

Student ID: _____

CS457: Computer Networking

Date: 5/8/2007

Name: _____

Instructions:

1. Be sure that you have 10 questions
2. Write your Student ID (email) at the top of every page
3. Be sure to complete the honor statement after you complete the exam
4. This is a closed book exam
5. The seats on both sides of you should be empty
6. State all assumptions and be sure your answers are legible
7. Show all work; the graders will give partial credit
8. Answer each question clearly and to the point; do not define or describe concepts unless asked to do so; assume that the graders are familiar with the concepts

<i>Question</i>	<i>Points</i>	<i>Score</i>
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
total	100	

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1. Answer the following True/False questions by circling either **T** or **F**.

1. 100% redundancy (ie. transmitting every bit in a packet twice) provides perfect bit error detection T F
2. Partitioning schemes (TDMA, FDMA) are better than random access schemes (Aloha, CSMA) when all nodes have packets to send T F
3. CDMA works with both wired and wireless networks T F
4. Wireless links provide a “broadcast” channel where every node hears every other node T F
5. Using “Ingress Filtering” on all routers would solve the IP spoofing problem T F
6. SSL uses both public key and symmetric key cryptography T F
7. FTP is a stateless protocol T F
8. UDP implements congestion control but not flow control or reliability T F
9. Some link layer implementations provide reliable delivery and flow control T F
10. All nodes on the Internet have a Physical Layer implementation T F

2. Random Access Protocols

- a. With the Slotted Aloha protocol, how long does a node wait once it gets a new frame to transmit? Can there be collisions and, if so, what does the node do when there is a collision?

- b. How is pure (unslotted) Aloha different from slotted Aloha? What effect does this have on efficiency (the long-run fraction of time with successful transmissions)?

- c. How is CSMA different from unslotted Aloha?

- d. How is CSMA/CD different from pure CSMA?

- e. How is CSMA/CA different from CSMA/CD?

3. Hubs, switches, and routers

- a. What is the difference between a hub and a switch? What effect does this have on the “collision domain”?

- b. What is the difference between a switch and a router? What effect does this have on the number of times they must forward a message.

- c. When MUST you use a switch instead of a hub?

- d. When MUST you use a router instead of a switch?

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4. RTS/CTS

With RTS/CTS on an 802.11 network:

- a. What prevents two nodes from sending RTS packets at the same time? Is it still possible for two RTS packets to collide? If so, how?
- b. What prevents a node from sending a RTS packet while another node is sending a data packet? Is it still possible for an RTS packet to collide with a data packet? If so, how?
- c. What prevents two nodes from sending data packets at the same time? Is it still possible for two data packets to collide? If so, how?

5. Mobile Routing

We want to route between a stationary node A and a mobile node B. Name the packet types and the entities involved when:

- a. a mobile node registers in a visited network?

- b. a correspondent uses indirect routing to send a message to a mobile node?

- c. a correspondent uses direct routing to send a message to a mobile node?

6. Cryptography Fundamentals

- a. With symmetric key cryptography, the encryption of a message using a key is reversible using the same key. In public key cryptography: (make an analogous statement)

- b. What authentication problem does a nonce (challenge) solve? Does this work with public key cryptography, symmetric key cryptography, or both? Why?

- c. Name two guarantees of digital signatures.

- d. All cryptographic techniques require us to identify a physical person or company based on the possession of a secret key. This is often achieved with the help of a Key Distribution Center (KDC) or Certificate Authority (CA). How does the CA or KDC first establish the identity?

7. Public Key Cryptography

- a. Should you use the public key or private key to digitally sign a message?
- b. Why would you use a message digest when creating a digital signature? What property must a cryptographic hash function have to produce a message digest that provides message integrity?
- c. How would you communicate with amazon.com if the certificate authority Verisign went down permanently?
- d. Draw a diagram of an encryption scheme that provides email privacy, authentication, and integrity without encrypting the entire message using a public key

8. The Application Layer

- a. Describe the difference between the client/server model and the peer-to-peer model of applications.
- b. Name one application that uses a hybrid of the client/server and peer-to-peer models.
- c. When one host sends a UDP packet to another host, what values will the receiving host use from the packet headers to direct the segment to the appropriate socket?
- d. When one host sends a TDP packet to another host, what values will the receiving host use from the packet headers to direct the segment to the appropriate socket?

9. Persistent Connections and Pipelining

Assume that you want to retrieve a web page that has 5 images. This question is about the number of messages to view the page, *including TCP connection establishment, data retrieval, and TCP connection close*

- a. How many messages must be sent when using non-persistent HTTP before this web page can be viewed? How many RTTs?

- b. How many messages must be sent when using persistent HTTP with no pipelining? How many RTTs?

- c. How many messages must be sent when using persistent HTTP with pipelining? How many RTTs?

- d. How does the bit-rate of a network affect the amount that persistent connections and pipelining can improve transfer speeds?

- e. How does the latency of a network affect the amount that persistent connections and pipelining can improve transfer speeds?

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10. The Routing Layer

- a. A circuit switched network requires a connection to be established before two hosts can send messages to each other, and each packet is addressed by the circuit number. A packet switched network: (make an analogous statement)

- b. In Link State routing, a router measures the cost of the link to all neighboring nodes and sends this information to all nodes in the network. In Distance Vector routing: (make an analogous statement)

- c. Why do we have different routing algorithms for inter-AS and intra-AS routing?

Honor Code

Signature _____