AJAMAH ILEMI 16ENG05007

MECHATRONICS

① $P = \frac{E^2}{R}$

$\frac{\partial P}{\partial E} = \frac{2E}{R} = \frac{2 \times 200}{8} = \frac{400}{8} = 50$

$\frac{\partial P}{\partial E} = E^2 \times R^{-1} = E^2 \times -R^{-2} = -\frac{E^2}{R^2} = -\frac{40000}{64} = -625$

$\delta E = -5, \delta R = 0.2$

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

$= (50 \times -5) + (-625 \times 0.2)$

$= -250 - 125$

$= -375$

P decreased by 375.

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

K = constant

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

$\frac{\partial y}{\partial d} = \frac{4wd^3}{t^3}$

$\frac{\partial y}{\partial t} = wd^4 \times t^{-3} = wd^4 \times -3t^{-4} = -\frac{3wd^4}{t^4}$

$\delta w = \frac{3\%}{100}, \delta d = \frac{-2\%d}{100}, \delta t = \frac{4t}{100}$

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

$$= \frac{d^4}{t^3}\left(\frac{3w}{100}\right) + \frac{4wd^3}{t^3}\left(\frac{-2\frac{1}{2}d}{100}\right) - \frac{8wd^4}{t^4}\left(\frac{4t}{100}\right)$$

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

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

$$= y\left(-19/100\right)$$

$= -19\%$ of y

y decrease by 19%