

Programming Assignment

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Sampled Voice

After executing the code over the given range of frequencies, I took sampling frequency as **6000 Hz** taking into account the timing and accuracy of the results.

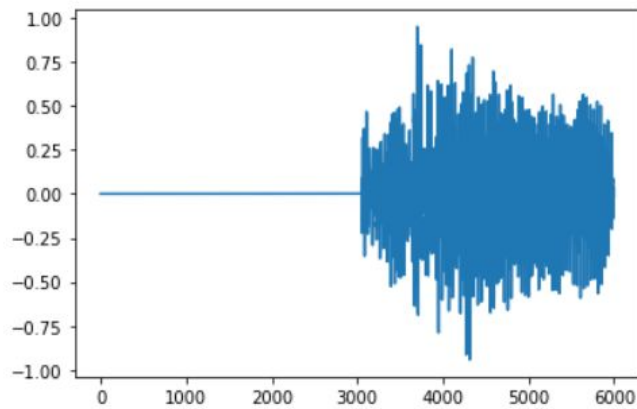
Bandwidth

Bandwidth is the maximum frequency component of the signal that doesn't contain any noise. So taking the amplitude threshold to be **0.1**, the bandwidth is calculated. The calculated bandwidth comes out to be **3.131118932457638** for the taken frequency range.

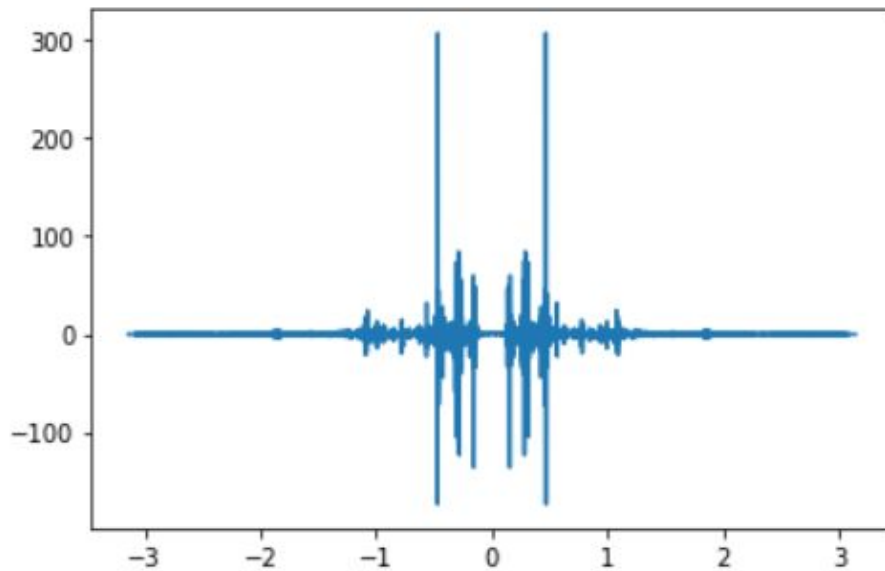
Graphs

Q1 & 2)

