# CSE/EE 461 Practice Exam – Winter 2004

## *Part I: Multiple Choice (2 points each)*

1. What type of errors *cannot* be detected by one parity bit?
    a. 1 bit errors
    b. 2 bit errors
    c. 3 bit errors
    d. burst errors

2. What problem does byte stuffing solve?
    a. Prevents independent clocks in the sender and receiver from drifting
    b. Improves coding efficiency
    c. Prevents frame boundary sentinels from appearing in the data stream
    d. Allows data transmission errors to be detected

3. Which phrase applies *least* to the IP service model?
    a. Unordered delivery
    b. Best-effort delivery
    c. Reliable delivery
    d. At-most-once delivery

4. The purpose of buffering at routers is best described as to
    a. Match sending and receiving rates
    b. Absorb transient bursts in traffic
    c. Decouple incoming and outgoing rates
    d. Statistically multiplex traffic from multiple flows

5. The purpose of flow control is to
    a. Prevent the sender from unnecessarily retransmitting data
    b. Prevent the sender from underutilizing the available bandwidth
    c. Prevent the sender from overrunning the network
    d. Prevent the sender from overrunning the receiver

6. Good round-trip time estimation is most important to
    a. Avoid unnecessary retransmissions
    b. Maximize the achieved throughput
    c. Speed connection establishment
    d. Avoid unnecessary loss

7. Quality of Service guarantees *cannot* be made for a flow or user without
    a. Mechanisms such as ECN that signal congestion without loss
    b. Traffic engineering mechanisms that redistribute load
    c. Admission control mechanisms that limit load
    d. Mechanisms such as WFQ that improve fairness

8. The Address Resolution Protocol (ARP) is used primarily to translate from
    a. IP addresses to MAC addresses
    b. MAC addresses to IP addresses
    c. Host names to IP addresses
    d. IP addresses to host names

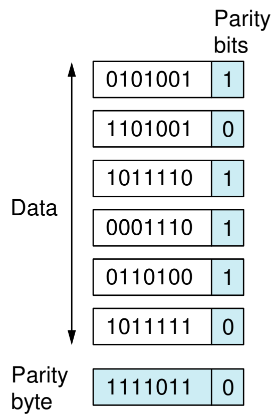
9. Which of the following descriptions applies *least* to BGP routing?
    a. Routing between autonomous systems
    b. Default-free routing
    c. Policy-based routing
    d. Metric-based routing

10. With public key cryptography, to ensure the secrecy of a message sent from A to B, A would encrypt the message with
    a. A's private key
    b. A's public key
    c. B's private key
    d. B's public key

## Part II: Short Answer (4 points each)

1. The Non-Return-to-Zero (NRZ) scheme encodes 0 as a low signal and 1 as a high signal. What are two problems with NRZ coding?

2. [Peterson 2.12] Give an example of a 4-bit error that would not be detected by 2-dimensional parity. What is the general set of circumstances under which 4-bit errors will be undetected?




3. [Peterson 1.8] Consider a LAN with a maximum distance of 50 km. At what bandwidth would propagation delay (at a speed of $2 \times 10^8$ m/s) equal transmit delay for 100-byte packets?

4. What 5 values uniquely identify a transport-layer connection?

5. [Peterson 4.10] Why do you think IPv4 has fragment reassembly done at the endpoint, rather than at the next router?

6. Explain why medium access control for wireless networks cannot rely on collision detection.
7. Many students' Fishnet packet forwarding implementations use flooding as a fallback when there is no routing table entry for a destination address. Why is this *not* a reasonable thing to do on the Internet? What might Internet routers do instead?
8. Describe what information a router needs to determine if a given IP datagram can be directly delivered on one of its interfaces.
9. The Random Early Detection (RED) gateway mechanism maintains two queue thresholds: MIN and MAX. Explain how a RED gateway processes an arriving packet in terms of these two thresholds.
10. Suppose that two hosts are communicating via a virtual circuit and a router along the circuit fails. What happens if the routers are using hard state? What if they are using soft state?

Additional short answer questions: discussion questions from class, 1.13, 2.46, 3.13, 3.19, 4.13, 5.8, 6.34, 6.38, 8.10, 8.13, 8.28

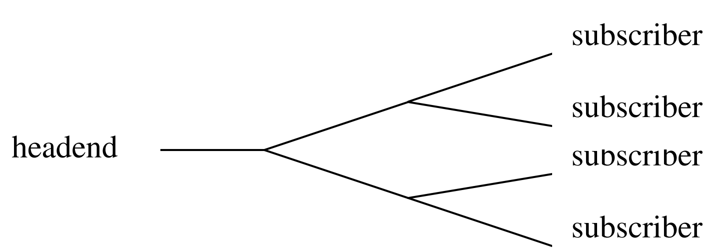
## *Part III: Problems (15 points each)*

**1.** Cable modems send data over the cable plant, which is modeled as a tree. Subscribers sit at the leaves of the tree and the root of the tree is the headend, which connects the cable plant the rest of the Internet. All communications between subscribers are sent via the headend. Transmissions from the headend are broadcast and reach all subscribers. Transmissions from each subscriber are not broadcast to other subscribers, but travel only to the headend along a path that is shared by different subscribers according to the structure of the tree. There are separate cables running in each direction, so that any station can receive and send at the same time. However, the headend can only receive from one subscriber at a time.

