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DCHAI MICHAEL . I

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MECHATRONICS ENGINEERING.

ENG 281

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ASSIGNMENT 3.

$$1) P = \frac{E^2}{R}$$

$$E = 200V$$

$$R = 80 \text{ ohms.}$$

$$\Delta E = -5V$$

$$\Delta R = 0.2 \text{ ohms.}$$

$$\frac{dP}{dE} = \frac{2E}{R}$$

$$\frac{dP}{dR} = \frac{-E^2}{R^2}$$

$$\Delta P = \frac{dP}{dE} \Delta E + \frac{dP}{dR} \Delta R$$

$$= \frac{2E(-5V)}{R} + \frac{-E^2}{R^2} (0.2)$$

$$= \frac{2(200)(-5)}{80} + \frac{(-200^2)(0.2)}{80^2}$$

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

$$= -250 + 125$$

$$\Delta P = -125W.$$

$$2) y = \frac{Kwd^4}{t^3}$$

$$\Delta w = +3\% w$$

$$\Delta d = +2.5\% d$$

$$\Delta t = +4\% t$$

$$\frac{dy}{dw} = \frac{Kd^4}{t^3}, \quad \frac{dy}{dd} = \frac{4Kwd^3}{t^3}, \quad \frac{dy}{dt} = \frac{-3Kwd^4}{t^4}$$

$$\Delta y = \frac{dy}{dw} \Delta w + \frac{dy}{dd} \Delta d + \frac{dy}{dt} \Delta t$$

$$\Delta y = \frac{Kd^4}{t^3} (0.03w) + \frac{4Kwd^3}{t^3} (0.025d) + \frac{(-3Kwd^4)}{t^4} (0.04t)$$

$$\Delta y = \frac{0.03Kwd^4}{t^3} + \frac{0.1Kwd^4}{t^3} = \frac{0.12Kwd^4}{t^3}$$

$$\Delta y = \frac{Kwd^4}{t^3} (0.03 + 0.1 - 0.12)$$

$$\Delta y = 0.01 \frac{Kwd^4}{t^3}$$

$$\Delta y = \pm 1\% y$$