occurs at a node (host or router) when an IP fragment is received. Your pseudocode should start with "An IP packet arrives from the datalink layer". You should describe the processing that is done and what happens to the packets. The processing should include "Hand IP packet to datalink layer" when forwarding or "Deliver payload to upper layer protocol" when that is appropriate.

Part 3: Network Programming (20 points)

1. **(10 pts)** What is meant by the term "iterative server"? What are the limitations with this approach and how can we improve upon it?

2. **(10 pts)** We say that TCP "does not preserve message boundaries" while UDP "does preserve message boundaries". What is meant by this and what are the implications for our applications.

Part 4: ARP (20 points)

Consider the network given on the board. The two network segments are broadcast Ethernet, shared bus networks.

Host *A* needs to send a IP data packet to host *E*. Provide the ARP message and IP data message flow that is necessary to support and deliver this data packet to host *E*. Assume that all ARP tables are currently empty. Assume that all routing tables are populated correctly. There are lots of messages that could be sent. You should provide the minimum required ARP and IP messages.

For each packet give: (1) the protocol - ARP or IP, (2) the purpose of the packet, (3) the source IP address, (4) the destination IP address, (5) the source MAC address and (6) the destination MAC address. Rather than using actual addresses, use the notation *MAC(A)* to indicate A's MAC address and *IP(A)* to indicate A's IP address.

1. **(10 pts)** For 10 points, answer the above questions assuming the intermediate device is a *switch*.

2. **(10 pts)** For 10 points, answer the above questions assuming the intermediate device is a *router*.

Part 5: Datalink Protocols (20 points)

1. **(6 pts)** What is the motivation behind the **minimum** frame size in the Ethernet specification? What is the minimum frame size for Ethernet?

2. **(6 pts)** What is the motivation behind the **maximum** frame size in the Ethernet specification? What is the maximum frame size for Ethernet?

3. **(8 pts)** The CSMA/CD MAC scheme is referred to as a "Random Access" scheme. What is the random part of this approach? Be specific about where and how randomness is used and why it is necessary.