CS 6380 Computer Networks **Fall Quarter, 1997**

Homework 2

Assigned: October 9 *Due: October 16*

Reminder: Late homeworks will NOT be accepted!

1. Tanenbaum, Chapter 3, Problem 3
2. Tanenbaum, Chapter 3, Problem 11. Repeat the problem with a bit error rate of 10^{-4}.
3. The utilization of Go-back-N and Selective-Reject under no errors is:

$$U = \begin{cases} 1 & S \geq 2a+1 \\ \frac{S}{1+2a} & S < 2a+1 \end{cases}$$

   where S is the maximum sending window size.

   Plot the utilization as a function of $a = T_p/T_t$, as a varies from 0.1 to 1000 on a log scale. Include window sizes for N of 1 frame, 7 frames and 64 frames. Comment on the implication for the design of a data link ARQ protocol.

4. Suppose we modify the Stop-and-Wait protocol to include a negative acknowledgement (NACK). If the receiver detects an error in the I-frame, it will send a NACK to the source.
   (a) Give an example of a scenario (draw a picture and explain in words) that shows an advantage of having the ability to NACK, over a system that only has ACKs.
   (b) Do the NACKs need sequence numbers? If yes, give a scenario demonstrating the need; if no, give a brief argument why not.
5. Read the paper "Performance of Checksums and CRCs over Real Data," by C. Partridge, J. Hughes and J. Stone, Sigcomm'95, handed out in class. (Unfortunately, an on-line copy of this paper does not seem to be available.) Write a concise evaluation of the paper. The first paragraph should summarize the paper, in your own words. The second paragraph should reflect on how this work is different than what you have seen in class.