NAME: GAMBA ABDULMALIK IBRAHIM

MATRIC NO: 16/ENG05/028

DEPT: CIVIL ENG

LEVEL: 200

1 The power P dissipated in a resistor is given as in eqn 0

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

If E = 200 volts 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

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

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

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

$E = 200V$

$R = 8\Omega$

$\delta E = -5V$

$\delta R = 0.2\Omega$

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

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

$$\frac{\partial P}{\partial R} = \frac{R(0) - E^2(1)}{R^2} = \frac{-E^2}{R^2}$$

$$\delta P = \frac{2E}{R}\cdot\delta E + \left(\frac{-E^2}{R^2}\right)\delta R$$

$$= \left[\frac{2 \times 200}{8} \times -5\right] + \left[\frac{-200^2}{8^2} \times 0.2\right]$$

$$= -250 - 125$$

$$\delta P = -375 \text{ Watts}$$

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

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

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 per cent, d is increased by 2½ per cent and t is increased by 4 per cent

Solution

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

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

$$\delta W = \frac{3W}{100}$$

$$\delta d = \frac{2.5d}{100}$$

$$\delta t = \frac{4t}{100}$$

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

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

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

$$\frac{\partial y}{\partial t} = \frac{-4Kwd^4}{t^5}$$

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

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

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

$$= \frac{1}{100}\frac{Kwd^4}{t^3}$$

$$\delta y = \underline{1\% \text{ of } y}$$