

Problem Set 8

Spring 2004

Issued: Wednesday, April 21, 2004**Due:** Tuesday, April 27, 2004Reading in *Oppenheim and Schaffer with Buck*

4/6/04 — Sections 7.0-7.2

4/13/04 — Sections 7.3-7.7

4/20/04 — Sections 4.6 and 4.8

4/27/04 — Sections 10.0-10.8

FINAL EXAM ANNOUNCEMENT:

The final exam is **Tuesday, May 11, 4:30-7:15pm**. This exam will cover material through the lecture on May 4, including problem sets 1-9 and Matlab projects 1-3. The exam will be closed book, but three $8\frac{1}{2}'' \times 11''$ sheets of notes (both sides) are allowed. Calculators are allowed, but probably won't be useful.

Problem 7.25 in *Oppenheim/Schafer/Buck*

Do parts b and f only.

Problem ECE535-7 In this problem you will use the window method to design an FIR linear-phase, causal discrete time filter that approximates the ideal response:

$$H_d(e^{j\omega}) = \begin{cases} 1 & |\omega| \leq \frac{\pi}{4} \\ 0 & \frac{\pi}{4} < |\omega| \leq \pi \end{cases}$$

- Obtain an expression for the infinite duration impulse response $h_d[n]$.
- Determine the coefficients of a 5-tap causal filter using a Hamming window.
- What is the group delay of this filter?
- Check your solution using Matlab's `fir1` command to design the filter. Note that `fir1` defaults to using the Hamming window. For an accurate comparison to your solution, you will need to use the `'noscale'` option for `fir1`. Type `help fir1` for more information about this command.

Problem 4.14 in *Oppenheim/Schafer/Buck*

Be sure to show your work, not just your final answers.

Problem 4.44 in *Oppenheim/Schafer/Buck***Matlab Exercises: Frequency Sampling Filter Design**

Do all exercises in Section 5.4 of *Computer Explorations in Signals and Systems* by *Buck, Daniel, and Singer*. Your solution to these exercises should be your Matlab code, plots, and any written work.

This section will give you some insights about another type of filter design, as well as familiarize you with skills you need for the "Advanced Problems" section of Project 3.

Additional instructions for part c: Please include a plot of the phase response ($\angle H_p$) that you define.