

Prob 2

$$(a) \sum \tau_{\text{ext}} = \frac{\Delta L}{\Delta t}$$

when the sum of the external torques is zero
then $\Delta L = 0$

$$(b) I = \sum m r_i^2$$

$$(c) I_i = I_o + 2mr_i^2$$

$$I_f = I_o + 2mr_f^2$$

$$\Delta L = 0 \Rightarrow L_i = L_f \Rightarrow I_i \omega_i = I_f \omega_f$$

$$\omega_f = \frac{I_i}{I_f} \omega_i = \frac{I_o + 2mr_i^2}{I_o + 2mr_f^2} \omega_i$$

$$\omega_f = \left[\frac{3.0 \text{ kg} \cdot \text{m}^2 + 2(10 \text{ kg})(1.0 \text{ m})^2}{3.0 \text{ kg} \cdot \text{m}^2 + 2(10 \text{ kg})(0.25 \text{ m})^2} \right] (0.50 \text{ rad/s})$$

$$\omega_f = \left(\frac{23}{4.25} \right) (0.50 \text{ rad/s})$$

$$\boxed{\omega_f = 2.7 \text{ rad/s}}$$