

Bryony Stajfeld 2008682

6 of 8

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

$$\zeta = 0.4152274$$

$$\therefore \% \text{ Peak O.S} = \left[ \exp\left(\frac{-(0.415)\pi}{\sqrt{1-(0.415)^2}}\right) \right] \times 100\%$$

$$= 23.837\%$$

$$\omega = \omega_n \sqrt{1-\zeta^2}$$

$$\therefore \omega = (16.609) \sqrt{1-(0.415)^2}$$

$$\omega = 15.110 \text{ Hz}$$

$$\text{Rise time, } t_r = \frac{\pi}{2\omega} = \frac{\pi}{2(15.11)} = 0.104 \text{ s}$$

$$\text{Peak time } t_p = \frac{\pi}{\omega} = \frac{\pi}{(15.11)} = 0.208 \text{ s}$$

$$5\% \text{ Settling time } 5\% + t_s = \frac{3}{\zeta\omega_n} = \frac{3}{(0.415)(16.609)}$$

$$5\% + t_s = 0.435 \text{ s}$$