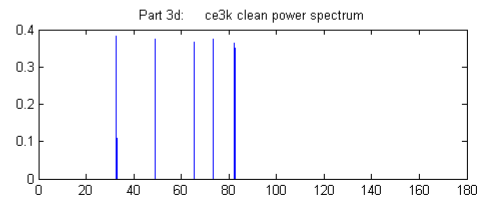
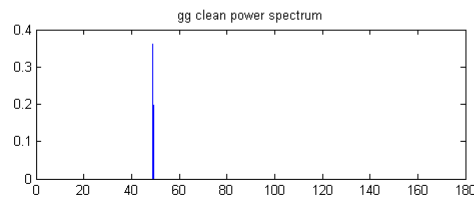
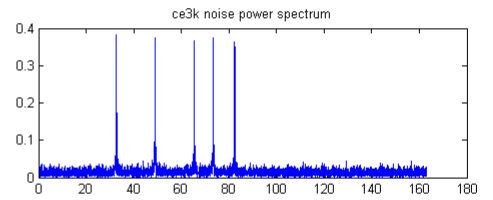
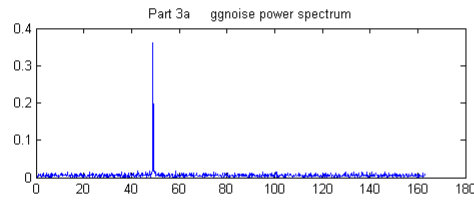
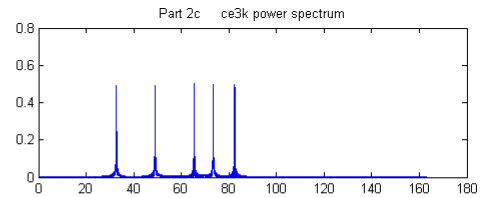
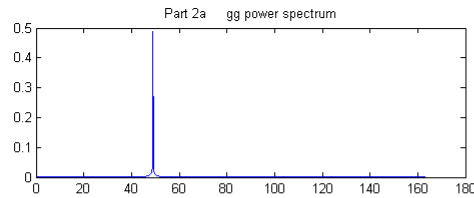


Project #1 Solutions



1. Codes

$$X = \frac{1}{n} D_n x$$

$$x = \bar{D}_n X$$

2. Power Spectrum

- note the x axis scale: $\frac{j}{2\pi}$ for $j = 0, \dots, \frac{n}{2} - 1$
- The spike is at 49 which corresponds to the frequency of $\sin(2\pi \frac{98}{2})$.
- Note that the gg spike is in the same position. This axis scale used $N = \text{length}(ce3k)$ and $\frac{j}{10\pi}$ for $j = 0, \dots, \frac{N}{2} - 1$

3. Signal Denoising

- We can see the noise as small values across all the frequencies.
- The threshold was set at 6% of the power spectrum: 0.0219 (scaled) 44.9 (unscaled).
- ggclean sounds like the original signal gg. There is no noticeable deterioration of the sound.

- (d) `ce3kclean` loses substantial quality. The threshold was set at 10.6% of the power spectrum: 0.0425 (scaled) 87 (unscaled). The cleaned sound lacks the crispness and clarity of the original `ce3k` signal.