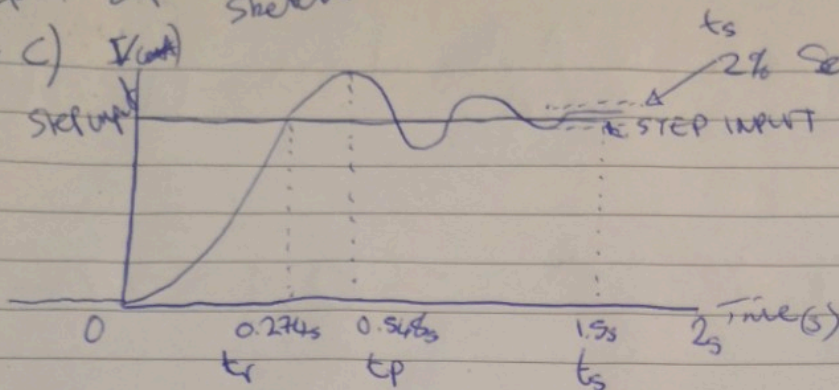


12/02/21 2d S
4 c)

Sketch



Garth
Grimslett
19/10/095

4 d) 15% $\zeta =$

$$\ln 0.15 \div -1.897 \left(\frac{-\zeta \omega_n}{\sqrt{1-\zeta^2}} \right) a$$

15% damp decimal

$$\therefore -1.897 \sqrt{1-\zeta^2} = -\zeta \omega_n \quad -1.897 \pm \frac{a}{b} = -1.897 b = a$$

$$\frac{-1.897^2}{= 3.599 (1-\zeta^2)} = 9.87 \zeta^2 \quad \therefore \zeta^2 = \frac{3.599}{13.467} = 0.26$$

$\therefore \zeta = \sqrt{0.26} \therefore \zeta = 0.52$ which is required to ensure the maximum peak overshoot % of 15.