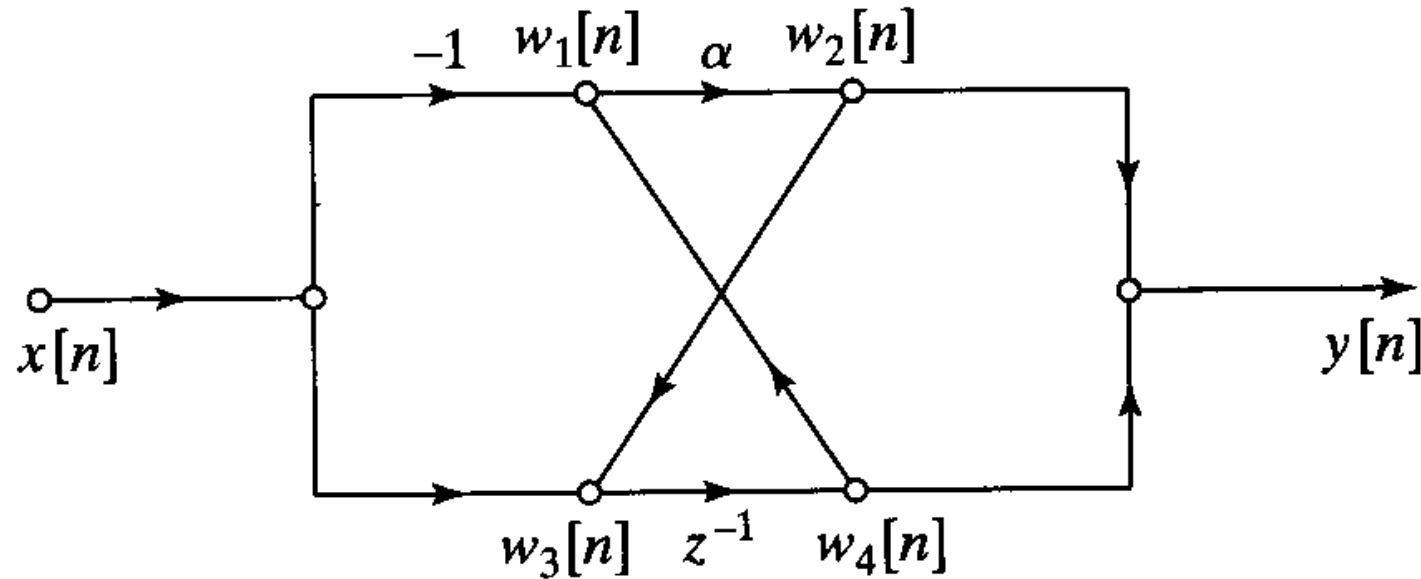# Class Exercises for Chapter 9

1. Consider a linear time-invariant (LTI) system whose transfer function is:

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

(a)   Draw the block diagram for $H(z)$ using direct form.

(b)   Draw the block diagram for $H(z)$ using canonic form.

(c)   Will the system be stable for practical implementation? Why?

2. Determine the system function $H(z) = Y(z)/X(z)$ from the following signal flow graph.

(Hint: First relate $x[n]$ and $y[n]$ with the dummy variables $\{w_i[n]\}$, $i = 1,2,3,4$, using equations and then perform z-transform.)

3. A LTI system is realized by the following flow graph:
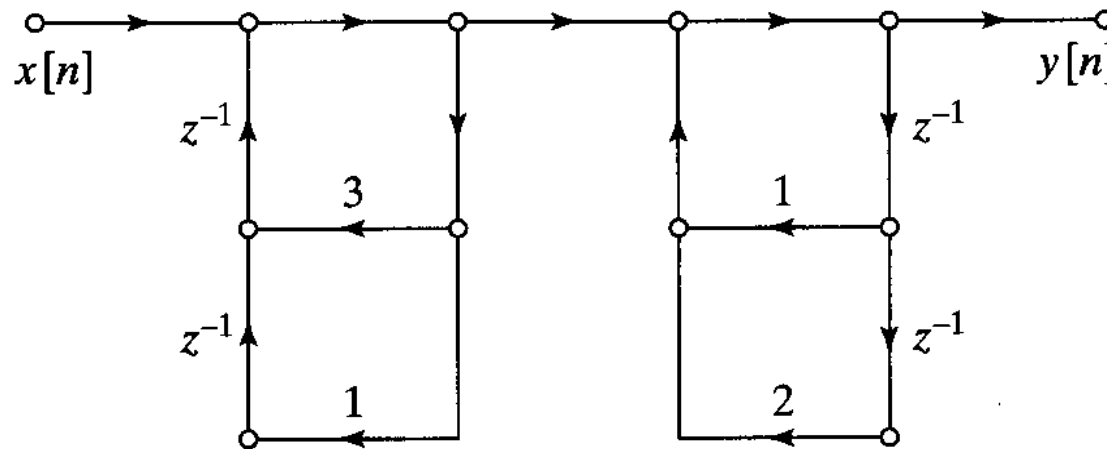
(a) Determine the transfer function $H(z) = Y(z) / X(z)$?

(b) Then write the difference equation that relates the input $x[n]$ and output $y[n]$.

(c) How many real multiplications and additions are required to compute each sample of the output?

(d) Is it possible to reduce the number of storage registers by using a different structure?