Anazodo Uchenna Kennedy
16/ENG05/011
Mechatronics Engineering
ENG 281 (Assignment III)

1. $E = 200v$, $\Delta E = -5v$

$R = 8\Omega$ $\Delta R = 0.2\Omega$

$$P = \frac{E^2}{R}$$

$$\frac{dP}{dE} = \frac{2E}{R}, \quad \frac{dP}{dR} = \frac{-E^2}{R^2}$$

$$\Delta P = \frac{dP}{dE} \cdot \Delta E + \frac{dP}{dR} \cdot \Delta R$$

$$= \frac{-2E}{R} (-5v) + \frac{-E^2}{R^2} \cdot (0.2)$$

$$= \frac{2(200)}{8} \cdot (-5) + \frac{(-200^2)}{8^2} (0.2)$$

$$= \frac{400}{8} \cdot (-5) + \left(\frac{40000}{64}\right) \cdot 0.2$$

$$= 50(-5) + 625(0.2)$$

$= -250 + 125$

$\Delta P = -125 W$

2 $y = \frac{kwd^4}{t^3}$

$\Delta w = +3\% w$

$\Delta d = +2.5\% d$

$\Delta t = +4\% t$

$\frac{dy}{dw} = \frac{kd^4}{t^3}$, $\frac{dy}{dd} = \frac{4kwd^3}{t^3}$, $\frac{dy}{dt} = \frac{-3kwd^2}{t^2}$

$\Delta y = \frac{dy}{dw} . \Delta w + \frac{dy}{dd} . \Delta d + \frac{dy}{dt} . \Delta t$

$\Delta y = \frac{kd^4}{t^3} (0.03w) + \frac{4kwd^3}{t^3} (0.025d) + \frac{(-3kwd^4)(0.04)}{t^4}$

$\Delta y = 0.03 \frac{kwd^4}{t^3} + 0.1 \frac{kwd^4}{t^3} - 0.12 \frac{kwd^4}{t^3}$

$\Delta y = \frac{kwd^4}{t^3} (0.03 + 0.1 + (-0.12))$

$\Delta y = \frac{kwd^4}{t^3} (0.03 + 0.1 \mp 0.12)$, $\therefore \Delta y = 0.01 \frac{kwd^4}{t^3}$

$= \Delta y = \pm 1\% y$