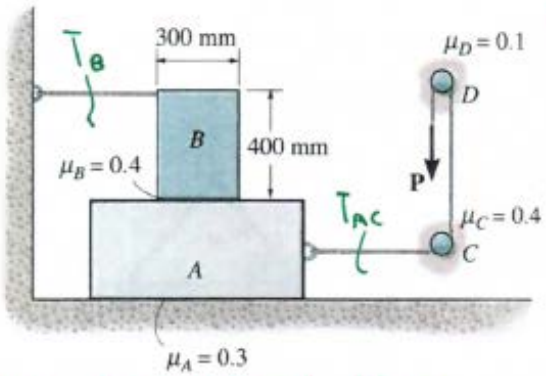
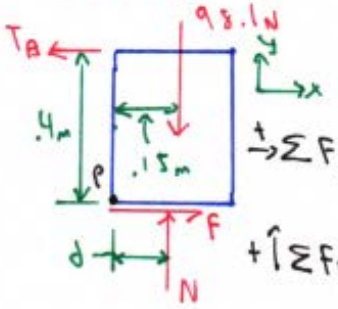
Problem 2 – Friction IV

Blocks A and B have a mass of 7 kg and 10 kg respectively. Using the coefficients of static friction shown, determine the largest force P which can be applied without causing motion



FBD of B



$\rightarrow \Sigma F_x = 0 = F - T_B$

$F = T_B$

$+\uparrow \Sigma F_y = 0 = N - 98.1$

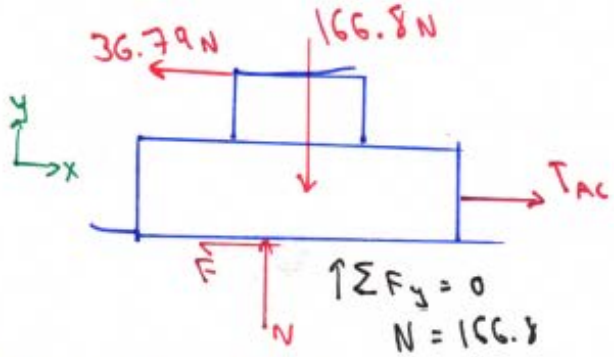
$N = 98.1\,N$

⊙ Impending Slip

$F = \mu N = 0.4(98.1)$

$\therefore T_B = 39.24\,N$

* Assuming A will not Tip:



$\uparrow \Sigma F_y = 0$

$N = 166.8$

⊙ Impending Tip ($d = 0$)

$\circlearrowleft \Sigma M_P = 0 = 98.1 \cdot 0.15 - .4 T_B$

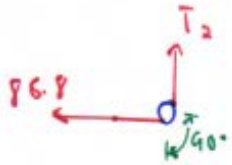
$\therefore T_B = 36.79\,N$

* Will Tip First $T_{Bmax} = 36.79\,N$

⊙ Impending Slip

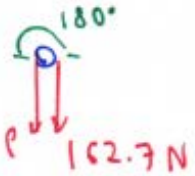
$\rightarrow \Sigma F_x = 0 = T_{AC} - 36.79\,N - 0.3 \cdot 166.8\,N \qquad \therefore T_{AC} = 86.8\,N$

⊙ C



$T_2 = 86.8\, e^{.4 \cdot \frac{\pi}{2}} = 162.7\,N$

⊙ D



$P = 162.7\, e^{.1(\pi)} = 223\,N \downarrow$

$\therefore P = 223\,N \downarrow$