PROB. 17-6

$$\omega_0 = \left(360 \frac{REV}{MIN}\right)\left(\frac{MIN}{60\,s}\right)\left(\frac{2\pi}{REV}\right) = 12\pi \frac{RAD}{s}$$

$$U_{1-2} = -1500\ ft\text{-}lb, \quad \omega_F = 0.95\,\omega_0 = 0.95 \cdot 12\pi \frac{RAD}{s}$$

a) FIND I

WORK AND ENERGY: $T_1 + U_{1-2} = T_2$

$$\frac{1}{2} I \omega_0^2 + U_{1-2} = \frac{1}{2} I \omega_F^2$$

$$I = \frac{2U_{1-2}}{\omega_F^2 - \omega_0^2} = \frac{2(-1500\ ft\text{-}lb)}{\left(0.95 \cdot 12\pi \frac{RAD}{s}\right)^2 - (12\pi)^2} = 21.65\ ft \cdot lb \cdot s$$

b) $M = 18\ ft\text{-}lb$, FIND $\Delta\theta$ FOR $\omega_F = 360\ RPM = 12\pi \frac{RAD}{s}$

$$T_1 + U_{1-2} = T_2$$

$$\frac{1}{2} I \omega_0^2 + M \cdot \Delta\theta = \frac{1}{2} I \omega_F^2$$

$$\Delta\theta = \frac{I}{2M}\left(\omega_F^2 - \omega_0^2\right) = \frac{(21.65\ ft \cdot lb \cdot s)}{2(18\ ft\text{-}lb)}\left[\left(12\pi \frac{RAD}{s}\right)^2 - (0.95 \cdot 12\pi)^2\right]$$

$$\Delta\theta = (83.33\ RAD)\left(\frac{REV}{2\pi}\right) = 13.26\ REV$$