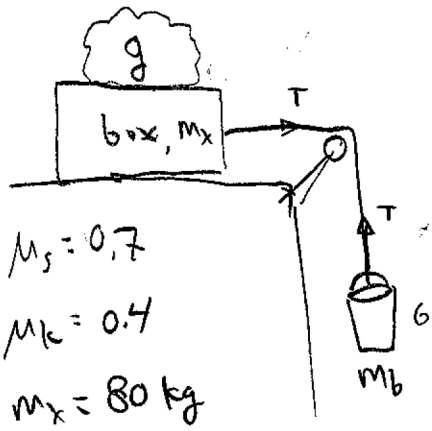
HOMEWORK 7 SOLNS

7.39 (a)



$\mu_s = 0.7$

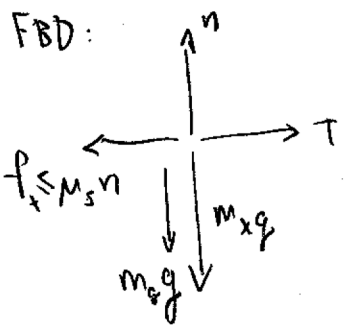
$\mu_k = 0.4$

$m_x = 80$ kg

$f_g = 0$ Friction on gravel

at rest, $T = m_b g$

Box FBD:



So: $n = (m_g + m_x) g$

$f_x = T = m_b g = 65\,kg \cdot 9.8 \frac{m}{s^2} = 637\,N$. friction on box.

b) $\Delta U + \Delta K - W_f = 0$ (n, Δx)

$$-m_b g h + \frac{1}{2}(m_b + m_x)v^2 + \mu_k m_x g \cdot h = 0$$

$$v^2 = \frac{2gh}{m_b + m_x}\left(m_b - \mu_k m_x\right) = 4g \cdot \frac{33}{145}\ [m]$$

$V = 3$ m/s

From $F = ma$

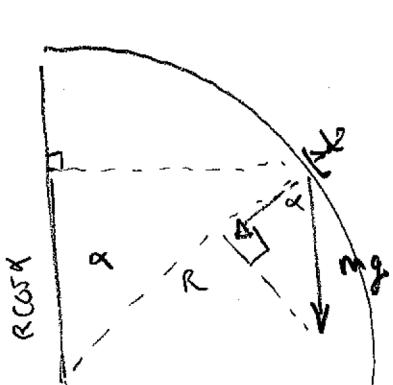
$m_b g - T = m_b a$

$T - \mu_k m_x g = m_x a$

$m_b g - \mu_k m_x g = (m_b + m_x) a$

Then use $v^2 = 2ax = \dfrac{2gh}{m_b + m_x}(m_b - \mu_k m_x)$

7.63. Contact lost when $(mg)_{rad} \le F_{rad} = \frac{mv^2}{R}$



$\frac{1}{2}mv^2 = mgR(1-\cos\alpha)$ Energy cons.

$\frac{mv^2}{R} = 2mg(1-\cos\alpha) = F_{RAD}$.

$(mg)_{rad} = mg\cos\alpha$

So critical point is $\cos\alpha = 2(1-\cos\alpha)$

$\cos\alpha = 2/3$ $\alpha = 48.2°$