Problem 1

A miter saw has an operating speed of 1500 rpm. The blade and motor armature have a combined weight of 3 lbs and a radius of gyration of 1 inch.

- What is the time required for the bearing friction alone (T=.015 in lbs) to stop the blade?
- What is the torque a braking system would need to apply to stop the blade in just .25 seconds?

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a)

$$(M)(t) = I(\omega_f - \omega_i)$$

$M = (-.015 \text{ in lbs})\left(\frac{1 \text{ ft}}{12 \text{ in}}\right)$

$I = mk^2$

$\left(\frac{3 \text{ lbs}}{32.2 \frac{\text{ft}}{\text{s}^2}}\right)\left(\frac{1}{12} \text{ ft}\right)$

$\omega_f = 0$

$\omega_i = 157.08 \text{ rad/s}$

$$t = 81.3 \text{ s} = 1.35 \text{ min}$$ no brakes

b

$$(M)(.25\text{s}) = I(\omega_f - \omega_i)$$

same as before

$$M = -.406 \text{ ft lbs} = -4.88 \text{ in lbs}$$ with brakes