

HOMEWORK ASSIGNMENT 5
Due Date: Tuesday, May 1, 2001 (in class)

1. *Dynamic multiaccess.* Explain why static multiaccess schemes (FDMA, TDMA, CDMA) are inefficient for data applications.
2. *Throughput versus offered load in ALOHA.* Explain why there are two values of λ for each value of η in the figure given on page 131 of the notes.
3. *Delay versus offered load in unslotted ALOHA.* Consider an unslotted ALOHA system with the following parameters: $\tau = 0.2$, $a = 0.1$, $\delta = 5$. Find the delay D as a function of the offered load λ , and plot D versus λ , for λ ranging from 0 to 4.
4. *CSMA Protocols.* Explain why CDMA protocols are more effective when the propagation delay is small.
5. *Multiaccess techniques for different traffic types.* Justify the table given on page 139 (i.e., Table 8.2 of the textbook).
6. *Scheduling.* Consider a discrete-time queueing system with two symmetric users, where the arrival rate corresponding to each user is 0.45 units/slot

The service process is equally likely to be in two states, with service rates described by the following table:

	User 1	User 2		
State 1:	0.95	0.05	w.p.	0.5
State 2:	0.05	0.95	w.p.	0.5

Show that a state dependent algorithm to schedule the users for service can stabilize the queues, whereas a state-independent algorithm cannot.

7. *Scheduling algorithms.* Explain the logic behind the construction of the EXP rule for scheduling, and give your intuition for why it performs better than the M-LWDF and PROP-FAIR rules.
8. *Modification of TCP for wireless cellular networks.* What are the problems with the Split Connection approach to modifying TCP for wireless cellular networks. How does the “Snoop” approach solve some of these problems. Which of these schemes gives a better performance?
9. *Count-to-infinity problem in DVR.* We saw in class that the count-to-infinity problem involving two nodes can be solved by split-horizon routing, i.e., when A exchanges its DV with B, it sets “blanks” in the DV corresponding to destinations that are reached through B. Give an example to show that split-horizon routing may not be able to solve the three-way counting-to-infinity problem, i.e., when three nodes are involved in the counting-to-infinity.
10. *Routing protocol for MANETs.* In class, we discussed the DSR protocol for routing in MANETs. Describe another protocol for routing in MANETs (“your own” or one that you find from a literature search).