NAME :- ABALI ERNEST DATONYE

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Dept :- Mech Eng

1.) The power P dissipated in a resistor is given by $P = E^2/R$ if, $E = 200$ volts and $R = 80$ ohms, find the change in P, resulting from a drop of 3 volts in E and an increase of 0.2 ohms

Soln

$$\delta P = \frac{\partial P}{\partial E}, \delta E + \frac{dP}{dR}$$

$$P = E^2 R^{-1} \qquad \frac{dP}{dr} = -\frac{r^2}{A^2}$$

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

$R = 8$, $E = 200$, $\delta R = 0.2$, $\delta E = -5$

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

$$= -250 - 125$$

$$= -375$$

Hence power decreases by 375 volts.

2) Calculate the approximate percentage change in y if w is increased by 3 percent, d is increased by 2½ percent as t is increased by 4 percent.

Soln

$$\delta y = w\left(\frac{dy}{dw}\delta w + \frac{dy}{dd}\cdot\delta d + \frac{dy}{dt}\delta t\right)$$

$$\frac{dy}{dw} = \frac{d^4}{t^5}, \quad \frac{dy}{dd} = \frac{4d^3}{t^3} = \frac{dy}{dt} = \frac{-5wd^4}{t^6}$$

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

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$$\delta y = \left(\frac{kd^4}{t^3}\left(\frac{3w}{w}\right)\right) + 4\kappa + wd^3\left(\frac{8d}{2w}\right) = \frac{kwd^4}{t^2}\left(\frac{4d}{w}\right)$$

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

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

$$\delta y = \frac{1}{100}(11y)$$

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

$\therefore$ y increases by 1/100 percent.

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