Your job is to design a feasible MAC protocol. It must use statistical multiplexing and make some attempt to improve efficiency by avoiding collisions. There are many possible solutions to this question, but the more efficient the MAC protocol, the better.

a) How does your protocol send a message from the headend to a subscriber?

b) How does your protocol send a message from a subscriber to the headend?



**2.** For the two TCP traces shown below:

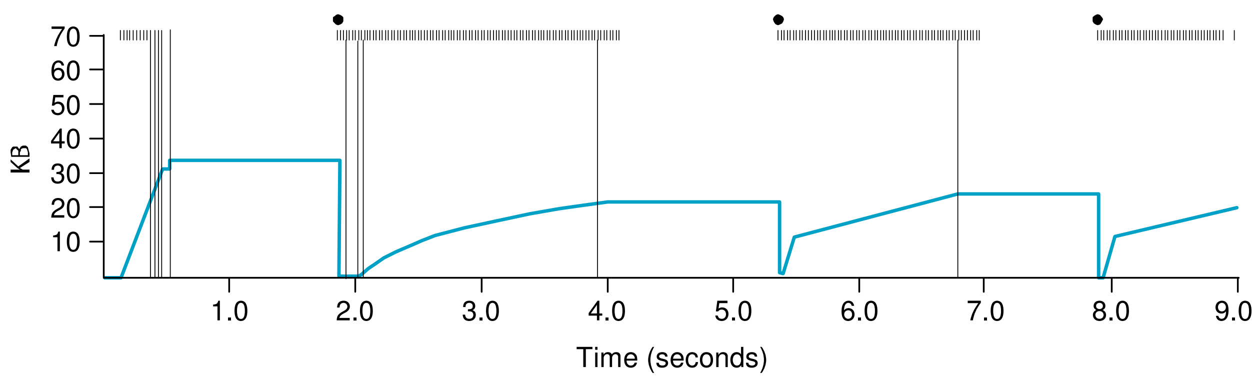
a. Identify the feature that the version of TCP illustrated in the second trace has that the version of TCP illustrated in the second trace does not have. Explain why this feature results in different behavior.

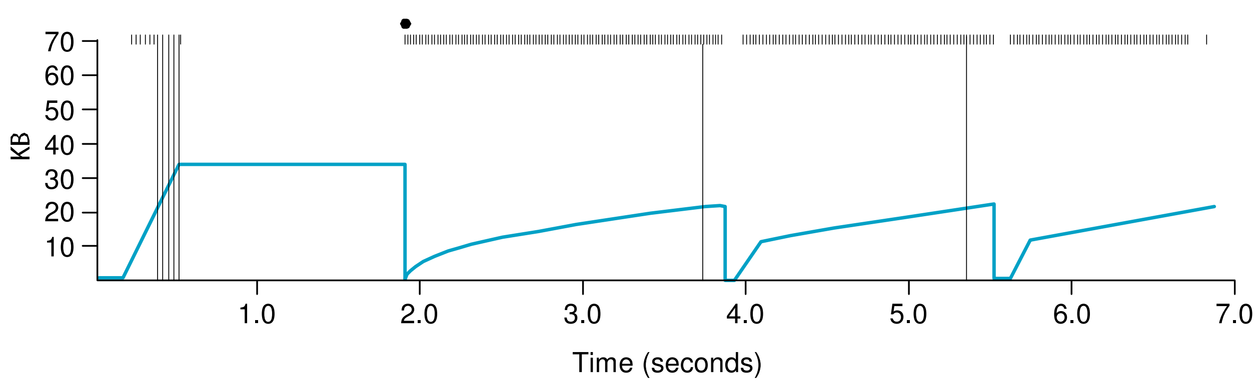
b. Explain why both traces have heavy losses at approximately 0.5 seconds.

c. For the first trace, explain why the congestion window is flat between 0.5s and 2.0s.

d. In the second trace, explain what the TCP congestion control algorithm is doing between 2.0s and 3.5s.

e. In the second trace, explain what triggers the change in slope of the congestion window at just after 4.0s.



**3.** [Peterson 9.9] One feature of the existing DNS .com hierarchy is that it is extremely "wide".

a. Propose a more hierarchical reorganization of the .com hierarchy. What objections might you foresee to your proposal's adoption?
b. What might be some of the consequences of having most DNS domain names contain four or more levels, versus the two of many existing names?
c. [Peterson 9.10] Suppose, in the other direction, we abandon any pretense at all of DNS hierarchy, and simply move all the .com entries to the root name server: www.cisco.com would become www.cisco, or perhaps just cisco. How would this effect root name server traffic?

Additional problems: Peterson 1.16, 2.44, 2.47, 3.16, 3.18, 4.22, 4.30, 4.47, 5.30, 5.30, 6.9, 6.11, 6.16, 6.32, 6.48