

**CS 757 –Computer Networks
Fall 2003**

Second Exam

Instructions (read carefully):

- This is a closed book and closed notes in-class exam.
- If any problem is unclear, or you believe some assumptions need to be made, state your assumptions at the beginning of your solution.
- Explain all steps of your solutions.
- Make sure your answers are legible. If we cannot read an answer, we will not grade it.
- The exam must be pledged.

	Max	
1	20	
2	10	
3	10	
4	10	
5	10	
Total	60	

- **STAPLE YOUR SOLUTIONS TO THIS SHEET BEFORE TURNING IN !**

Name: _____

Email: _____

Pledge:

Problem 1. (20 Points) Congestion Control

How do the following congestion control algorithms achieve or fail to achieve the design objectives of fairness and efficiency (Efficiency = resources are completely utilized if there is enough demand). Use an example with 2 connections to support your answer:

- a. Additive Increase – Additive Decrease
- b. Additive Increase – Multiplicative Decrease
- c. Multiplicative Increase – Additive Increase
- d. Multiplicative Increase – Multiplicative Increase

Problem 2. (10 points) Congestion Control

Discuss similarities and differences of the *Forward Explicit Congestion Notification* (FECN) algorithms for the ATM ABR service and the “*slow start/congestion avoidance*” algorithm in TCP.

Problem 3. (10 Points) Quality of Service

- a. (5 points) Describe the differences between the following techniques for traffic conditioning at the entrance of a network with Quality of Service: (1) policing, (2) shaping, and (3) marking.
- b. (5 points) List and briefly characterize the services of the *IntServ* and *DiffServ* service models. Which services are provided and what kind of QoS guarantees provided by each service.

Problem 4. (10 points) Deterministic Service

The Tenet architecture uses the following parameters for the traffic description of a real-time channel:

- $x_{min,j}$ minimum distance between packets from channel j .
- $x_{avg,j}$ minimum average packet interarrival time of packet from channel j
averaged over an interval of length I
- I averaging interval
- s_j maximum packet size

Given a real time channel j with traffic arrival pattern described with the following parameters: $x_{min,j} = 0.5$ msec, $x_{avg} = 1$ msec, $I = 10$ msec and $s_j = 100$ bits.

- a. What is the most amount of traffic that can be transmitted in any time interval of length 2 msec, 5 msec, and 11 msec.
- b. Measured over a long time period, what is the highest average rate of the channel?

Problem 5. (10 points) ATM Service Model

Explain the following services of the ATM service architecture. Provide the QoS guarantees of each of the services.

- a. CBR
- b. VBR
- c. rt-VBR
- d. UBR
- e. ABR
- f. GFR

