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COMPUTER ENGINEERING
ENG 281
ASSIGNMENT 3

1. The power P dessipated in a resistor is given by $P = \frac{E^2}{R}$ If E = 200volts and R = 8ohms, find the change in P, resulting from a drop of 3 volts in E and an increase of 0·2 ohms in R.

Answer.

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

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

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

$$= \frac{2E}{R}.$$

$R = 8, \quad E = 000, \quad \delta r = 0·2, \quad \delta e = -5$

$$\delta P = \frac{(2)(200)(-3)}{8} - \frac{(200)^2 (0·2)}{8^2}$$

$$= -250 - 125$$

$$= -375w$$

hence power decreases by 375 watts.

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.

Calculate the approximate percentage change in y if w is increased by 3 percent, d is increased by $2\frac{1}{2}$ per cent and t is increased by 4 per cent.

Ans.

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

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

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

$$\delta y = \left(\frac{kd^4}{t^3}\left(\frac{3w}{100}\right) + k\frac{4wd^3}{t^3}\left(\frac{5d}{2w}\right) - \frac{kwd^4}{t^4}\left(\frac{4t}{kw}\right)\right)$$

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

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

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

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

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

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