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16.36 Communication Systems Engineering

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16.36: Comm. Sys. Engineering
Problem Set No. 9

Problem 1: Stop and Wait ARQ (from HW8)

A) A geosynchronous satellite has a half-duplex channel with a transmission rate of 10 kbps and a propagation delay of 0.25 sec each way. With a data packet size of 1000 bits and a loss probability p of 10^{-3} , what is the expected transmission time of a packet in this system? (Assume the acknowledgement packets are very small and $D_{TA} = 0$.) What is the efficiency of the system?

B) Suppose the minimum acceptable efficiency is 50%. Assuming all other parameters are the same as part (a), what is the longest channel propagation delay for which we can still use stop-and-wait?

Problem 2: ARQ design for a satellite link

You have to design a satellite transmission link where two nodes communicate through a satellite. The distance between the two nodes through the satellite is 36,000 miles. The packets and acknowledgments are 1000 bits long. The transmission rate is 10 Mbps. The link is full duplex and you propose to use Go Back N retransmission. What window size would you recommend using?

Problem 3: In class I said that for go back N, packets must be numbered modulo $N+1$. Can you give an example in which go back N fails if the packets are numbered modulo N ? (Hint: use $N = 3$).

Problem 4:

(a) Apply the bit stuffing rule we learned in class to the following string:

01101111100111111010111111111010

(b) Suppose the following string is received:

011111101111101100111110011111011111011000111111010111110

Remove the stuffed bits and show the actual flags.

Problem 5: In class I gave two examples of Go Back 4 ARQ with errors in both the forward and reverse directions (slides 8 and 9 in your notes). Redraw the figures with the same frame lengths and errors, but now focusing on data transmissions from B to A. That is, show the SN and the window for node B, and show the RN's for node A.