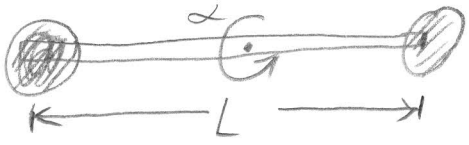
I For Rotating Part:

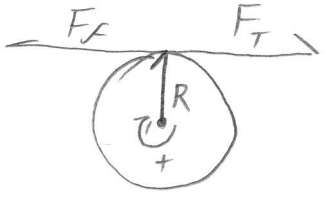
1) 

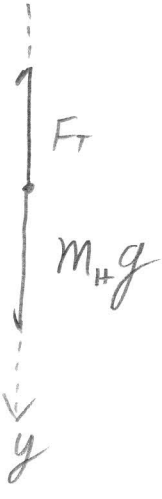
$I_T = I_{ROD} + 2I_W$, $I_{ROD} = \frac{1}{12} m_R L^2$, $I_W = m_W \frac{L^2}{4}$

$I_T = \frac{1}{12} m_R L^2 + 2 m_W \frac{L^2}{4 \cdot 2}$

$$\boxed{I_T = \left(\frac{1}{12} m_R + \frac{1}{2} m_W\right) L^2}$$

2) FBD





Cylinder

$R F_T - R F_f = I\alpha$

$\Rightarrow F_T - F_f = \frac{I}{R}\alpha$ ①

Hanging mass

$m_H g - F_T = m_H a$

$\Rightarrow F_T = m_H g - m_H a$ ②

Eliminate F_T

② → ①: $m_H g - m_H a - F_f = \frac{I}{R}\alpha$, $a = R\alpha$

$\Rightarrow \alpha = \frac{a}{R}$

$\Rightarrow m_H g - m_H a - F_f = \frac{I}{R^2} a$

$m_H g - F_f = \left(m_H + \frac{I}{R^2}\right) a$

$$\Rightarrow \boxed{a = \frac{m_H g - F_f}{m_H + I/R^2}}$$

(3) Kinematics

$y = y_0^{\,0} + v_0^{\,0} t + \frac{1}{2} a t^2$ ~~$v = v_0 + at$~~ don't care

$$\boxed{d = \frac{1}{2} a t^2}$$

$$\Rightarrow d = \frac{1}{2} \frac{m_H g - F_L}{m_H + I/R^2} t^2$$

$$\Rightarrow \frac{2d}{t^2} = \frac{m_H g - F_L}{m_H + I/R^2} \Rightarrow \frac{2d}{t^2}\left(m_H + I/R^2\right) = m_H g - F_L$$

$$\Rightarrow \boxed{F_L = m_H g - \frac{2d}{t^2}\left(m_H + \frac{I}{R^2}\right)}$$