LE/EECS 3213 E Communication Networks Fall 2014
Quiz #1, Thurs. Sept. 25, 2014 Name: _____

1. (*5 points*)

1.) [1] What kind of connection service did telegraph offer?

connectionless

2.) [1] What kind of connection service did telephone offer?

connection-oriented

3.) [1] Which better describes classic Ethernet: broadcast or switching?

broadcast

4.) [1] Name two types of round robin networks

polling or token passing or slotted ring

5.) [1] Which of the following is the job of the network layer: routing, framing (i.e. setting message boundaries), or defining bits.

routing

2. (*5 points*)

A network provider wants to operate at a data rate of 36 Mbps and expects signal power to be only 1.5 times the noise power. What useful (i.e. quantitative) information can you tell the provider about the quality of the lines that they will need?

→ from capacity relation: $C = W_c \log_2(1+SNR)$

can tell them the bandwidth of the lines they will need

$$W_c = \frac{C}{\log_2(1+SNR)} = \frac{36M}{\log_2(2.5)} = 27.2\,MHz$$

(C = 36M; SNR = 1.5)

3. (*5 points*) I want to build a switching network where every unit is connected to every other unit in a bi-directional fashion (i.e. I can send and receiver information between any 2 units). Unfortunately I only have uni-directional cables (i.e. I can send information in only one direction). Assuming I have 321 nodes in the network, how many cables do I need to realize my network?

n users need to connect to n-1 other users

∴ line number = $n \cdot (n-1) = 321 \times 320 = 102,720$

$c = 3 \times 10^8$ m/s (in free space), $c = 2 \times 10^8$ m/s (in media), 1 km $= 10^3$ m, 1 ms $= 10^{-3}$ s, 1 Mb $= 10^6$ b

$$\log_x y = \frac{\log_a y}{\log_a x}$$

$$C = W_c \log_2(1 + \text{SNR})$$

$$y = \int_a^b x\mathrm{d}x = \frac{x^2}{2}\Big|_a^b = (b^2 - a^2)/2, y = \int_a^b x^2\mathrm{d}x = \frac{x^3}{3}\Big|_a^b = (b^3 - a^3)/3$$

$$y(t) = a_0 + \sum_{k=1}^{\infty} a_k \cos(2\pi f_0 \cdot k \cdot t) + \sum_{k=1}^{\infty} b_k \sin(2\pi f_0 \cdot k \cdot t)$$

$$f_0 = \frac{1}{T}, a_0 = \frac{1}{T}\int_0^T y(t)\mathrm{d}t, a_k = \frac{2}{T}\int_0^T y(t) \cdot \cos(2\pi f_0 \cdot k \cdot t)\mathrm{d}t, b_k = \frac{2}{T}\int_0^T y(t) \cdot \sin(2\pi f_0 \cdot k \cdot t)\mathrm{d}t$$

$$\text{SNR [dB]} = 10\log(\text{SNR})$$

$$\text{SNR [dB]} = 6m - 7.2$$