

PROBLEM:

A *unit impulse sequence* is defined as

$$\delta[n] = \begin{cases} 1 & n = 0 \\ 0 & n \neq 0 \end{cases}$$

Suppose that a LTI system has a z -transform system function equal to

$$\mathcal{H}(z) = 1 - z^{-1} - z^{-3} + z^{-4}$$

- Determine the difference equation that relates the output $y[n]$ of the system to the input $x[n]$.
- Determine and plot the *impulse response*: i.e., the output sequence $y[n]$ when the input is $x[n] = \delta[n]$. How is the output due to an impulse related to $\mathcal{H}(z)$?
- Determine the output of the system when the input is a shifted and scaled impulse:

$$x[n] = 7\delta[n - 3]$$

- Determine the step response, i.e., the output when the input is

$$u[n] = \begin{cases} 1 & \text{for } n \geq 0 \\ 0 & n < 0 \end{cases}$$