ECE210A – Signals and Systems

Assignment 06: Foray and Zee

Assume we're sampling at 44.1 kHz, a common sampling rate for audio.

1. Create an anonymous `db2mag()` function. You'll be converting from decibels to magnitude pretty frequently, so this function will save you some writing.

2. Generate a signal with 88.2k samples with components at 14.96 kHz, 5.52 kHz, 3.15 kHz, -3.76 kHz, and 11.01 kHz, with magnitudes of 20 dB, 19 dB, 7 dB, -7 dB, and -4 dB. Also, add white noise to your signal at -10 dB using MATLAB's `randn()` function. Use `subplot()` to plot the real component of your signal and its DFT in one figure.

   Hint: To generate the different components, convert the dB measures to magnitudes and multiply them by complex sine waves at the desired frequencies. Once you have the magnitudes, there is an example of the rest in the notes. To generate the noise, convert the dB measure to a magnitude and multiply by the output of randn().

3. Given the following transfer function:

$$H(z) = -0.43\frac{(z - 0.55 \pm j0.08)(z - 0.39 \pm j0.96)(z - 0.07 \pm j0.68)(z - 0.08)}{(z + 0.06 \pm j0.83)(z - 0.3 \pm j0.69)(z - 0.77 \pm j0.61)(z + 0.68)(z + 0.34)}$$

   Plot the poles and zeros using `zplane()` and then use `freqz()` to generate plots for the magnitude response and phase response.