Computer Communication Networks
Spring 2015
HomeWork#2
Feb 4th

1. A client-server pair communicate using a satellite network, with satellites at a height of **30,000 km**. A message sent by the client (or the server) is transmitted up to the satellite and then transmitted down to the server (or the client). *What is the best case delay in response to a request, i.e., after the client sends (or initiates) a request to the server, how long does the client need to wait for a response from the server?* Assume that the signals travel at the speed of light. (Hint: Speed of light is 300,000,000 meters/second.)

2. Consider a transmission channel that is **3 MHz** wide. *How much data can be sent per second if **eight-level** digital signals are used?* Assume a noiseless channel, and use the Nyquist limit.

3. *What signal to noise ratio is needed to get a bit rate of **40 Mbps** (megabits per second) on a channel with **10 MHz** bandwidth?* Hint: Use Shannon limit. Also recall that signal to noise ratio can either be expressed as a ratio or in dB units (as per the lecture).