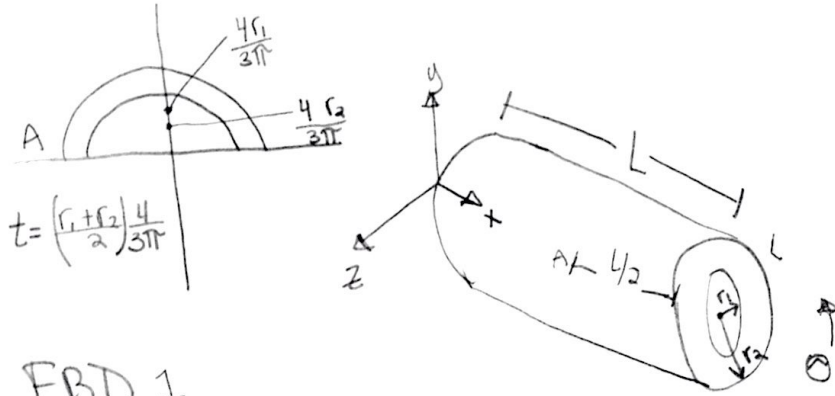


Combined Loading @ The Reel



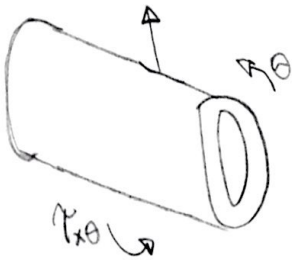
$$A = \frac{\pi}{4} (r_2^2 - r_1^2) = \text{Area}$$

$$J = \text{Momentum} = \frac{\pi}{32} (r_2^4 - r_1^4)$$

$$I = \text{Inertia} = \frac{J}{2} = \frac{\pi}{64} (r_2^4 - r_1^4)$$

FBD 1

TETHER TENSION

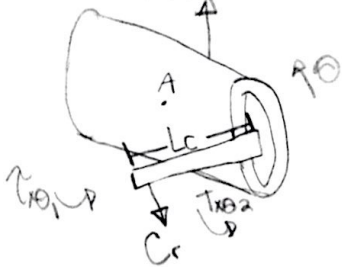


$$T = T(r_2 - r_1) = \text{Torque}$$

$$T_{x\theta} = \frac{T \rho}{J} = \frac{(r_2 - r_1) \rho T}{\frac{\pi}{32} (r_2^4 - r_1^4)} = \frac{32 \rho T (r_2 - r_1)}{\pi (r_2^4 - r_1^4)}$$

FBD 2

TETHER TENSION



$$Q = \frac{r_2^3 \pi}{2} \left(\frac{4r_1}{3\pi} \right) - \frac{r_1^3 \pi}{2} \frac{4r_1}{3\pi} = \frac{2}{3} (r_2^3 - r_1^3)$$

$$T_{x\theta 2} = \frac{T \rho}{J} = \frac{Lc T (r_2 - r_1) \rho}{\frac{\pi}{32} (r_2^4 - r_1^4)}$$

$$\sigma_{xx} = \frac{M_y z}{I_{yy}} = \frac{(C r \frac{1}{2}) Lc}{J/2} = \frac{(Lc)(C) L}{\frac{\pi}{32} (r_2^4 - r_1^4)} = \frac{32 L(Lc) C}{\pi (r_2^4 - r_1^4)}$$

$$T_{xx} = \frac{C r (Q)}{I_{xx}} = \frac{C r \frac{2}{3} (r_2^3 - r_1^3)}{\frac{\pi}{64} (r_2^4 - r_1^4) \frac{r_1 + r_2}{2} \frac{4}{3\pi}} = \frac{64 C r}{r_1 + r_2}$$

$$T_{x\theta} = \frac{32 \rho T (r_2 - r_1)}{\pi (r_2^4 - r_1^4)}$$

$$\Sigma T = \frac{32 T (r_2 - r_1) \rho Lc}{\pi (r_2^4 - r_1^4)} + \frac{64 C r}{r_1 + r_2} + \frac{32 \rho T (r_2 - r_1)}{\pi (r_2^4 - r_1^4)} = \frac{64 C r}{r_1 + r_2} + \frac{32 \rho T (r_2 - r_1) (1 + Lc)}{\pi (r_2^4 - r_1^4)}$$

$$\sigma_{xx} = \frac{32 L(Lc) C}{\pi (r_2^4 - r_1^4)}$$