ANSWER ALL QUESTIONS

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1. (a) A signal has a fundamental frequency of 1000 Hz. What is its period in ms?

   (b) Suppose a signal travels through a transmission medium and its power is reduced to one-third. Calculate the attenuation.

   (c) A signal travels through an amplifier, and its power is increased 5 times. Calculate the gain of power.

   (d) A digital signal can have more than two levels. In this case, we can send more than 1 bit for each level. Assume that a digital signal has six levels. How many bits are needed per level?

   [2+2+3+3=10M]

2. (a) A network with bandwidth of 10 Mbps can pass only an average of 12,000 frames per minute with each frame carrying an average of 10,000 bits. What is the throughput of this network?

   (b) Assume three routers are to be connected in a point-to-point subnet. Between each pair of routers, the designers may put a high-speed line, a medium-speed line, a low-speed line, or no line. If it takes 60 ms of computer time to generate and inspect each topology, how long will it take to inspect all of them?

   (c) Under what conditions would circuit switching be a better network design than packet switching? Also, explain the conditions under which a packet-switched network is preferable to a circuit switched network.

   [3+3+4=10M]

3. (a) What is the relationship between the wavelength and frequency of a sine wave?

   (b) What is the propagation time if the distance between the two points is 20,000 km? Assume the propagation speed to be 2.4×10^8 m/s in cable.

   (c) Shannon's theorem gives an upper bound to the capacity of a link. Suppose that the spectrum of a channel is between 3 MHz and 5 MHz and SNR is 30 dB. Calculate the capacity.

   [2+4+4=10M]

4. Assume we want to transmit the following binary string: 10011001. Show the resulting signal on the following line coding techniques:

   (a) Unipolar NRZ

   (b) Polar NRZ-L

   (c) Polar NRZ-I

[3+3+4=10M]

5. (a) What are the benefits of using a layered model to describe network protocols and operations?

   (b) Suppose the algorithms used to implement the operations at layer n is changed. How does this impact operations at layers $n - 1$ and $n + 1$?

[5+5=10M]

$* * *$ALL THE BEST $* **$