Name _____

CS3516 B10
Computer Networks
Final Exam
December 14, 2010

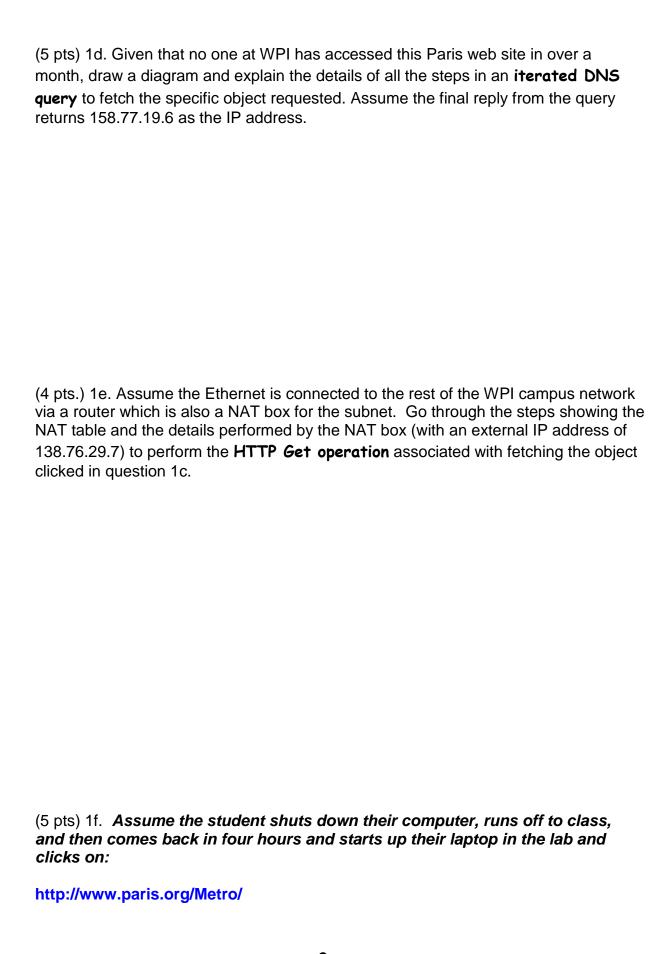| Question	Points	Score
0	1	
1	27	
2	8	
3	12	
4	7	
5	2	
6	6	
7	3	
8	6	
9	3	
10	9	
11	3	
12	2	
13	8	
14	2	
15	2	
Total	100	

Trivia Question (1 extra credit point)

0.a   From whom did the Grinch steal Christmas?
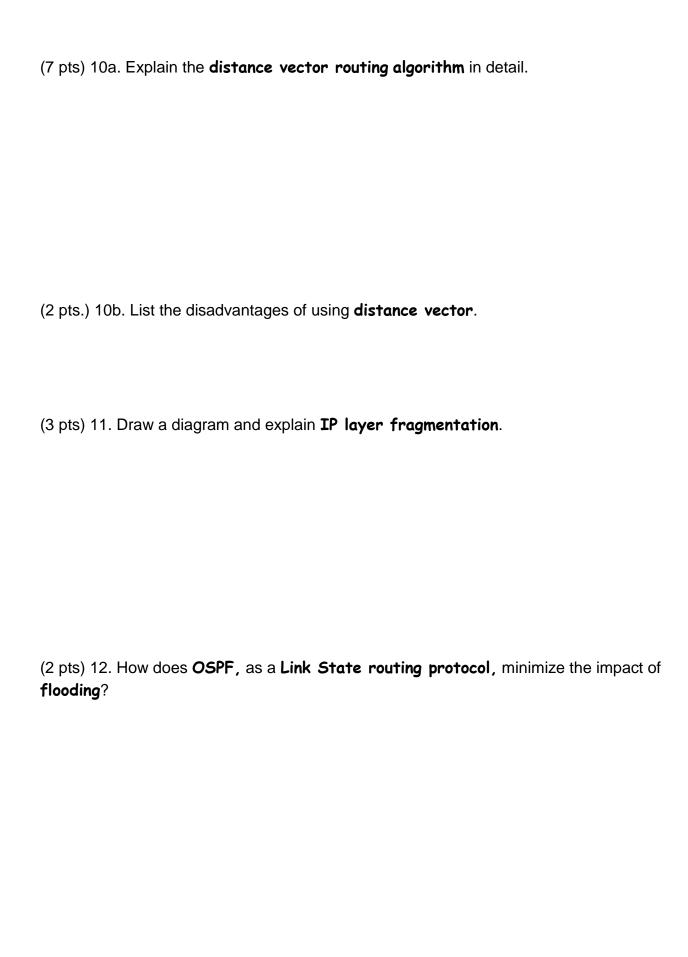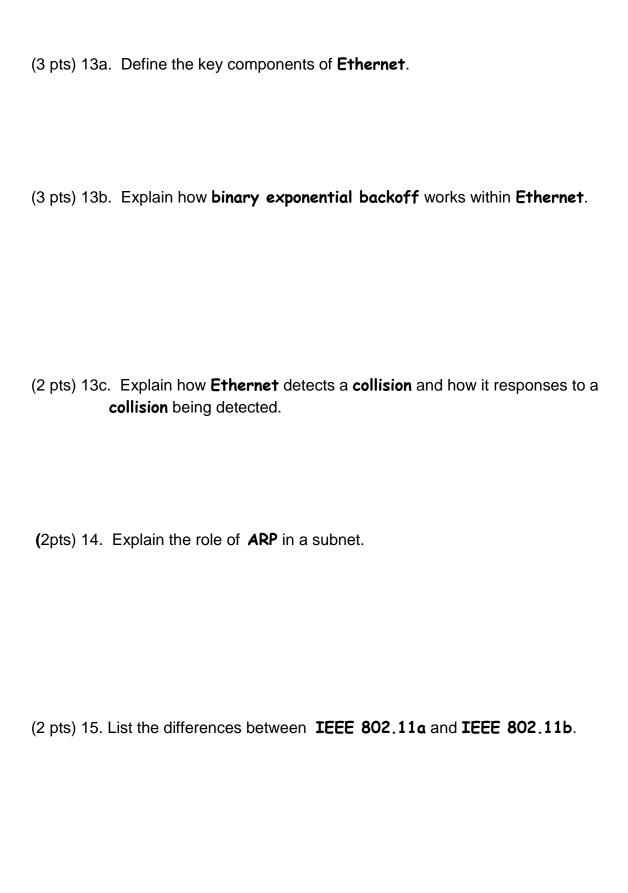

