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COMPUTER ENGINEERING
ENG 203
Questions

1) The Power P dissipated in a resistor is given as in Equation (1)

$$P = \frac{E^2}{R} \quad \text{——— (1)}$$

if E = 200volts and R = 80ohms, find the change in P resulting from a drop of 5volts in E and an increase of 0.2ohms in R.

2 The deflection Y at the Centre of a circular plate suspended at the edge and Uniformly loaded is given in Equation (2)

$$Y = \frac{KWd^4}{t^3} \quad \text{——— (2)}$$

Where W = total load,
d = diameter of plate
t = the thickness and
K is a constant

Calculate the approximate percentage change in Y if W is increased by 3%, d is increased by 2½% and t is increased by 4%

Solutions

1) from equation (1)

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

$$\Rightarrow \frac{\partial P}{\partial R} = \frac{-E^2}{R^2} \quad \text{and} \quad \frac{\partial P}{\partial E} = \frac{2E}{R}$$

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

where

$$\frac{\partial P}{\partial R} = \frac{-E^2}{R^2} = \frac{-(200)^2}{8^2} = \frac{40,000}{64} = 625$$

$$\frac{\partial P}{\partial E} = \frac{2E}{R} = \frac{2 \times -(200)}{8} = \frac{-400}{8}$$

$$= -50$$

$\partial R = 0.2\ \Omega$, $\partial E = 5V$

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

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

$$= -125 - 250$$

$$\therefore \delta P = -375$$

2 from equation 2

$$Y = \frac{KWd^4}{t^3}$$

$$\Rightarrow \frac{dy}{dW} = \frac{Kd^4}{t^3} \; ; \frac{dY}{\partial d} = \frac{4Wd^3}{t^3} \; , \frac{\partial W}{\partial t} = \frac{-3KWd^4}{t^4}$$

$$\Rightarrow \partial Y = \left[\frac{Kd^4}{t^3} \times \frac{3w}{100}\right] + \left[\frac{4Wd^3}{t^3} \times \frac{2.5d}{100}\right]$$

$$+ \left[\frac{-3KWd^4}{t^4} \times \frac{4t}{100}\right]$$

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

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

$$= \left(\frac{1}{100}\right)\frac{KWd^4}{t^3}$$

$\partial y = 1\%$ of Y