PROBLEM:

Consider the following cascade system:

$$\begin{array}{c|c} x[n] & LTI & w[n] & LTI & y[n] \\ \hline X(z) & H_1(z) & W(z) & H_2(z) & Y(z) \end{array}$$

The system function for the first system is

$$H_1(z) = \frac{(1 - 1.2z^{-1})}{(1 - 0.8e^{j\pi/4}z^{-1})(1 - 0.8e^{-j\pi/4}z^{-1})}$$

- (a) We wish to find a System #2 such that y[n] = x[n] for any input. How should $H_2(z)$ be chosen?
- (b) Determine the difference equation that would be satisfied by the input w[n] and the output y[n] of the second system.
- (c) Would there be any problem in implementing the system found above? Explain.

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(a)
$$y[n] = x[n] \implies H_1(z)H_2(z) = 1$$

 $\implies H_2(z) = \frac{1}{H_1(z)} = \frac{(1 - .8e^{j\pi/4}z^{-1})(1 - .8e^{-j\pi/4}z^{-1})}{1 - 1.2z^{-1}}$
 $= \frac{1 - 1.6\cos(\pi/4)z^{-1} + .64z^{-2}}{1 - 1.2z^{-1}}$

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