or

0.b   What is capital of Mongolia?

(5 pts) 1a. Name and explain the roles of the three classes of servers in the **DNS distributed hierarchy**.

(2 pts) 1b. What is a **subnet** and why is it useful?

Assume a WPI student sits down in a WPI computer lab and plugs their laptop into a wired Ethernet which is part of the WPI campus network.

(6 pts.) 1c. Draw a diagram and explain the four steps that occur when this newly arriving client machine requests a IP address from a WPI **DHCP server** (142.0.0.4) located on the wired subnet. The subnet is identified by the subnet mask 142.0.0./24 and the address assigned to the student's laptop is 142.0.0.9.

Once connected to the Internet, the student opens a Firefox browser and clicks on the following url:

http://www.paris.org/Hotels/Etoiles/hotel.etoiles.2E.html

(5 pts) 1d. Given that no one at WPI has accessed this Paris web site in over a month, draw a diagram and explain the details of all the steps in an **iterated DNS query** to fetch the specific object requested. Assume the final reply from the query returns 158.77.19.6 as the IP address.

(4 pts.) 1e. Assume the Ethernet is connected to the rest of the WPI campus network via a router which is also a NAT box for the subnet. Go through the steps showing the NAT table and the details performed by the NAT box (with an external IP address of 138.76.29.7) to perform the **HTTP Get operation** associated with fetching the object clicked in question 1c.

(5 pts) 1f. *Assume the student shuts down their computer, runs off to class, and then comes back in four hours and starts up their laptop in the lab and clicks on:*

http://www.paris.org/Metro/

Discuss whether the **DNS actions** performed in question 1d will be repeated or will be different for this second url request? If the DNS actions might be the same explain how this can happen. If the DNS actions might be different, discuss the steps the **DNS hierarchy** will take.

(2 pts) 2a. Explain the difference between a **virus** and a **worm**.

(3 pts) 2b. Draw a picture and explain the details of the **TCP three-way handshake**.

(1 pt) 2c. How does the **initial timeout interval (RIO)** get set for TCP?

(2 pts) 2d. Discuss how a **DDoS** can use the **three-way handshake** to attack the web site accessed in problem 1.

(12 pts) 3. Professor Missing Link has proposed a one-directional data link layer protocol (called ML) in which frames are acknowledged in pairs. The **sender** sends one frame and does not wait for an ACK. The **sender** sends a second frame and then waits for a single ACK for both frames. In the ML protocol, a timer is only started when the second frame is sent. However, if the **sender** times out, both frames are retransmitted.

Write pseudo-code in the Tanenbaum style for the **sender** and the **receiver** for the ML protocol.

(7 pts) 4. Explain the differences between **Go Back N** and **Selective Repeat**.

(2 pts) 5. Explain how the **UDP checksum** works.

(4 pts) 6a. What is a **cumulative ACK**? Draw a diagram and explain how it works in
       Selective Repeat.

(2 pts) 6b. What is the inequality relationship between **the maximum size of a sliding window** and the **size of the sequence number field** in a reliable data transmission protocol that guarantees a protocol will work when **cumulative ACKs** are used.

(3 pts) 7. Define **flow control**. Explain how the **advertised window** is used in the **TCP flow control** mechanism.

(6 pts) 8. Explain the difference between the **slow start phase** and the **congestion avoidance phase** of the **TCP Reno protocol.**

(3 pts) 9. List the disadvantages of **centralized routing**.

(7 pts) 10a. Explain the **distance vector routing algorithm** in detail.

(2 pts.) 10b. List the disadvantages of using **distance vector**.

(3 pts) 11. Draw a diagram and explain **IP layer fragmentation**.

(2 pts) 12. How does **OSPF,** as a **Link State routing protocol,** minimize the impact of **flooding**?

(3 pts) 13a. Define the key components of **Ethernet**.

(3 pts) 13b. Explain how **binary exponential backoff** works within **Ethernet**.

(2 pts) 13c. Explain how **Ethernet** detects a **collision** and how it responses to a **collision** being detected.

(2pts) 14. Explain the role of **ARP** in a subnet.

(2 pts) 15. List the differences between **IEEE 802.11a** and **IEEE 802.11b**.

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