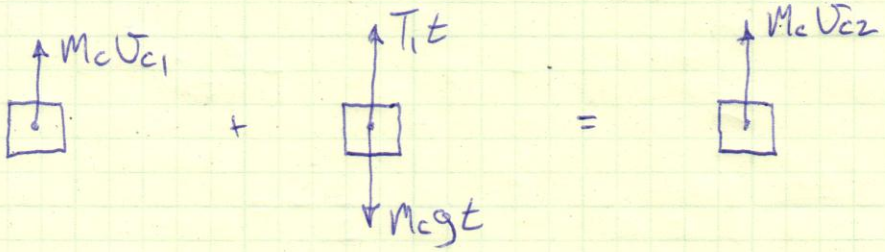
$r_A = 0.2^m$, $r_B = 0.15^m$, $m_A = 10^{kg}$, $m_B = 6^{kg}$, $m_C = 6^{kg}$

$m_D = 10^{kg}$, STARTS FROM REST: FIND t FOR $v_{C2} = 0.5 \frac{m}{s}$

SYSTEM WILL ROTATE CLOCKWISE.

PRINCIPLE OF IMPULSE AND MOMENTUM:

CYLINDER C:

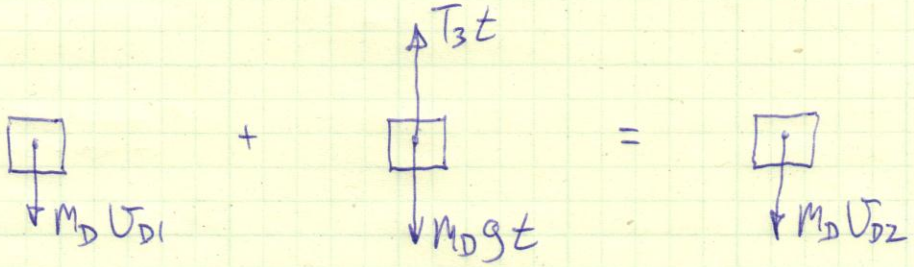


Y-DIR. LIN. MOM. ↑+:

$m_C \cancel{v_{C1}}^{0} + T_1 t - m_C g t = m_C v_{C2}$

$$\boxed{T_1 t = m_C (g t + v_{C2})} \quad (1)$$

CYLINDER D:

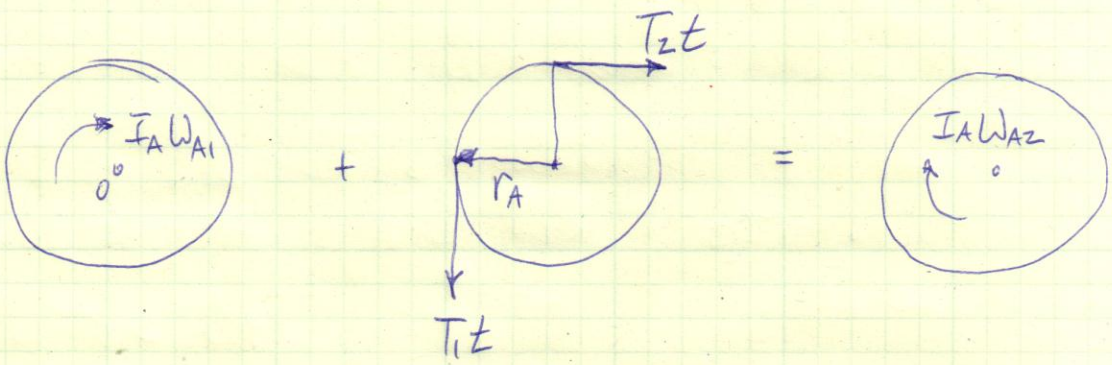


Y-DIR. LIN. MOM. ↓+:

$m_D \cancel{v_{D1}}^{0} + m_D g t - T_3 t = m_D v_{D2}$

$$\boxed{T_3 t = m_D (g t - v_{D2})} \quad (2)$$

DISK A:



ANG. MOM. ABOUT O +↻:

$$-I_A\omega_{A1} + T_1t \cdot r_A - T_2t \cdot r_A = -I_A\omega_{A2}$$

$$T_2t = T_1t + \frac{I_A\omega_{A2}}{r_A}$$

$$I_A = \tfrac{1}{2} m_A r_A^2$$

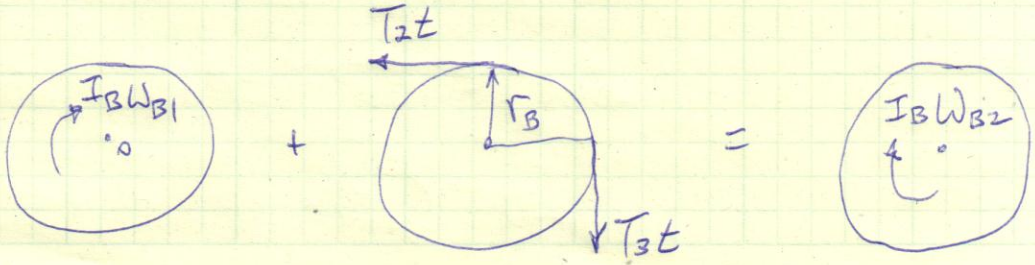
$$T_2t = m_c(gt + v_{c2}) + \tfrac{1}{2} m_A r_A \omega_{A2}$$

KINEMATICS: $v_{c2} = r_A\omega_{A2}$

$$T_2t = m_c(gt + v_{c2}) + \tfrac{1}{2} m_A v_{c2}$$

$$\boxed{T_2t = m_c g t + v_{c2}\left(m_c + \tfrac{1}{2} m_A\right)} \quad ③$$

DISK B:



ANG. MOM. ABOUT O +↻:

$$-I_B\omega_{B1} + T_2 t \cdot r_B - T_3 t \cdot r_B = -I_B \omega_{B2}$$

$$T_2 t = T_3 t - \frac{I_B \omega_{B2}}{r_B}$$

$$I_B = \tfrac{1}{2} m_B r_B^2$$

$$T_2 t = m_D(g t - v_{D2}) - \tfrac{1}{2} m_B r_B \omega_{B2}$$

KINEMATICS: $v_{D2} = r_B \omega_{B2} = v_{C2}$

$$\boxed{T_2 t = m_D g t - v_{C2}\left(m_D + \tfrac{1}{2} m_B\right)} \quad (4)$$

SET (3) = (4):

$$m_C g t + v_{C2}\left(m_C + \tfrac{1}{2} m_A\right) = m_D g t - v_{C2}\left(m_D + \tfrac{1}{2} m_B\right)$$

$$g t (m_D - m_C) = v_{C2}\left(m_C + \tfrac{1}{2} m_A + m_D + \tfrac{1}{2} m_B\right)$$

$$t = \frac{v_{C2}}{g} \cdot \frac{\left[(m_C + m_D) + \tfrac{1}{2}(m_A + m_B)\right]}{(m_D - m_C)}$$

$$t = \frac{\left(0.5 \frac{m}{s}\right)}{\left(9.81 \frac{m}{s^2}\right)} \cdot \frac{\left[(6+10) + \tfrac{1}{2}(10+6)\right]}{(10-6)}$$

$$\boxed{t = 0.3058^{s}}$$