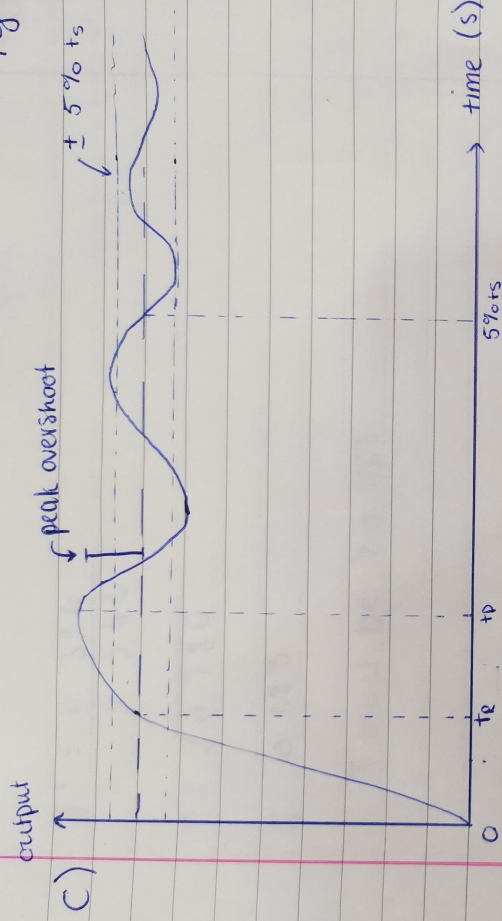




d) % Peak overshoot = $\left[\exp\left(\frac{-\zeta\pi}{\sqrt{1-\zeta^2}}\right) \right] \times 100\%$

1f % Peak overshoot = 12.5% =

$$0.125 = \exp\left(\frac{-\zeta\pi}{\sqrt{1-\zeta^2}}\right)$$

Taking natural logs of both sides:

$$\ln(0.125) = \frac{-\zeta\pi}{\sqrt{1-\zeta^2}}$$

$$-2.079(\sqrt{1-\zeta^2}) = -\zeta\pi$$

Squaring both Sides

$$\begin{aligned} 4.324(1-\zeta^2) &= 9.870\zeta^2 \\ 4.324 - 4.324\zeta^2 &= 9.870\zeta^2 \\ \therefore 5.546\zeta^2 &= 4.324 \end{aligned}$$