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1. Equation, $P = \frac{E^2}{R}$

$E = 200V$, $R = 8\Omega$, $\delta E = -5$, $\delta R = 0.2$

$P = f(E, R)$

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

$\frac{\delta P}{\delta E} = 2ER^{-1}$ $\quad \frac{\delta P}{\delta R} = -E^2R^{-2})$

$\frac{\delta P}{\delta E} = \frac{2E}{R} = \frac{2(200)}{8} = 50$

$\frac{\delta P}{\delta R} = -E^2R^{-2} = -(200)^2(8)^{-2}$

$= -625$

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

$\delta P = -250 - 125$

$\delta P = -375\,W$

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

w = total load, d = diameter of plate

t = thickness, K is a constant

w = 3%, d = 2.5%, t = 4%

$y = Kwd^4t^{-3}$, $y = f(wdt)$

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

$\delta w = 3w/100$ $\quad \delta d = 2.5d/100$ $\quad \delta t = 4t/100$

$\frac{\delta y}{\delta w} = Kd^4t^{-3}$, $\frac{\delta y}{\delta d} = 4Kwd^3t^{-3}$ $\quad \frac{\delta y}{\delta t} = -3Kwd^4t^{-4}$

$\delta y = \frac{Kd^4}{t^3}\left[\frac{3w}{100}\right] + \frac{4Kwd^3}{t^3}\left[\frac{2.5d}{100}\right] - \frac{3Kwd^4}{t^4}\left[\frac{4t}{100}\right]$

$\frac{3Kd^4w}{100t^3} + \frac{10Kwd^4}{100t^3} + \left(\frac{-12Kwd^4}{100t^3}\right)$

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$$y = \frac{Kwd^4}{t^3}\left[\frac{3}{100} + \frac{10}{100} - \frac{12}{100}\right]$$

$$y = \frac{Kwd^4}{t^3}\left[\frac{1}{100}\right] = 1\%$$

∴ the percentage change in y is 1%