Ebrahim Simmons - simmoe1 - 400200042
Bilal Yusuf - yusufb1 - 400185626

Lab 1 Report

fourierTransform.py

- In-Lab 1: We wrote our own function for DFT and IDFT by converting the pseudocode given to us in the lab document. The data for both the DFT and FFT when monitored on screen was the same. It was tested similarly for IDFT and IFFT. We used the allclose function to confirm DFT/IDFT correctness
- In-Lab 2: Using random.rand we created a random signal, normalized to a magnitude +-10. Our function signalEn returns the signal energy. We confirmed that the signal energy of DFT/IDFT were correct, through the numerical values
- In-Lab 3: We created a function in which we made 3 tones using generateSin. We returned the sum of the 3 tones.
- Take-Home: Using the square function from SciPy, we implemented a 1Hz waveform, sampled at 500Hz, for 1 second. It has a duty cycle of 50%. The frequency domain plot shows the peak being half the amplitude. There are no even harmonics. At different duty cycles there would be, and the frequency domain plot would converge to 0 differently.

filterDesign.py

- In-Lab 1: We designed our own low-pass filter (**lowPassImpulse**). The two digital filter frequency responses were similar, when we compared our method to firwin.
- In-Lab 2: We created a new function called filterMTSignal, which contains the multi tone signal from our last experiment. We used lfilter to get rid of the highest frequency. Within the outputs you can visually see the highest frequency signal missing.
- Take-Home: Using the firwin in built function I filtered out the 5hz and 15z (high pass and low pass) then plotted the signals using freqzplot and filterMTSingal functions. To create a band pass signal. The plot that was used was from the fourierTransform.py in lab 3.

blockProcessing.py

- In-Lab 1: when altering the block sizes for example lowering the value to 200 from 1000 and when the audio.wav file is played a cracking noise can be heard in the right channel. Since the state isn't saved. From this we can tell the relation from n_taps and block size affects the cracking noise.
- Take-Home: First we had to try and implement the convolution. Using the lecture slides we created the formula for convolution using for loops. At the end we add all of the zi values to make sure that the outputs and the beginning of the blocks are correct.