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***MATRIC NO****: 17/ENG05/007*

***COURSE****: ENG281 [ENGINEERING MATHEMATICS}*

***ENGINEERING MATHEMATIC ASSIGNMENT***

*The hypotenus of a right angled triangle is denoted as C, as the other two sides are denoted as* ***a & b****. If the possible error of measuring each of a and b is ± 1.5%. Find the maximum possible error in calculating;*

1. *The area of the triangle*
2. *The length of the hypotenuse*

***Solution***

*a).*

*c*

*a*

*b*

*Area of triangle =* $\frac{1}{2}ab$

*A =* $\frac{1}{2}ab$

***Let A = (a, b)***

$\frac{dA}{da}$ ***=*** $\frac{b}{2}$

$\frac{dA}{db}$ ***=*** $\frac{a}{2}$

***dA =*** $\frac{dA}{da}$ ***\* da +*** $\frac{dA}{db}$ ***\* db***

$\frac{b}{2}$ ***\**** $\frac{\pm 1.5 a}{100}$ ***+*** $\frac{a}{2}$ ***\**** $\frac{\pm 1.5 b}{100}$

$\frac{ab}{2}$$\frac{\pm 1.5 }{100}$ ***+*** $\frac{ab}{2}$$\frac{\pm 1.5 }{100}$

$\pm $$\frac{ab}{2}$$(\frac{ 1.5 }{100}$ ***) + (*** $\frac{ab}{2})$$(\frac{ 1.5 }{100}$ ***)***

$\pm $$\frac{ab}{2}$$(\frac{ 1.5 }{100}$ ***+*** $\frac{ 1.5 }{100}$ ***)***

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

$\pm $ ***0.003*** $\frac{ab}{2}$

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

***dA =*** $\pm $ ***0.003A***

***b).*** $c^{2}= a^{2}+ b^{2}$

***c =*** $\sqrt{a^{2}+ b^{2}}$

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

***Let c = ( a, b)***

$\frac{dC}{da}$ ***= a(*** $a^{2}+ b^{2}$***)-1/2***

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

$\frac{dC}{da}$ ***= b(***$a^{2}+ b^{2}$ ***) -1/2***

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

***dc =*** $\frac{dC}{da}$ ***\* da +*** $\frac{dC}{db}$ ***\* db***

***dc =*** $\frac{a}{\sqrt{a^{2}+ b^{2}}}$ ***(*** $\frac{\pm 1.5 a}{100}$***) +*** $\frac{b}{\sqrt{a^{2}+ b^{2}}}$ ***(*** $\frac{\pm 1.5 b}{100}$***)***

$\frac{1}{\sqrt{a^{2}+ b^{2}}}$ ***\* (*** $\frac{\pm 1.5 a^{2}}{100}$***) +*** $\frac{1}{\sqrt{a^{2}+ b^{2}}}$ ***\* (*** $\frac{\pm 1.5 b^{2}}{100}$***)***

***±***$\frac{1}{\sqrt{a^{2}+ b^{2}}}$ ***(*** $\frac{\pm 1.5 a^{2}}{100}$ ***+*** $\frac{\pm 1.5 b^{2}}{100}$***)***

***±***$\frac{1}{\sqrt{a^{2}+ b^{2}}}$ ***(0.015***$a^{2}$ ***+ 0.015***$b^{2}$***)***

***±***$\frac{1}{\sqrt{a^{2}+ b^{2}}}$ ***0.015(***$a^{2}+b^{2}$***)***

***±*** $\frac{1}{c}$ ***\* 0.015***$c^{2}$

***=± 0.015c***