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Elect / Elect

16/Eng04/1015

Eng 281

1. $P = \frac{\mathcal{E}^2}{R}$ $\quad \mathcal{E} = 200V$ $\quad R = 8\Omega$

$\Delta\mathcal{E} = -5V$ $\quad \Delta R = 0.2\Omega$

$$\Delta P = \frac{dP}{d\mathcal{E}} \cdot \Delta\mathcal{E} + \frac{dP}{dR} \cdot \Delta R$$

$$\frac{dP}{d\mathcal{E}} = \frac{2\mathcal{E}}{R} \qquad \frac{dP}{dR} = \frac{-\mathcal{E}^2}{R^2}$$

$$\Delta P = \frac{2(200)(-5)}{8} + \frac{-(200)^2}{3^2} \cdot (0.2)$$

$$\Delta P = -250 - 125$$

$$\Delta P = -375W$$

Change in P is $= -375W$

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

$$\Delta w = \frac{3}{100} w \qquad \Delta d = \frac{2.5}{100} d$$

$$\Delta t = \frac{4}{100} t$$

$$\frac{dy}{dw} = \frac{kd^4}{t^3} \qquad \frac{dy}{dd} = \frac{4kwd^3}{t^3} \qquad \frac{dy}{dt} = \frac{-3kwd^4}{t^4}$$

$$\Delta y = \frac{dy}{dw} \cdot \Delta w + \frac{dy}{dd} \cdot \Delta d + \frac{dy}{dt} \cdot \Delta t$$

$$\Delta y = \frac{kd^4}{t^3} \cdot \frac{3}{100} w + \frac{4kwd^3}{t^3} \cdot \frac{2.5}{100} d - \frac{3kwd^4}{t^4} \cdot \frac{4}{100}$$

$$\Delta y = \frac{kwd^4}{t^3} \cdot \frac{3}{100} + \frac{kwd^4}{t^3} \cdot \frac{2.5 \cdot 4}{100} - \frac{kwd^4}{t^3} \cdot \frac{12}{100}$$

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

$$\Delta y = \frac{kwd^4}{t^3} \left(\frac{1}{100} \right)$$

$$\Delta y = \frac{K w d^4}{t^3}$$

$$\therefore \quad \Delta y = \frac{1}{100} y$$

$$= 1\% \, y$$

Change in $y = \pm 1\%$