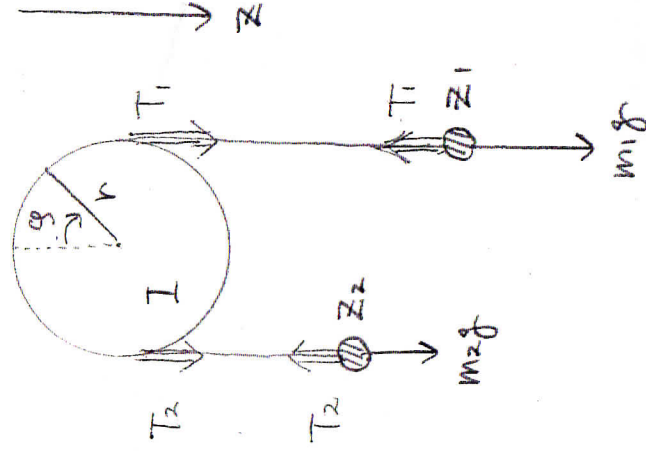


問1.



$$(1) m_1 \ddot{z}_1 = m_1 g - T_1$$

$$m_2 \ddot{z}_2 = m_2 g - T_2$$

$$I \ddot{\theta} = (T_1 - T_2) r \quad // \quad (10)$$

$$(2) \ddot{z}_2 = -\ddot{z}_1, \quad r \ddot{\theta} = \ddot{z}_1 \quad \text{より}$$

$$m_1 \ddot{z}_1 = m_1 g - T_1$$

$$- m_2 \ddot{z}_1 = m_2 g - T_2$$

$$(m_1 + m_2) \ddot{z}_1 = (m_1 - m_2) g - (T_1 - T_2)$$

$$= (m_1 - m_2) g - \frac{I}{r} \ddot{g}$$

$$\begin{aligned} T_1 - T_2 &= \frac{I}{r} \ddot{g} \\ &= (m_1 - m_2) g - \frac{I}{r^2} \ddot{z}_1 \\ \ddot{g} &= \ddot{z}_1 / r \end{aligned}$$

$$\therefore \ddot{z}_1 = \frac{m_1 - m_2}{m_1 + m_2 + \frac{I}{r^2}} g \quad // \quad (10)$$

(3) h 落下する要は時間 t とする。

$$h = \frac{1}{2} \ddot{z}_1 t^2 \quad \therefore t = \sqrt{2h / \ddot{z}_1} \quad \text{落下後の速度は } \dot{z}_1 = \sqrt{2 \ddot{z}_1 h}$$

$\therefore$ 運動エネルギーの増加分は

$$\begin{aligned} \Delta T &= \frac{1}{2} (m_1 + m_2) \dot{z}_1^2 = (m_1 + m_2) \ddot{z}_1 h \\ &= \frac{(m_1 - m_2)(m_1 + m_2)}{m_1 + m_2 + \frac{I}{r^2}} g h \quad // \quad (5) \end{aligned}$$

(4) 位置エネルギーの減少分は

$$\Delta U = (m_1 - m_2) g h$$