

Assignment - 2
Semester: Summer 2023
Submission: 9th July, 2023 (in Class)
Total Marks: 20
Total Questions: 4
[CO2]

1. Consider a communications channel being used by a cable modem network. The channel has use of the spectrum between 204MHz and 220MHz. The signal power is 30mW and the noise power is 3mW.
 - a. **Interpret** the theoretical maximum capacity of the channel in bps.
 - b. Assuming the capacity of the channel could be realized, **distinguish** how many signal levels would be needed?
 - c. If we change the bandwidth to 10 MHz. **How** changes in signal levels should be made to maintain the same data rate?
 - d. **Discuss** what advantage/disadvantage, if any, would there be in using half this number of signal levels [from b]. [8 Marks]
2. **Estimate** the total delay (latency) for a frame of size 5 million bits that is being sent on a link with 7 routers each having a queuing time of 5 μ s, 2 ps, 3 ns, 5 ps, 4 ps, 3 ps, and 3 ns, respectively. And the processing times of the router are 2 ps, 3 ps, 3 ns, 2 μ s, 4 ps, 6 μ s and 5 μ s, respectively. The length of the link is 4800 km. The speed of light inside the link is 2×10^8 m/s. The link has a bandwidth of 18 Gbps. [5 Marks]
3. **Show** a non-periodic composite signal contains frequencies from 25 to 60 KHz. The peak amplitude is 30 V for the lowest and the highest signals and is 10 V for the 45-KHz signal. **Calculate** is the bandwidth of this signal?

Assuming that the amplitudes change gradually from the maximum to the minimum and then minimum to the maximum, **draw** the frequency spectrum. [3 Marks]
4. In **which** factors SNR depends on? **Discuss** the difference between Attenuation and Distortion with a diagram. [1+3 Marks]