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17/Engou/050

Electrical Engineering

Engg Mathematics

- ① The hypotenous of a right angle triangle is denoted by 'c' and the other two sides are denoted as 'a' and 'b' is $\pm 1.5\%$ find the maximum possible error in calculating:

→ The length of the hypotenous:

Solution



$$\text{Area} = \frac{1}{2} b \cdot a = \frac{1}{2} \cdot b \cdot a = \frac{b \cdot a}{2}$$

$$\frac{\partial A}{\partial a} = \frac{b}{2}, \quad \frac{\partial A}{\partial b} = \frac{a}{2}$$

$$\therefore \delta A = \frac{\partial A}{\partial a} \cdot \delta a + \frac{\partial A}{\partial b} \cdot \delta b$$

$$\delta A = \frac{b}{2} \cdot \frac{1.5 a}{100} + \frac{a}{2} \cdot \frac{1.5 b}{100}$$

$$= \frac{b}{2} \times \frac{1.5 a}{100} + \frac{a}{2} \times \frac{1.5 b}{100}$$

$$\pm 1.5\% = \pm \frac{3}{2} \times 100\% b$$

$$= \frac{36}{200}$$

$$\frac{b}{2} \left[\pm \frac{3b}{200} \right] + \frac{a}{2} \left[\pm \frac{3a}{200} \right]$$

$$= \pm \frac{a \cdot b}{2} \left[\frac{3}{200} + \frac{3}{200} \right]$$

$$= \pm \frac{a \cdot b}{2} \left[\frac{3}{200} + \frac{3}{200} \right]$$

$$= \pm A \left[\frac{3}{100} \right]$$

$$\therefore \Delta A = \pm 3\% \text{ or } \delta A \text{ or } \delta A = \pm 3\%$$

$$b) \quad c = \sqrt{a^2 + b^2} = (a^2 + b^2)^{1/2}$$

$$\therefore \frac{dc}{da} = \frac{1}{2} (a^2 + b^2)^{-1/2} \cdot 2a \left[\frac{dc}{du} \times \frac{du}{da} \right]$$

$$u = (a^2 + b^2)$$

$$\frac{du}{da} = 2a$$

$$\frac{dc}{du} = \frac{u^{-1/2}}{2}$$

$$\therefore \frac{dc}{da} = \frac{1}{2} (a^2 + b^2)^{-1/2} \cdot 2a$$

$$\therefore \frac{dc}{db} = \frac{1}{2} (a^2 + b^2)^{-1/2} \cdot 2b = \frac{b}{\sqrt{a^2 + b^2}}$$

$$= \frac{a^2 + b^2}{2} = 2a$$

$$\frac{dc}{da} = \frac{+3a}{200} \quad \therefore \quad \frac{dc}{db} = \frac{+3b}{200}$$

$$\frac{dc}{dc} = \frac{dc}{da} \cdot da + \frac{dc}{db} \cdot db$$

$$= \left[\frac{a}{\sqrt{a^2 + b^2}} \cdot \frac{+3a}{200} \right] + \left[\frac{b}{\sqrt{a^2 + b^2}} \cdot \frac{+3b}{200} \right]$$

$$= \frac{3}{200} \left[\frac{a^2 + b^2}{\sqrt{a^2 + b^2}} \right]$$

$$= \frac{3}{200} \left[\frac{c^2}{c} \right]$$

$$= \frac{3}{200} [c]$$

$$\frac{dc}{dc} \quad \text{or} \quad dc = 1.5\% \text{ of } c$$