

Given Name Initial: _____ Family Name: _____

CEN 5501C Computer Networks

Examination 3

26 April 2007

Instructions

1. **Read all instructions. Failure to follow instructions will result in loss of points.**
2. This is a closed-book examination.
3. You are permitted one 8.5 by 11 inch sheet of notes, both sides, which you have prepared.
4. You are permitted 90 minutes to complete this examination.
5. **Do not start** the exam until the proctor has told you to start.
6. **Answer any two (2) questions, and no more.** All questions are of equal value.
7. **Leave sufficient room in the upper left-hand corner for the staple** and staple your answer sheets in the room you have left.
8. Start the answer to each question on a new page (i.e., **do not put the answer to more than one question on the same page**).
9. Use **no more than one page** of paper (both sides is OK, or two pages front side only) to hold the answer to each question, and please write legibly.
10. Put the **question number in the top center** of each answer page and label each part of the question answer.
11. Show your work, and **explain your answers**.
12. Include your **family name and page number** in the upper right hand corner of each answer page.
13. **Assemble your answers in numerical order** of the questions when you submit them.
14. Print your family name and first initial in the upper right hand corner of this page, and complete the honor statement affirmation below.

Read and sign the following statement. This page **MUST** be attached to your examination answers and **MUST** be completed to obtain credit for this examination.

On my honor, I have neither given nor received unauthorized aid on this examination.

Signed: _____

Printed Name: _____

UFID: _____

1. (15) Recall the main routing protocols, RIP, OSPF, and IS-IS.
 - a. (5) Why is a hop metric almost always used in RIP? What does an address report of 0.0.0.0 mean in RIP, and why is it used? What is one “improvement” that RIP 2 makes over RIP, and how is it an improvement?
 - b. (6) Compare and contrast the routing hierarchies in OSPF and IS-IS. What restrictions does IS-IS place on propagation of routing information, and why? How does OSPF handle this issue, and what are the consequences?
 - c. (4) How do IS-IS and OSPF handle routers attached to LANs? Why is this needed? How do their solutions differ, and what are the consequences?

2. (15) Consider the potential problems of sender injecting too much data into a network.
 - a. (3) In what distinct ways could a sender be sending “too much data” to a destination? Describe each.
 - b. (8) What are the ways in which a source can determine that it is sending data too fast to a destination? For each approach, give an example of a protocol that does this.
 - c. (4) How does TCP (Reno) obtain feedback on the rate at which it is sending data?

3. (15) Pathological conditions sometimes arise.
 - a. (6) What situation does Nagel’s algorithm attempt to alleviate? Describe the condition and why it is bad, then give Nagel’s algorithm and explain why it should help.
 - b. (6) What is “silly window syndrome” and why is it bad? How does TCP eliminate this condition? Explain why this approach works.
 - c. (3) Give two reasons why UDP does not suffer from these problems.

4. (15) A client requests a web page of size 4 KB with 2 objects on it, each object of size 10 KB. Assume that the path transmission speed is $R=80$ Kbps, RTT is 600 ms MSS is 1KB, and that there are no losses or retransmissions. Include slow start in your estimation, and assume the full link capacity is available to this client. Estimate the response time for the client request for each protocol below.
 - a. (7) Non-persistent HTTP.
 - b. (8) Persistent HTTP.

5. (15) Consider two TCP connections (A and B) using the same link.
 - a. (10) Observe the Thruput graph on the next page and explain what is happening. Include what occurs with the cwnd and ssthresh for A and for B.
 - b. (2) Which version of TCP is being used, and how can you tell?
 - c. (3) Graph the throughputs on the chart given on the next page with the X-axis A’s throughput and the Y axis B’s throughput for times 1 through 10, and explain what this shows. Include an estimate of path capacity and buffering.

For this question, use the graphs provided on the next sheet.

