CEN 5501C Computer Networks
Examination 2
29 March 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 50 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.
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) Consider network services and implementations.

    a. (5) What are the two main dimensions of network service types? Briefly describe and compare choices for each dimension. How do these choices interact?

    b. (6) What are three main choices for implementation? Briefly describe and compare these choices.

    c. (4) What type of service would best suit each of the following: file transfer, telemetry, telephone service, video on demand.

2. (15) Recall X.25.

    a. (2) What type of service is offered by X.25?

    b. (5) Suppose the source is DTE_A and the destination is DTE_B. DTE_A - DCE_A link supports a maximum packet size of 1000, but the DTE_B – DCE_B link only supports a maximum packet size of 300. Describe what happens in terms of control information and activities at DCE_A and DCE_B, as well as on each link. For this part and the next, include packet sizes, flags, and acknowledgements.

    c. (5) Consider the same situation as (b), except that the source is DTE_B and the destination is DTE_A. Again describe what happens in terms of control information and activities at DCE_A and DCE_B, as well as on each link.

    d. (3) How does X.25 significantly differ from ATM in terms of what it standardizes?

3. (15) Recall ATM.

    a. (4) Why does ATM have an "adaptation layer?" What does the AAL do?

    b. (5) What are the ATM service categories and how do they relate to the AALs?

    c. (6) How is routing accomplished in ATM?

4. (15) Consider datagram networks.

    a. (2) What is fragmentation and why does it occur?

    b. (6) Compare the strategies of MTU discovery based on what an intermediate
        router does when it receives a datagram that is too large to send over the next link:
            i. Silently drop the datagram
            ii. Truncate the datagram and mark as truncated
            iii. Drop the datagram and return "too large" error to sender
            iv. Drop the datagram and return "size X would work" error to sender
            v. Break the datagram into equal sized pieces
            vi. Break the datagram into maximum sized pieces plus remainder pieces.

    c. (7) Compare datagram networks and circuit-switched networks quantitatively.
        Consider a transfer of D bytes of data over N hops, each with data rate R and
        propagation delay t. Assuming the circuit switched network takes time S to set up
        the circuit, and the datagram payload size is P with header size H, for what
        quantity of data D is the circuit switched network faster than the datagram
        network? Assume no errors or ACKS, and estimate where needed.

5. (15) Consider addressing.

    a. (5) Describe initial IPv4 address classes and compare to CIDR addressing. What
        does CIDR buy us?

    b. (4) What are "special" IP addresses, how are they used, and what are the
        restrictions on them? How do these special addresses impact address space
        utilization?

    c. (6) What is "one-hop suboptimality" in IP and IPX? How does IPX solve this
        problem? Why don't CLNP or DECnet normally have this problem? When do
        they have it?

6. (15) Consider routing.

    a. (6) What is the "count to infinity" problem in Distance Vector routing, and what
        are three distinct ways to counter this problem? Compare these methods.

    b. (6) A fundamental problem in Link State routing is distribution of the LSPs, when
        routing information is not yet known. Compare timestamps and sequence
        numbers and how they are used in solving this problem.

    c. (3) Why is "aging" needed in addition to sequence numbers? How was aging
        changed in the new, improved LSP distribution scheme for ARPANET, and why?