

DLTI Frequency Response

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Transfer Function

Transfer Function $H(z) = \frac{Y(z)}{X(z)}$

Impulse Response $h[n] \Leftrightarrow H(z)$

IO Difference Equation
$$y[n+N] + a_1 y[n+N-1] + \dots + a_{N-1} y[n+1] + a_N y[n] \\ = b_0 x[n+M] + b_1 x[n+M-1] + \dots + b_{N-1} x[n+1] + b_N x[n]$$

IO Convolution Equation
$$y[n] = \sum_{m=0}^M h[m] x[n-m]$$

Frequency Response $H(\hat{\omega}) = H(z) \Big|_{z=e^{j\omega}}$

Pole / Zero Pattern

Block diagram realization

Transfer Function

Impulse Response

Frequency Response

IO Convolution Equation

Pole / Zero Pattern

IO Difference Equation

Block diagram realization

$$H(z) = \frac{5 + 2z^{-1}}{1 - 0.6z^{-1}}$$

$$H(z) = A_0 + \frac{A_1}{1 - 0.6z^{-1}}$$

$$\begin{aligned} A_0 &= H(z) \Big|_{z=0} = \frac{5 + 2z^{-1}}{1 - 0.6z^{-1}} \Big|_{z=0} \\ &= \frac{5z + 2}{z - 0.6} \Big|_{z=0} = \frac{2}{-0.6} \end{aligned}$$

References

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