

EE112/PPV/Winter'09: Digital Signal Processing

HW SET #5

Due On **Thursday Feb. 12** in class.

1. (120 points) PPV's book Problem 3.1.
2. (120 points) PPV's book Problem 3.2.
3. (60 points) PPV's book Problem 3.3.
- *4. (180 points) PPV's book Problem 3.4.
5. (150 points) This problem shows that we can design stable linear phase IIR filters if noncausality is not of concern. Consider the IIR filter

$$H(z) = \frac{-3}{1 - 2.5z^{-1} + z^{-2}}$$

- a) We know that the inverse transform $h(n)$ depends on the choice of the region of convergence. Find the impulse response $h(n)$ by assuming a region of convergence that yields a stable solution. You will find that this solution is noncausal.
- b) What is the phase response of this solution?
- c) Show that $h(n) = h(N - n)$ for appropriate N . What is this N ?

In class we showed that such systems can be implemented by running two separate difference equations, one causal and one anticausal. Such an implementation is practical as long as the signal to be filtered is of finite duration (like an image), and has already been acquired and stored.

Reading assignments (absolutely essential).

1. PPV's book, Sec. 2.4.2, 3.2.1, and 3.2.4.

Reminders:

Late homework policy for EE112. Late homeworks will not be accepted. No exceptions other than institute-established emergency reasons, in which case a signed letter is required from authorized official.

NCT Problems. Remember that problems with an asterik, such as *6 are no-collaboration (NCT) problems.

Books. AVO's book means "Discrete time signal processing" by Oppenheim et al. PPV's book means "Multirate systems and filter banks" by PPV. Most homework problems come from these books.
