تمرین فصل پنجم

1.

Verify that the magnitude of an all-pass filter is equal to 1:

$$H_{ap}(z) = \frac{z^{-1} - a^*}{1 - az^{-1}}$$

2.

A causal linear time-invariant system has system function:

$$H(z) = \frac{(1 - 0.5z^{-1})(1 + 4z^{-2})}{(1 - 0.64z^{-2})}$$

a) Find expressions for a minimum-phase system $H_1(z)$ and an all-pass system $H_{ap}(z)$ such that

$$H(z) = H_1(z)H_{ap}(z)$$

b) Find expressions for a different minimum-phase system $H_2(z)$ and a generalized liner-phase FIR system $H_{lin}(z)$ such that

$$H(z) = H_2(z)H_{lin}(z)$$

3.

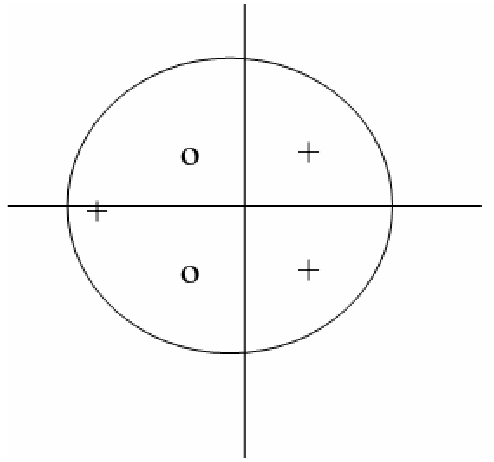
Consider a stable LTI system with input x[n] and output y[n]. The input and output satisfy the difference equation

$$y[n-1] - \frac{10}{3}y[n] + y[n+1] = x[n]$$

a) Plot the poles and zeros in the z-plane.
b) Find the impulse response h[n]

4.

If the system function H(z) of a LTI system has a pole-zero diagram as shown in the following figure and the system is causal, can the inverse system Hi(z), where H(z)Hi(z)=1, be both causal and stable? Clearly justify your answer.



5. Solve problem 5.12 from oppenheim book.
6. Solve problem 5.29 from oppenheim book.
7. Solve problem 5.37 from oppenheim book.