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***MATRIC NO****: 17/ENG01/005*

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

*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*