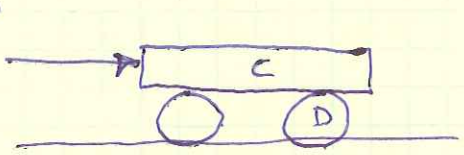
PROB. 17-35

$m_C = 9^{kg}$, $m_D = 6^{kg}$, $r = 0.08^{m}$, $v_0 = 0$, $P = 30^{N}$

FIND v_C AFTER $x - x_0 = 0.25^{m}$

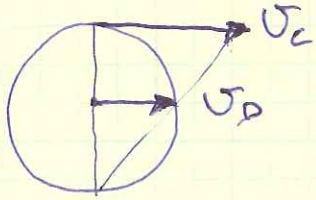


WORK AND ENERGY:

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

$$T_1 = 0, \quad U_{1-2} = P \cdot \Delta x$$

$$T_2 = \frac{1}{2} m_C v_C^2 + \frac{1}{2}\left(2 m_D v_D^2\right) + \frac{1}{2}\left(2 I_D \omega_D^2\right)$$



$$v_D = \frac{1}{2} v_C$$

$$v_C = 2 r \omega_D, \quad \omega_D = \frac{v_C}{2r}$$

$$I_D = \frac{1}{2} m_D r^2$$

$$T_2 = \frac{1}{2} m_C v_C^2 + m_D\left(\frac{1}{2} v_C\right)^2 + \left(\frac{1}{2} m_D r^2\right)\left(\frac{v_C}{2r}\right)^2$$

$$T_2 = \frac{v_C^2}{4}\left(2 m_C + m_D + \frac{1}{2} m_D\right) = \frac{v_C^2}{4}\left(2 m_C + \frac{3}{2} m_D\right)$$

$$0 + P \cdot \Delta x = \frac{v_C^2}{4}\left(2 m_C + \frac{3}{2} m_D\right)$$

$$v_C = \sqrt{\frac{4 P \cdot \Delta x}{\left(2 m_C + \frac{3}{2} m_D\right)}}$$

$$v_C = \sqrt{\frac{4(30^{N})(0.25^{m})}{\left[2(9^{kg}) + \frac{3}{2}(6^{kg})\right]}} = 1.054 \frac{m}{s} \rightarrow$$