

EE 341 - Homework 10

Due Nov. 19, 2018

1. Verify that the frequency response of the Notch filter $H_{notch}(s)$ on page 283 of text, is given by:

$$H(s) = 1 - \frac{(2\alpha s + \alpha^2)}{(s + \alpha)^2 + \omega_0^2}$$

2. Verify that the impulse response $h_{notch}(t)$ is given by

$$h_{notch}(t) = \delta(t) - Ae^{-\alpha t} \cos(\omega_0 t + \theta)u(t)$$

with

$$A = [4\alpha^2 + \frac{\alpha^4}{\omega_0^2}]^{1/2}, \quad \text{and}$$

$$\theta = \text{atan}(\frac{\alpha}{2\omega_0})$$

3. Show that the inequality on page 284 of Example 6-7 of the text leads to $\alpha \approx 100s^{-1}$; for $f_0 = 1000$ Hz. i.e.,

$$(4\alpha^2 + \frac{\alpha^4}{\omega_0^2})^{1/2} e^{-0.1\alpha} \leq 0.01$$