PHY 2811 (2009)

Solution of Exp. 4 prelab questions

(1) In Eqn. [1], what is the unit of K?

Ans: $[K]=[\tau/\theta]$=Nm

(2) In Eqn. [6], what is the unit of G?

Ans: dimension $[K]=[G]\dfrac{[a]^4}{[\ell]}=[G]L^3$

$\Rightarrow [G]=\text{Nm}^{-2}$

(3) Using dimensional analysis, show that $m+n+p=3$.

Ans: For a wire, $K=G\dfrac{\pi a^4}{2l}$.

For a strip, $K=CGa^m b^n l^p$.

Compare these two equations, we have dimensions:

$$[K]=\left[G\frac{\pi\ a^4}{2\ell}\right]=[G]\left[\frac{a^4}{\ell}\right]=[G]L^3$$

$$[K]=\left[CGa^m b^n \ell^p\right]=[G][a]^m[b]^n[\ell]^p=[G]L^m L^n L^p=[G]L^{m+n+p}$$

$\Rightarrow L^{m+n+p}=L^3$

$\Rightarrow m+n+p=3$