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Electrical electronics Engineering ENG 281

1) $P = \frac{E^2}{R}$ $E = 200V$, $R = 8\Omega$, $\frac{\delta E}{\delta t} = -5V$, $\frac{\delta R}{\delta t} = 0.2\Omega$

$$\frac{\delta P}{\delta t} = \frac{\delta P}{\delta E} \cdot \frac{\delta E}{\delta t} + \frac{\delta P}{\delta R} \times \frac{\delta R}{\delta t}$$

$$\frac{\delta E}{\delta t} = \frac{2E}{R} \qquad \frac{\delta R}{\delta t} = -\frac{E^2}{R^2}$$

$$\therefore \frac{dP}{dt} = \frac{2E}{R}\frac{dE}{dt} + \left(-\frac{E^2}{R^2}\right)\frac{dR}{dt}$$

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

$$dP = -375W$$

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

$dw = 3\%$, $\delta d = 2\frac{1}{2}\%$, $dw = 4\%$

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

$$= \frac{kd^4}{t^3} dw + \frac{4kwd^3}{t^3} + \left(\frac{3kwd^4}{t^4}\right) \delta t$$

$(3w\%)$

$$= \frac{kd^4}{t^3} (3\%) + \frac{4kwd^3}{t^3} (\tfrac{5}{2}d\%) - \frac{3kwd^4}{t^4} (4t\%)$$

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

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

$$= \frac{1}{100}\frac{kwd^4}{t^3}$$

$$= 1\%y$$