

Due Tue., Sept. 23, 2014 in class by the end of class.

Only hand in the following problems: 1, 4, 5, 8, 10, 12

1. Assuming a telegraph operator can achieve a maximum of 40 words-per-minute and assuming on average 6 characters per word in the English language, approximate, R , for this communication system.
2. Network design is often partitioned into a multi-layer hierarchy with each layer looking after some particular subset of network functions. What is the name of the layer that (among other things) would look after the management of boundaries between words in a telegraph network? Give the full name (not just the number).
3. How many cables does a wired telephone network consisting of 100 users need if it attempts to facilitate communication without a central office?
4. You need to operate at error-free rates of 24-kbps through a channel with a 1.6 kHz bandwidth. What is the minimum SNR in dB that you require?
5. What kind of switching do wire-line telephone and telegraph provide? What kind of connection service do they provide?
6. What general kind of switching does the Internet provide? And what flavours of this switching can it make available?
7. Is classic Ethernet better classified as a broadcast or switching network?
8. Name two types of round robin networks. Sketch a round-robin network arrangement that might have a problem with signal ringing.
9. I want to send 2-level (just 1 and 0) digital information in the form of square pulses through a channel with a (channel) bandwidth of 12 MHz. The communication designer has determined that only the first lobe of the signal's spectral content needs to get through the channel. What data rate can I achieve?
10. You are using a $R = 2.3$ -Mbps link and notice a 15-MB file downloaded in 1.3 seconds. What is the throughput of your network?
11. Packets with an average length of 1 KBytes arrive at a link to be transmitted. The arrival rate of packets corresponds to 8-Mbps. The link rate is 10-Mbps. Estimate the average delay per packet. What fraction of that delay is due to queuing?
12. For a link with a data rate of 10 Gbps communicating over a distance of 5000-km how long does it take to send a 1000-byte message AND to receive a 1-byte acknowledgment?
13. If switching time is $10 \mu\text{s}$ (microseconds) in a store-and-forward packet-switching system, is this likely to be a major factor in the response of a client-server system where the client is in Vancouver and the server is in Toronto? Assume the propagation speed in copper and fiber to be $2/3$ the speed of light in vacuum.