Practice Examples
Chapter-6 Structures for Discrete-Time Systems

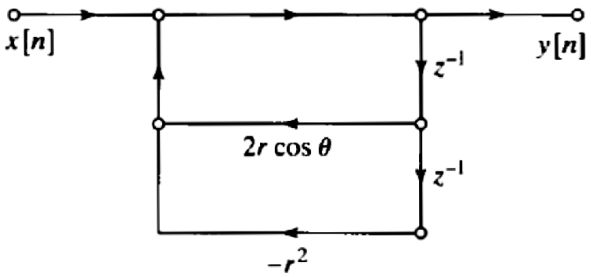
Summary

1. Mainly two forms of structures, (a) Direct Form-I (b) Direct Form-II. Both have variants also.
2. For a given system, its DF-I and DF-II have same $H(z)$.
3. In DF-I, numerator b_k coefficients reside with $x[n]$ and feedforward while denominator a_k coefficients reside with $y[n]$ and are feedback. In DF-II, b_k reside with $y[n]$ and still feedforward while a_k reside with $x[n]$ and still feedback.
4. In DF-I we can reduce central adders while in DF-II, we can reduce central delay (memory) elements.
5. Transposed form is yet another form but same $H(z)$ as DF-I and DF-II for a given system.
6. Cascade and parallel forms are created to fragment a large network for easy troubleshooting.

Practice

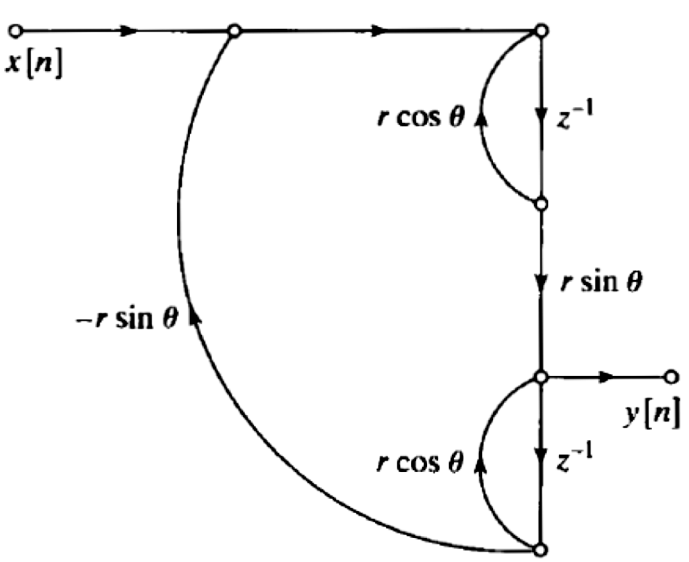
1.

Determine the system function of the two networks in Figure P6.1-1, and show that they have the same poles.



Network 1

(a)



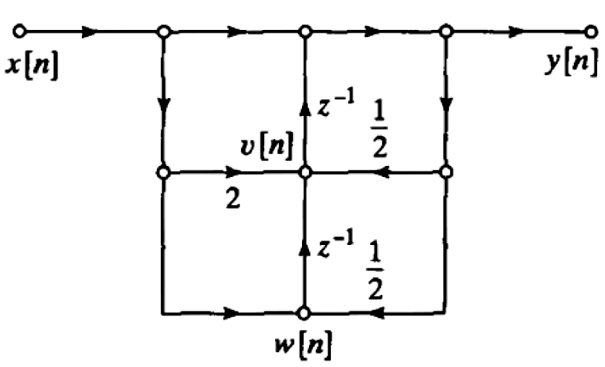
Network 2

(b)

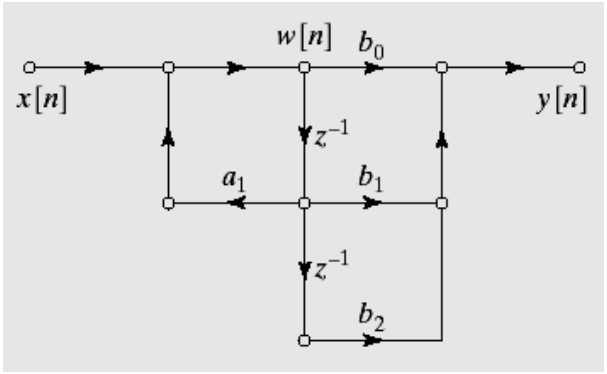
Figure P6.1-1

2.

1. For the signal flow graph given below, find the system function $H(z)$.
2. Redraw the system using cascade of two first order systems.



3. Sketch the transposed form of the given circuit by keeping $x[n]$ and $y[n]$ in their original place.
4. Prove that the original and transposed form has same $H(z)$.



5.

Consider the causal LTI system with system function

$$H(z) = 1 - \frac{1}{3}z^{-1} + \frac{1}{6}z^{-2} + z^{-3}.$$

(a) Draw the signal flow graph for the direct form implementation of this system.
(b) Draw the signal flow graph for the transposed direct form implementation of the system.

Do problem 6.2, 6.5, 6.8, 6.26