

NETWORKS — PROBLEM SET 1
DUE FRIDAY, 2008-FEB-08, AT 2:00 PM

Note that these questions are from the text. I present those that I can here so that you may get started before the text is available.

1. **Chapter 1, question 1:** Imagine that you have trained your St. Bernard, Bernie, to carry a box of three 8 mm tapes instead of a flash of brandy. (When your disk fills up, you consider that an emergency.) These tapes each contain 7 GB. The dog can travel to your side, wherever you may be, at $18 \frac{km}{hour}$. For what range of distances does bernie have a higher data rate than a transmission line whose data rate (excluding overhead) is $150 \frac{Mb}{sec}$.
2. **Chapter 2, question 2:** A noiseless $4 - kHz$ channel is sampled every $1 msec$. What is the maximum data rate?
3. **Chapter 2, question 3:** Television channels are $6 MHz$ wide. How many $\frac{bits}{sec}$ can be sent if four-level digital signals are used? Assume a noiseless channel.
4. **Chapter 2, question 4:** If a binary signal is sent over a $3 - kHz$ channel whose signal-to-noise ratio is $20 dB$, what is the maximum achievable data rate?
5. **Chapter 2, question 9:** Is the Nyquist theorem true for optical fiber or only for copper wire? Why?
6. **Chapter 2, question 22:** *[This question relies on a figure in the book, so you must obtain a copy of the text to answer it.]*
7. **Chapter 2, question 28:** Ten signals, each requiring $4000 Hz$, are multiplexed on to a single channel using FDM. How much minimum bandwidth is required for the multiplexed channel? Assume that the guard bands are $400 Hz$ wide. *[Note: A guard band is an excess portion of the frequency range used to buffer one FDM channel from another, thus reducing frequency. See Section 2.5.4 in the book for a more complete explanation and example.]*