...no: 16/ENG04/053
...se code:
...partment: Elect / Elect

The power P dissipated in a resistor is given as in equations

$$P = \frac{E^2}{R}$$

If E = 200 volts and R = 8 ohms, find the change in P resulting from a drop of 4 volts in E and an increase of 0.2 ohms in R

Soln

$$E_r = \frac{\partial P}{\partial E} \quad \text{set} \quad \frac{\partial e}{\partial R} \; \delta_1$$

$$P = E^2 R^{-1} \qquad \frac{\partial P}{\partial r} = -\frac{E^2}{R^2}$$

$$\partial P = 2ER^{-1} = \frac{\partial E}{R}$$

$R = 8, \; E = 200, \; \delta r = 0.2 \qquad \delta e = -5$

$$\delta p = 2\frac{(200)(-5)}{8} - \frac{(200)^2(0.2)}{8}$$

$$= -2.80 - 125 = -375 \text{ w}$$

Power dissipated by 375 volts

(2) The deflection y at the centre of a circular plate supported at the edge and uniformly loaded is given in equation 2

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

where w = total load, d = diameter of plate, t = thickness and k is a constant

$$\delta y = k\left[\frac{\partial y}{\partial w}\delta w + \frac{\partial y}{\partial d}\delta d + \frac{\partial y}{\partial t}\delta t\right]$$

$$\frac{\partial y}{\partial w} = \frac{\partial}{t^3} + \frac{\partial y}{\partial d} = \frac{4kwd^3}{t^3} = \frac{\partial y}{\partial t} = \frac{-3wd^2}{t^4}$$

$\delta w = 3\%_{100}$, $\delta d = 5\%_{200}$ $\delta t = 4\%_{100}$

$$\delta y = \left[\frac{kd^4}{t^3}\left[\frac{3w}{100}\right] + \frac{kwd^3}{t^3}\left[\frac{\delta d}{2w}\right] = \frac{k^2wd^4}{t^4}\left[\frac{4t}{100}\right]\right]$$

$$\delta y = \frac{3kwd^4}{100t^3} + \frac{10wd^4k}{200t^3} - \frac{kwd^4}{100t^3}$$

$$\delta y = \frac{1}{100}\left[3y + 10y - 12y\right]$$

$$\delta y = \frac{1}{100}(y)$$

$$\delta y = \frac{1}{100}y$$

y increases by 1/100 percent.