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DEPT: MECHANICAL ENGINEERING
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1) The Power, P, dessipated in a resistor is given by $P = E^2/R - I^2$
E = 200 Volts and R =

2) The deflection y at the centre of a circular plate suspended at the edge and uniformly loaded is given as

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

where w = total load, d = diameter of plate, t = thickness and k is a constant. Calc the approximate percentage change in y if w is increased by 3 per cent, d is increased by 2½ per cent and t is increased by 4 per cent.

SOLUTION

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

$$\frac{\partial y}{\partial w} = \frac{d^4}{t^3}, \quad \frac{\partial y}{\partial d} = \frac{4wd^3}{t^3}, \quad \frac{\partial y}{\partial t} = \frac{-3wd^4}{t^4}$$

$$\partial w = \frac{3w}{100}, \quad \delta d = \frac{5d}{200}, \quad \partial t = \frac{4t}{100}$$

$$\delta y = \left(\frac{kd^4}{t^3}\left(\frac{3w}{100}\right) + \frac{k4wd^3}{t^3}\left(\frac{5d}{200}\right) - \frac{k3wd^4}{t^4}\left(\frac{4t}{100}\right)\right)$$

$$\delta y = \frac{3kwd^4}{100t^3} + \frac{20wd^4k}{200t^3} - \frac{12kwd^4}{100t^3}$$

$$\delta y = \frac{1}{100}\left(\frac{3kwd^4}{t^3} + \frac{10kwd^4}{t^3} - \frac{12kwd^4}{t^3}\right)$$

$$\delta y = \frac{1}{100}(3y + 10y - 12y)$$

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

$\therefore$ y increases by $\frac{1}{100}$ percent

1) The power P dessipated in a resistor is given by $P = E^2/R$ if $E = 200v$ and $R = 8$ ohms, find the change in P resulting from a drop of 5 volts in E and an increase of 0.2 ohms in R.

SOLUTION

$$\partial P = \frac{\partial P}{\partial I}\partial e + \frac{\partial P}{\partial R}\partial r$$

$P = E^2 R^{-1}$

$R = 8 \qquad \partial r = 0.2$

$E = 200 \qquad \partial e = -5$

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

$$\therefore \frac{\partial P}{\partial E} = \frac{2E}{R}$$

$$\partial P = \frac{2 \times 200 \times (-5)}{8} - \frac{(200)^2 (0.2)}{8^2}$$

$$\partial P = -250 - 125$$

$$\therefore \partial P = -375 w$$

$\therefore$ Power decreases by 375 watts