ECE 2305 D-term 2014
Homework 2 Solution

1. Problem 2.4

No. There is no way to be assured that the last message gets through, except by acknowledging it. Thus, either the acknowledgment process continues forever, or one army has to send the last message and then act with uncertainty.

2. Problem 2.7

Data plus transport header plus internet header equals 1820 bits. This data is delivered in a sequence of packets, each of which contains 24 bits of network header and up to 776 bits of higher-layer headers and/or data. Three network packets are needed. Total bits delivered = 1820 + 3 × 24 = 1892 bits.

3. Before attenuation, $P_{\max} = 10\log(0.25) = -6.02 dBW$.

After 6dB attenuation, the attenuated signal is received at -12.02dBW. This corresponds to an attenuated signal of 0.2506sin(t), which means that the peak-to-peak voltage is 0.5012 volts (approximately half the peak-to-peak voltage of the original signal). In general, a 6dB attenuation results in an approximate power reduction by a factor of four and an approximate amplitude reduction by a factor of two.

4. Since the noise floor is -100dBm and we need 11dB SNR for reliable communication, we need the received power to be at least -89dBm. The attenuation of the fiber optic cable is only 4.8dB. Hence, the transmit power must be at least -84.2dBm. This is equivalent to 3.8E-9 mW or 3.8E-12W.

5. Problem 4.3

The allowable power loss is 10 × log 100 = 20 dB

a. From Figure 4.3, the attenuation is about 13 dB per km.
Length = (20 dB)/(13 dB per km) = 1.5 km

b. Length = (20 dB)/(20 dB per km) = 1 km

c. Length = (20 dB)/(2.5 dB per km) = 8 km

d. Length = (20 dB)/(10 dB per km) = 2 km

e. Length = (20 dB)/(0.2 dB per km) = 100 km