Assignment

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① Find δP where x decreases by 5 volts & R increases by $0.2\,\Omega$

$$\delta P = \frac{\partial P}{\partial t}\delta t + \frac{\partial P}{\partial R}\delta R$$

$$\frac{\partial P}{\partial t} = \frac{E^2}{R} \qquad P = E^2 R^{-1}$$

$$\frac{\partial P}{\partial t} = 2ER^{-1} = \frac{2E}{R}$$

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

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

$$\delta P = -250 + 125$$

$$\delta P = -25\,V^2\,\Omega$$

② $y = \frac{kwd^4}{t^3}$

find δy if $w = +3\%$ $i\ d = \frac{5}{2}\%$ & $t = +4\%$

Soln

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

$\frac{dy}{dk} = \frac{wd^4}{t^3}$, $\frac{dy}{dw} = \frac{kd^4}{t^3}$, $\frac{dy}{\partial d} = \frac{4kwd^3}{t^3}$

$\frac{\partial y}{\partial t} = -3kwd^4 t^{-4}$. $\frac{dy}{dt} = \frac{-3kwd^4}{t^4}$

$\delta y = \frac{\partial y}{\partial w}\delta w + \frac{dy}{\partial d}\delta d + \frac{dy}{dt}\delta t$

$dy = \frac{kd^4}{t^3} * \frac{3w}{100} + \frac{4kwd^3}{t^3} \times \frac{2\frac{1}{2}d}{100} \frac{-3kwd^4}{t^4} \times \frac{t}{100}$

$\delta y = \frac{3wkd^4}{-100t^3} + \frac{10kwd^4}{100t^3} - \frac{12kwd^4}{t^3 \times 100}$

$$\delta y = \frac{4kd^4}{100t^3}\left(3 + 10 - 12\right)$$

$$\delta y = \frac{4kd^4}{t^3} \cdot \frac{1}{100}$$

$$\delta y = 1\% \text{ of } y.$$