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Course: ENG281

Matric no:16/ENG05/002

ENG 281 ASSIGNMENT
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DEPARTMENT: MECHANICAL ENGINEERING

① $P = \frac{E}{R}$

$$\frac{dP}{dE} = \frac{d}{dE} \left(\frac{E}{R} \right) = \frac{1}{R} - \frac{E}{R^2} \frac{dR}{dE}$$
$$dE = 5, \quad dR = 0.2, \quad E = 200, \quad R = 8$$
$$dP = \frac{dE}{R} - \frac{E}{R^2} dR$$
$$= \frac{200}{8} (5) - \frac{(200)^2}{8^2} (0.2)$$
$$= \frac{2000}{8} - \frac{8000}{64}$$
$$= 150 - 125$$
$$dP = 25$$

P increases by 3.75 W

② $f = \frac{hw^3}{E^3}$

$$dw = \frac{3w}{100}, \quad dd = -\frac{2d}{100}, \quad dt = \frac{4t}{100}$$
$$\frac{df}{dw} = \frac{3w^2}{E^3}, \quad \frac{df}{dE} = \frac{3hw^3}{E^4}, \quad \frac{df}{dt} = \frac{3hw^3}{E^3} \cdot \frac{4t}{100}$$
$$df = \frac{df}{dw} dw + \frac{df}{dE} dE + \frac{df}{dt} dt$$
$$= \frac{3w^2}{E^3} \left(\frac{3w}{100} \right) + \frac{3hw^3}{E^4} \left(-\frac{2d}{100} \right) - \frac{3hw^3}{E^3} \left(\frac{4t}{100} \right)$$
$$= \frac{d^3 w}{E^3} \left(\frac{3}{100} \right) - \frac{6hd^2}{E^4} \left(\frac{2}{100} \right) - \frac{3wd^3}{E^3} \left(\frac{4}{100} \right)$$
$$= \frac{d^3 w}{E^3} \left(\frac{3}{100} - \frac{12}{100} - \frac{12}{100} \right)$$

$$\frac{d^3 w}{E^3} \left(\frac{-19}{100} \right)$$

Since $y = \frac{d^3 w}{E^3}$

$$= y \left(\frac{-19}{100} \right) = -19 \text{ percent of } y$$

y decreases by 19%