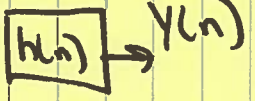
Lecture 12

Ex: $H(z) = \dfrac{5+2z^{-1}}{1-0.8z^{-1}}$



$h(n) = ?$ (1) inverse z-transform
using partial fractions
or tables

(2) difference equation
apply impulse

how do we implement this filter?

(1) convolution

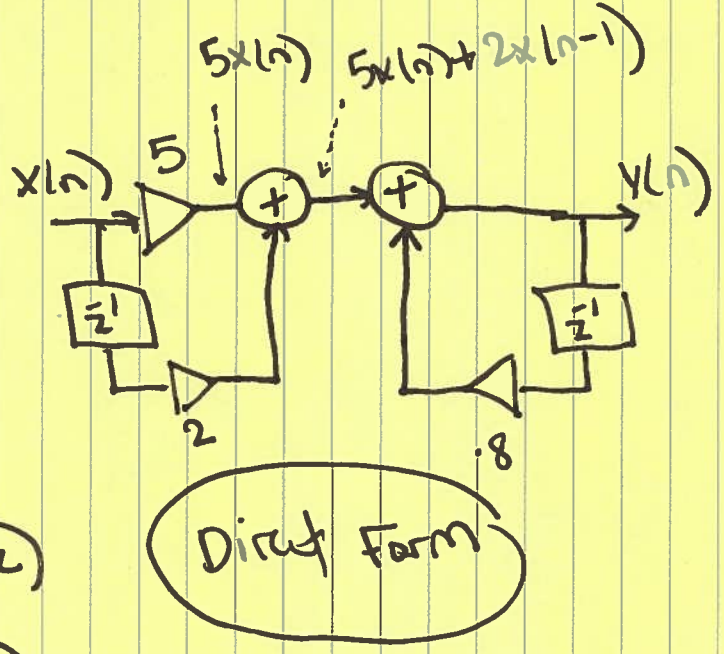
(2) difference equation

$$H(z) = \frac{Y(z)}{X(z)} = \frac{5+2z^{-1}}{1-0.8z^{-1}}$$

$$Y(z)\left[1-0.8z^{-1}\right] = \left[5+2z^{-1}\right]X(z)$$

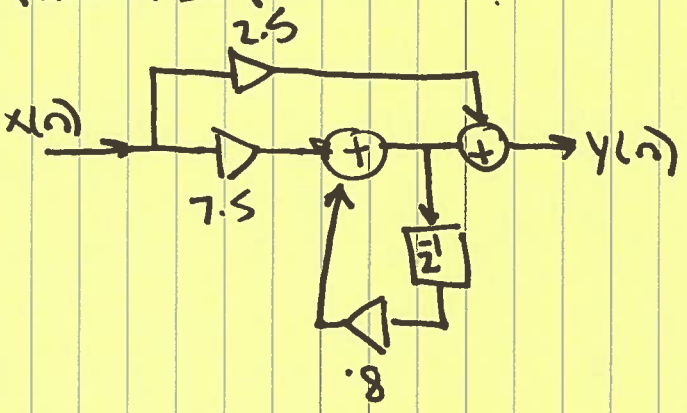
$$Y(z) = .8z^{-1}Y(z) + 5X(z) + 2z^{-1}X(z)$$

$$y(n) = .8y(n-1) + 5x(n) + 2x(n-1)$$



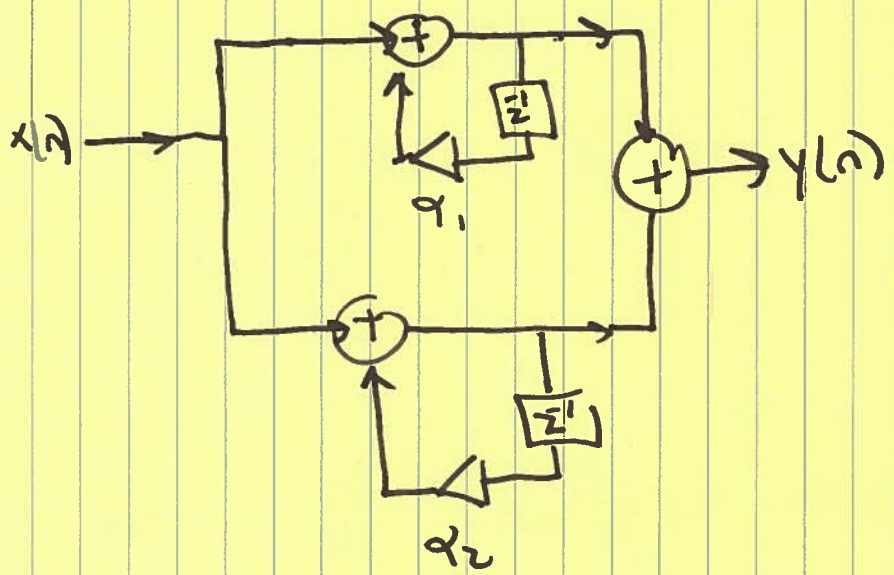
$$H(z) = \frac{5+2z^{-1}}{1-0.8z^{-1}} = -2.5 + \frac{7.5}{1-0.8z^{-1}}$$

Parallel Implementation:



Extension:

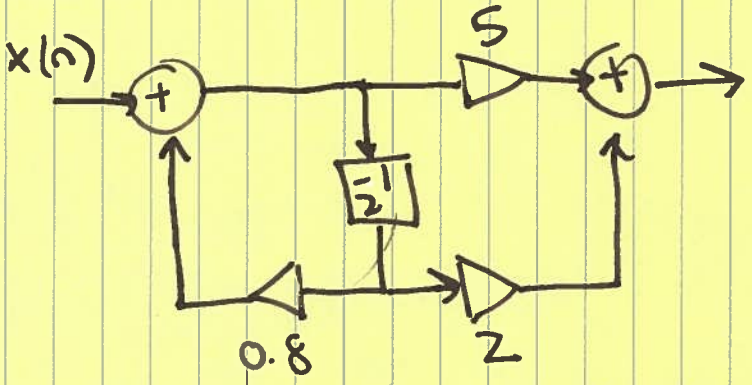
$$H(z) = \frac{b_0+b_1z^{-1}+b_2z^{-2}}{a_0+a_1z^{-1}+a_2z^{-2}} = \frac{A_1}{1+a_1z^{-1}} + \frac{A_2}{1+a_2z^{-1}}$$



$$H(z) = \frac{5+2z^{-1}}{1-0.8z^{-1}} = -2.5 + \frac{7.5}{1-0.8z^{-1}}$$

$$y(n) = .8y(n-1) + 5x(n) + 2x(n-1)$$

$$\begin{cases} \omega_0 = 0.8\omega_1 + 7.5x(n) \\ y = \omega_0(n) - 2.5x(n) \\ \omega_1(n+1) = \omega(n) \end{cases}$$



Cannical form Realization

gcc -o x.exe x.cc a.out

[]: x.exe