Time domain sketch of recorder audio

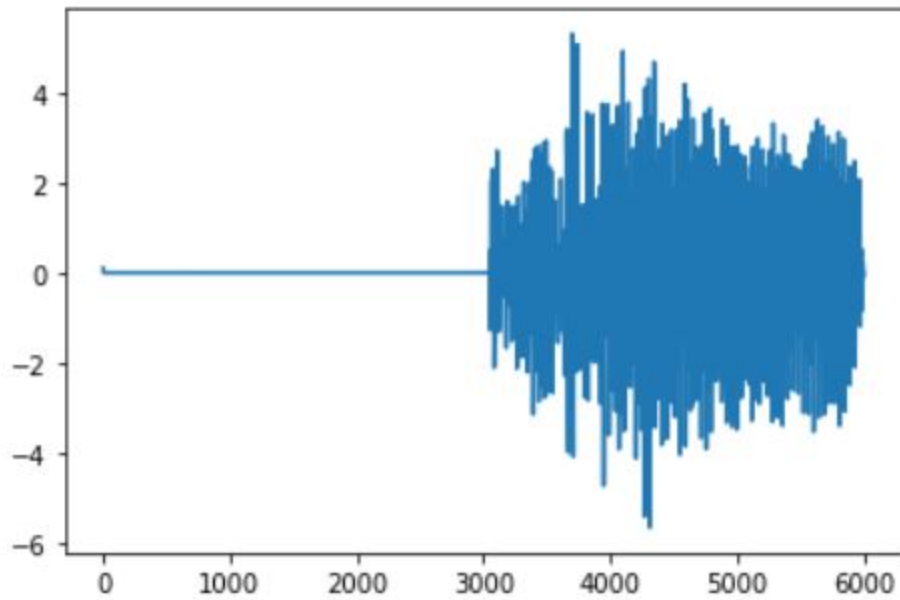


Fourier transform sketch of the audio



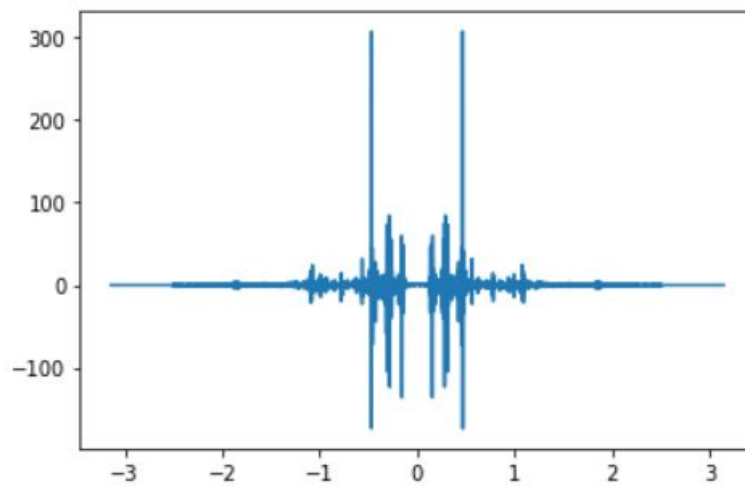
Q5)

Inverse Fourier Transform of the original

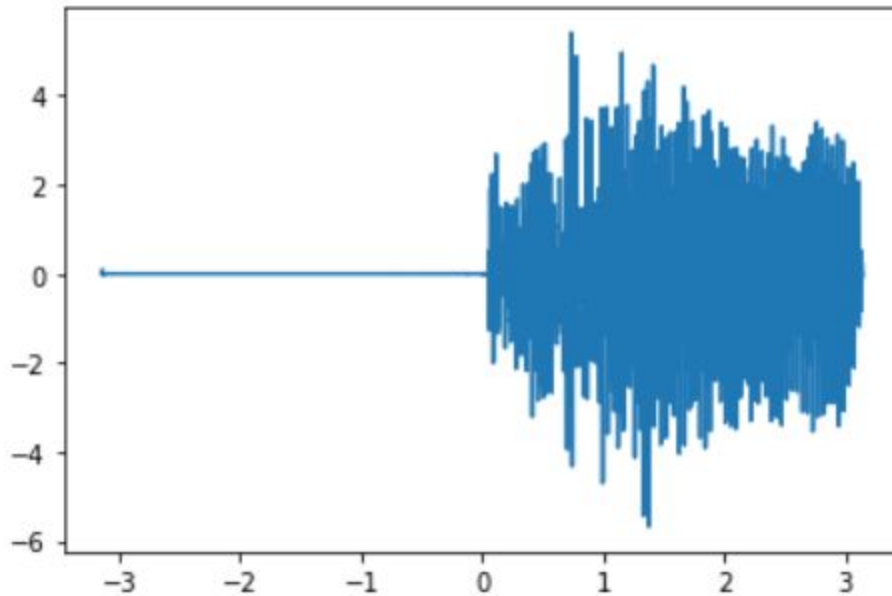


Q6)

Fourier transform when frequency greater than $0.8 \times \text{bandwidth}$ are removed



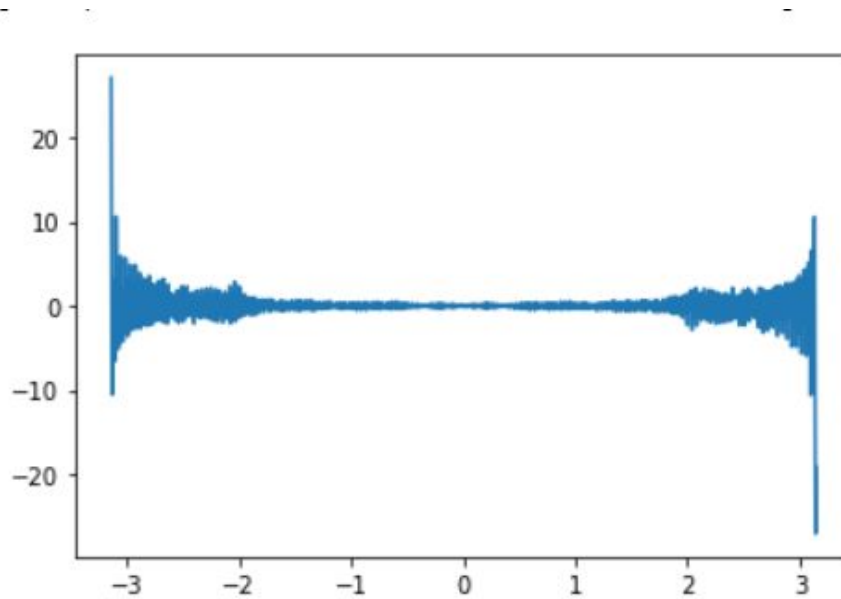
Inverse Fourier transform of the above signal



Inference from Q6 : Removing the frequencies outside 80% of bandwidth results in reduction of noise and clarity in sound.

Q7)

Inverse Fourier Transform of the signal



Inference from Q7 : Only taking the amplitude response into account, the sound comes out a lot “echoey” than the original. The amplitudes are higher at the extremes and lower in the middle.