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16/ENG04/021
Elect/Elect Engr.
ENG 281 (Engineering Maths) Assignment 3

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

$$\delta P = \frac{\delta P}{\delta \mathcal{E}} \delta \mathcal{E} + \frac{\delta P}{\delta R} \delta R$$

$$\frac{\delta P}{\delta \mathcal{E}} = \frac{2\mathcal{E}}{R}$$

$$\frac{\delta P}{\delta R} = -\frac{\mathcal{E}^2}{R^2}$$

$\delta \mathcal{E} = -5$ Volts.
$\delta R = 0.2$ ohm
$\mathcal{E} = 200$ Volts
$R = 8$ ohms

$$\delta P = \left[\frac{2\mathcal{E}}{R} \times (-5)\right] + \left(\frac{-\mathcal{E}^2}{R^2}\right) \times 0.2$$

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

$$\delta P = \left[\frac{400}{8} \times -5\right] + \left[\frac{40000}{64} \times \frac{2}{10}\right]$$

$$\delta P = (50 \times -5) + (62.5 \times 2)$$

$$\delta P = -250 + 125$$

$\delta P = -125$ Watts i.e. a decreases in power o

2. $y = kwd^4$

$$\delta y = \frac{\delta y}{\delta w} \delta w + \frac{\delta y}{\delta y} \delta d + \frac{\delta y}{\delta t} \delta t$$

$$\frac{\delta y}{\delta w} = \frac{kd^4}{t^3}$$

$$\frac{\delta y}{\delta t} = -\frac{3kwd^4}{t^4}$$

$$\delta w = \frac{3}{100} \times w = \frac{3w}{100}$$

$$\delta d = \frac{5}{200} \times d = \frac{5d}{200}$$

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

$$\delta y = \left(\frac{kd^4}{t^3} \times \frac{3w}{100}\right) + \left(\frac{4kwd^3}{t^3} \times \frac{5d}{200}\right) + \left(\frac{-3kwd^4}{t^3} \times \frac{4t}{100}\right)$$

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

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

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

$\therefore \delta y = 1\%$ increase of y