

PROBLEM:

Suppose that a system is defined by the following operator

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

- Write the time-domain description of this system—in the form of a difference equation.
- Write the formula for the frequency response of the system.
- Derive a simple formula for the magnitude squared of $\mathcal{H}(\hat{\omega})$ response versus $\hat{\omega}$.
- This system can “block” certain input signals. For which input frequencies ω_o , is the response to $x[n] = \cos(\omega_o n)$ equal to zero?
- When the input to the system is $x[n] = \cos(\pi n/3)$ determine the output signal $y[n]$ in the form:

$$A \cos(\omega_o n + \phi)$$

Give numerical values for the constants A , ω_o and ϕ .