FALL 06 PE#3

Newton's second law for Block: \[ \vec{F}_{\text{net}} = m \vec{a} \]

\[ Mg - T = ma \] (I)

Newton's second law for Pulley:

\[ \vec{F}_{\text{net}} = I \alpha \]

\[ \tau = RT = I \alpha \]

\[ \frac{R}{I} = \frac{a}{R} \]

\[ T = \frac{R^2 T}{I} \] (II)

\[ R = 0.50 \text{m/} \frac{1}{2} = 0.25 \text{m} \]

\[ I = 0.4 \text{kg-m}^2 \]

\[ a = 6.4 \text{ m/s} \]

\[ \alpha = 6.4 \text{ m/s} \]

Cord does not slip ⇒ \[ R \alpha = a \]

Eliminate \( T \) and solve for \( m \)
\[ T = \frac{aI}{R^2} \rightarrow I \]

\[ M_g = \frac{aI}{R^2} = ma \]

\[ m(g-a) = \frac{aI}{R^2} \]

\[ M = \frac{\frac{aI}{R^2(g-a)}}{(0.25 \text{ m})^2(9.8 - 6.4) \text{ m/s}^2} = \frac{12.047 \text{ kg}}{\text{check}} \]