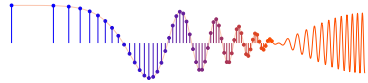


EXERCISE 7.2: Find the impulse response $h[n]$ of an FIR filter whose system function is

$$H(z) = 4(1 - z^{-1})(1 + z^{-1})(1 + 0.8z^{-1})$$

Hint: Multiply out the factors to get a polynomial and then determine the impulse response by "inverse z-transformation."

McClellan, Schafer and Yoder, *Signal Processing First,* ISBN 0-13-065562-7.
Prentice Hall, Upper Saddle River, NJ 07458.

SOLUTION

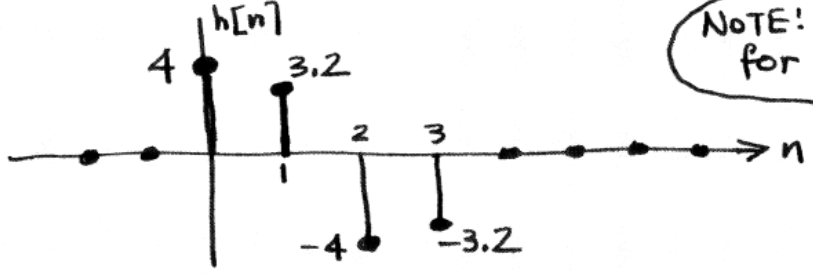
$$H(z) = 4\underbrace{(1-z^{-1})(1+z^{-1})}_{1-z^{-2}}(1+0.8z^{-1})$$

$$= 4(1+0.8z^{-1}-z^{-2}-0.8z^{-3})$$

$$H(z) = 4 + 3.2z^{-1} - 4z^{-2} - 3.2z^{-3}$$

$h[0]$ $h[1]$ $h[2]$ $h[3]$

$$\Rightarrow h[n] = 4\delta[n] + 3.2\delta[n-1] - 4\delta[n-2] - 3.2\delta[n-3].$$



NOTE: $h[n]$ is zero for $n<0$ & $n \geq 4$