**CMPE 352 – Signal Processing & Algorithms**

**Week 13 Problem Session   
29 April 2019**

**Problem 1**

A sinusoidal signal is transmitted using PCM. Find the minimum number of bits required to achieve a target signal-to-quantization-error ratio (SNR) of 25 dB.

**Problem 2**

Consider a sinusoidal signal given by 𝑥 𝑡 = 3 sin(1000𝜋𝑡). Find the signal-to quantization-error ratio (SNR) when the signal is quantized using a 9-bit PCM.

**Problem 3**

A sinusoidal TV signal with a frequency of 42 MHz is transmitted using binary PCM. The number of quantization levels is 1024. Calculate

a) The word length N

b) The average SNR

c) The bit rate R

**Problem 4**

At what minimum frequency can the signal

be sampled if we assume that the ″essential bandwidth″ 𝐵 of the signal is the frequency at which |𝑋(jw)| drops to 1% of its peak value ?

**Problem 5**

Let 𝑓0=1, 𝑓1=3, and 𝑓2=5 and let 𝑡 be measured in seconds.

Compute in Matlab the DFT of the signal

𝑧(𝑡)=sin(2𝜋𝑓0𝑡)+cos(2𝜋𝑓1𝑡)+sin(2𝜋𝑓2𝑡)

How would you choose 𝑇𝑠 and 𝑇0? Plot the signal 𝑧(𝑡) and plot its DFT.