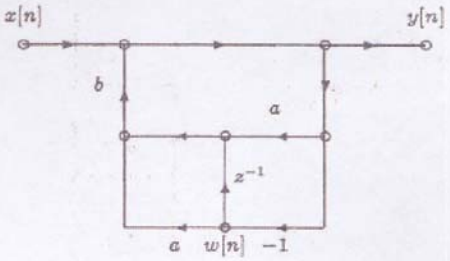
Digital Signal Processing
http://kom.aau.dk/~zt/cources/DSP_E/

Solutions 6 (MM62)

6.1



(a)

$$y[n] = x[n] + abw[n] + bw[n-1] + aby[n]$$
$$w[n] = -y[n]$$

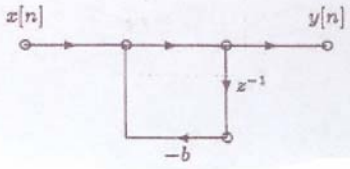
Eliminate w[n]:

$$y[n] = x[n] - aby[n] - by[n-1] + aby[n]$$
$$y[n] = x[n] - by[n-1]$$

So:

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

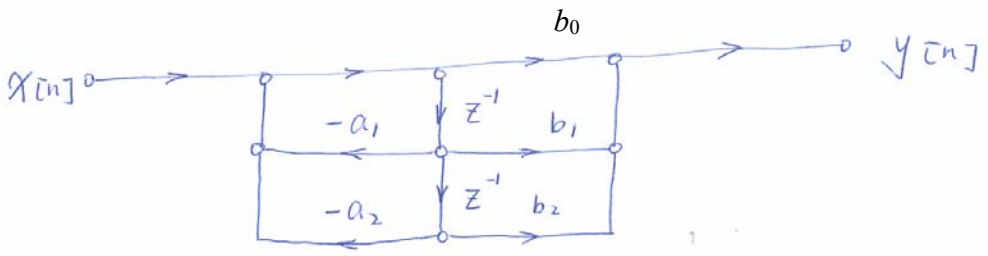
(b)



6.2

a) $y[n] = b_0 + b_1 x[n-1] + b_2 x[n-2] - a_1 y[n-1] - a_2 y[n-2]$

b) Canonic form



6.3

(a) $y[n]-4y[n-1]+7y[n-3]+2y[n-4]=x[n]$

(b) $H(z)=\dfrac{1}{1-4z^{-1}+7z^{-3}+2z^{-4}}$

(c) Two multiplications and four additions.

(d) No. It requires at least four delays to implement a fourth-order system.

6.4