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Electrical / Electronics
GNS 251 (Assignment 3)

1 $P = \frac{E^2}{R}$

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

$dE = -5V$, $dR = 0.2\Omega$, $E = 200V$, $R = 8\Omega$

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

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

$= -\frac{2000}{8} - \frac{8000}{64}$

$= -250 - 125$

$dP = -375W$

∴ P decreases by 375W

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

$$\partial\omega = \frac{3\omega}{100} \quad \partial d = \frac{-2\frac{1}{2}d}{100} \quad \partial t = \frac{4t}{100}$$

$$\frac{dy}{d\omega} = \frac{d^4}{t^3}; \quad \frac{dy}{dd} = \frac{4\omega d^3}{t^3}; \quad \frac{dy}{dt} = \frac{-3\omega d^4}{t^4}$$

$$dy = \frac{dy}{d\omega} \cdot d\omega + \frac{dy}{dd} \cdot dd + \frac{dy}{dt} \cdot dt$$

$$dy = \frac{d^4\omega}{t^3}\left(\frac{3\omega}{100}\right) + \frac{4\omega d^3}{t^3}\left(\frac{-2\frac{1}{2}d}{100}\right) - \frac{3\omega d^4}{t^4}\left(\frac{4t}{100}\right)$$

$$dy = \frac{d^4\omega}{t^3}\left(\frac{3}{100}\right) + \frac{4\omega d^4}{t^3}\left(\frac{2\frac{1}{2}}{100}\right) - \frac{3\omega d^4}{t^3}\left(\frac{4}{100}\right)$$

$$dy = \frac{d^4\omega}{t^3}\left(\frac{3}{100} - \frac{10}{100} - \frac{12}{100}\right)$$

$$dy = \frac{d^4\omega}{t^3}\left(\frac{-19}{100}\right)$$

Recall! $y = \frac{d^4\omega}{t^3}$

$$dy = 4\left(\frac{-19}{100}\right)$$

$$= -19\%$$