Electrical, Computer, and Systems Engineering
ECSE-4670: CCN
Fall 1999

Problem Set 4- Due Monday, November 1st 1999

Your Name	

Notes:

1. Be brief and precise, but complete in your answers
2. A part of the homework credit is given to reading. Reading assignments will be quizzed in both informal and formal quizzes
3. Please write your answers on separate sheets and staple it along with the questions to facilitate easy grading.

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1	2	3	4	5	Total
20	5	10	10	5	50

TA Signature :___________________________________

1. ***Reading assignment:***
   Read the textbook (Tanenbaum) Chapter 4 (MAC layer). Summarize key concepts and issues NOT covered in class.
2. [Probability] The disadvantage of a broadcast subnet is the capacity wasted due to multiple hosts attempting to access the channel at the same time. As a simplistic example, suppose that time is divided into discrete slots, with each of the n hosts attempting to use the channel with probability p during the slot. What fraction of slots are wasted due to collisions ?
3. [Distributions] Show that the sum of probabilities in the each of the following distribution is 1: binomial distribution, poisson distribution. **Derive** the mean (expectation) of a poisson distribution. **Derive** the following statement: the inter-arrival times of a poisson process are exponentially distributed. **State** one positive and negative aspect about the "memoryless" property of an exponential distribution.
4. [Queuing Theory] Starting from the Markov chain model (states and steady state probabilities p_n) of the M/M/1, **derive** an expression for E(T), the average waiting time as a function of average input rate (λ) and average service rate (μ). Plot pn as a function of n (n ranges from 1 to 20) for ρ = 0.5 and 0.8 (two graphs). Plot E(n) vs ρ for ρ = 0.5 and 0.8. Comment on what you observe from the graph.
5. [MAC layer] Explain why CSMA/CD is better than CSMA; why CSMA is better than Aloha or slotted Aloha; why slotted Aloha is better than Aloha, as a shared medium access protocol.