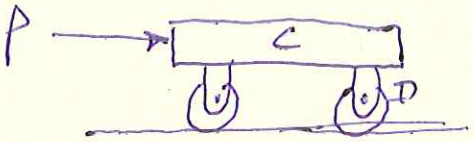
PROB. 17-33

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

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

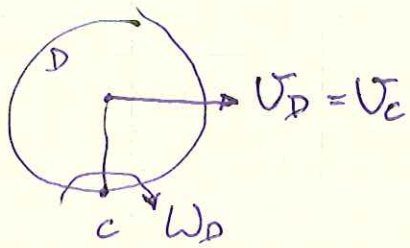


WORK AND ENERGY:

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

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

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



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

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

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

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

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

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

$$v_C = \sqrt{\frac{2(30^{N})(0.25^{m})}{[(9^{kg}) + 3(6^{kg})]}} = 0.7453 \ \frac{m}{s} \rightarrow$$