

For $f_s = 5000 \text{ Hz}$

$$y(n) = 0.158 y(n-1) + 0.5792 x(n) - 0.5792 x(n-1)$$

for $f_s = 100 \text{ Hz}$

$$\begin{aligned} \omega_p &= \frac{0}{10^{-2}} \tan\left(\frac{2000\pi \times 10^{-2}}{2}\right) \\ &= 200 \tan(10\pi) = 0 \end{aligned}$$

$$\therefore \omega_s = \infty$$

$$N = \log \left(\frac{\sqrt{10^{0.1(10)} - 1}}{10^{0.1(3)} - 1} \right) = \frac{9}{20}$$

$$= \infty$$

Not valid freq

⊗ For $f_s = 100 \text{ Hz}$ $T = 2.5 \times 10^{-3}$

$$\begin{aligned} \omega_p &= \frac{2}{2.5 \times 10^{-3}} \tan\left(\frac{2000\pi \times 2.5 \times 10^{-3}}{2}\right) \\ &= \infty \end{aligned}$$

Not valid

⊗ $f_s = 1000 \text{ Hz}$

$$\begin{aligned} \omega_p &= 2000 \tan\left(\frac{2000\pi \times 10^{-3}}{2}\right) \\ \omega_s &= 2000 \tan(0.35\pi) = 1.9621 \end{aligned}$$