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DEPT : Computer Engineering

Course : Eng 281

Date : 24/10/2017

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

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

$$\frac{\delta \mathcal{E}}{\delta t} = \frac{2\mathcal{E}}{R} \quad , \quad \frac{\delta R}{\delta t} = \frac{-\mathcal{E}^2}{R^2}$$

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

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

$$= -250 - 125$$

$$dP = -375\,w$$

2 $q = \frac{hwd^4}{t^3}$

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

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

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

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

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

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

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

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

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

$$= 1\% y$$