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

If E = 200volts and R = 80volts, find the change in p resulting from a drop.

Solution

$\partial p = \frac{\partial p}{\partial E} \, dE + \frac{\partial p}{\partial p_1} \partial p_1$

$\frac{\partial p}{\partial E} = \frac{2E}{R} \; \frac{\partial P_1}{\partial P_1} = -E^2 R^{-2} = -\frac{E^2}{R^2}$

$\partial E = -5v : \partial R = +0.2\Omega$

$dp = \left(\frac{2e}{R_1}\right)\left(-5u\right) + \left(\frac{E^2}{R^2}\right)\left(+0.2\Omega\right)$

$dp = \left(\frac{2 \times 2000}{8}\right)\left(-5\right) + \left(\frac{-200^2}{8^2}\right)\left(0.2\right)(8)$

$dp = -250 + (-125)$

$dp = -375$ watts

Increase in p = -375 watts

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

$w = +3\%;\ \partial = 2\frac{1}{2}\% \simeq 5/2\%;\ t = +\%$

$\therefore$

$\frac{dy}{dw}\partial w + \frac{dy}{d\partial}\partial\gamma + \frac{du}{dt}dt$

$\frac{dy}{dw} = \frac{k\gamma^4}{t^3} \quad -\frac{dy}{d\partial} = \frac{4kw\partial^3}{t^3} \cdot \frac{dy}{dt} = \frac{3kw\partial^4}{t^4}$

$dw = \frac{3}{100} \times w \quad \partial\gamma = \frac{5}{2} \times \frac{1}{100} \times \partial \quad dt = \frac{4}{100} \times t$

$dy = \left(\frac{k\partial^4}{t^3}\right)\left(\frac{3w}{100}\right) \left(\frac{4kw\partial^3}{t^3}\right)\left(\frac{5}{2}/\frac{d}{100}\right) + \left(-\frac{3kw\partial^4}{t^4}\right)\left(\frac{4t}{100}\right)$

$dy = \left(\frac{3wk\partial^4}{100t^3}\right) + \left(\frac{20kw\partial^4}{200t^3}\right) - \left(\frac{12kw\gamma^4}{100t^3}\right)$

$dy = \frac{kw\partial^4}{t^3}\left(\frac{3w}{100} + \frac{20}{200} - \frac{12}{100}\right)$

$\frac{kw\partial^4}{t^3} = \frac{6 + 20 - 24}{200}$

$\frac{kw\gamma^4}{t^3} = \frac{2}{200} = \frac{1}{100}$

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

$\therefore y = 1/100$

$\therefore$ increase $= 1\%$.