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LMS Assignment III

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ENG 281 (Engineering Maths)

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

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

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

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

$\delta E = -5$ volts
$\delta R = 0.2$ ohm
$E = 200$ volts
$R = 8$ ohms

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

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

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

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

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

$\delta P = -125$ watts

i.e. a decrease in Power of 125 watts.

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

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

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

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

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

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

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

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

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

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

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

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

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

δy = 1% increase of y