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PETROLEUM ENGINEERING

17/ENGG07/006

ENG 281

ASSIGNMENT (2)

(a) Error percentage = $\pm 1.5\%$

$$= \frac{\pm 1.5}{100}$$

$$= \pm 0.015$$

$$\text{Area of a triangle} = \frac{1}{2} \times a \times b$$
$$= \frac{ab}{2}$$

$$\Delta A = \frac{\partial A}{\partial a} \Delta a + \frac{\partial A}{\partial b} \Delta b$$

$$= \frac{b}{2} (\pm 0.015a) + \frac{a}{2} (\pm 0.015b)$$

$$= \frac{ab}{2} (\pm 0.015) + \frac{ab}{2} (\pm 0.015)$$

$$A = \frac{ab}{2}$$

$$\Delta A = A (\pm 0.015) + A (\pm 0.015)$$

$$= A (\pm 0.015 + (\pm 0.015))$$

$$= A(\pm 0.03)$$

$$= \pm A \cdot 0.03$$

~~± 3%~~

$$= \pm 3\% A$$

$$\therefore \Delta A = \pm 3\% A \text{ or } \pm 0.03A$$

⑤ Length of hypotenuse = C



From Pythagoras theorem

$$C^2 = a^2 + b^2 \quad \text{or}$$

$$C = \sqrt{a^2 + b^2}$$

$$= (a^2 + b^2)^{1/2}$$

Possible error = ± 0.015

$$\frac{\partial C}{\partial a} = \frac{\partial C}{\partial a} \cdot \Delta a + \frac{\partial C}{\partial b} \cdot \Delta b$$

~~ABUAD~~

$$\begin{aligned} \frac{\partial C}{\partial a} \cdot \Delta a &= \frac{1}{2} (a^2 + b^2)^{-1/2} \cdot (2a) \cdot (\pm 0.015a) \\ &= (a^2 + b^2)^{-1/2} \cdot a \cdot (\pm 0.015a) \\ &= \frac{a}{(a^2 + b^2)^{1/2}} \cdot (\pm 0.015a) \\ &= \frac{a^2}{(a^2 + b^2)^{1/2}} \cdot \pm (0.015) \end{aligned}$$

$$\begin{aligned} \frac{\partial C}{\partial b} \cdot \Delta b &= \frac{1}{2} (a^2 + b^2)^{-1/2} \cdot (2b) \cdot (\pm 0.015b) \\ &= (a^2 + b^2)^{-1/2} \cdot b \cdot (\pm 0.015b) \\ &= \frac{b}{(a^2 + b^2)^{1/2}} \cdot (\pm 0.015b) \\ &= \frac{\pm b^2}{(a^2 + b^2)^{1/2}} (0.015) \end{aligned}$$

$$\therefore \partial C = \frac{a^2}{(a^2 + b^2)^{1/2}} (\pm 0.015) + \frac{b^2}{(a^2 + b^2)^{1/2}} (\pm 0.015)$$

$$= \frac{\pm a^2 (0.015)}{(a^2 + b^2)^{1/2}} + \frac{\pm b^2 (0.015)}{(a^2 + b^2)^{1/2}}$$

$$= \frac{\pm a^2 (0.015) + b^2 (0.015)}{(a^2 + b^2)^{1/2}}$$

$$= \frac{\pm a^2 + b^2 (0.015)}{(a^2 + b^2)^{1/2}}$$

$$= \frac{\pm (a^2 + b^2) (0.015)}{(a^2 + b^2)^{1/2}}$$

→ laws of indices

$$\Delta C = \pm (a^2 + b^2)^{-1/2} \cdot (0.015)$$

$$= \pm (a^2 + b^2)^{1/2} \cdot (0.015)$$

$$\text{but } (a^2 + b^2)^{1/2} = C$$

$$\therefore \Delta C = \pm C \cdot 0.015$$

$$= \pm 1.5\% C$$

$$\Delta C = \pm C \cdot 0.015 \text{ or } 1.5\% C //$$