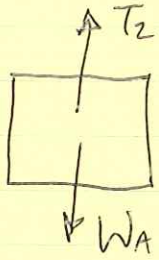
PROB. 8.122

$\mu_s = 0.40$, $m_A = 12\ kg$, $W_A = (12)(9.81) = 118\ N$

FIND $M_{B,MIN}$ FOR EQUILIBRIUM.

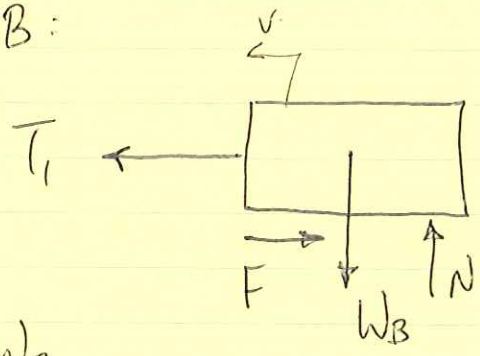
IMPENDING MOTION.

FBD MASS A:



$T_2 = W_A$

FBD MASS B:

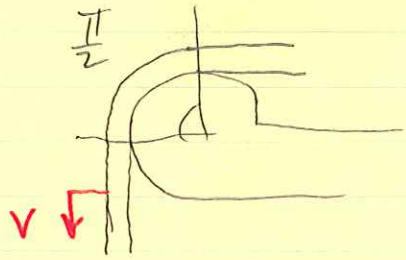


$\Sigma F_x = 0: \quad T_1 = F$

$\Sigma F_y = 0: \quad N = W_B$

$F = \mu_s W_B$ ~~$= \mu_s N$~~

$T_1 = \mu_s W_B$



RELATION FOR BELT FRICTION:

$\frac{T_2}{T_1} = e^{\mu_s \beta}$ IN THIS CASE, $\beta = \frac{\pi}{2}$

$\frac{W_A}{\mu_s W_B} = e^{\frac{\pi}{2}\mu_s}$, $W_B = \frac{W_A}{\mu_s} \cdot e^{-\frac{\pi}{2}\mu_s}$

$W_B = \frac{(118\ N)}{(0.4)} e^{-\frac{\pi}{2}\cdot 0.4} = 157\ N$, $M_B = \frac{W_B}{g} = 16.0\ kg$