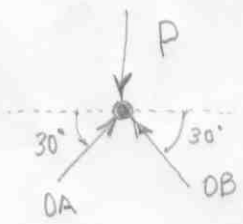
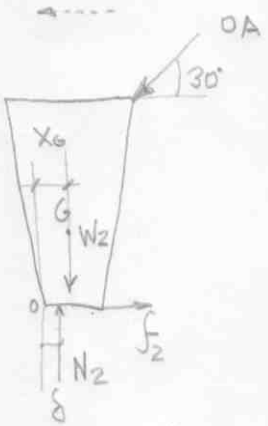
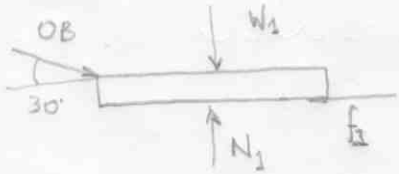
P1 :



DCL (O)



DCL (W_2)



DCL (W_1)

⇝ DCL (O)

$\rightarrow \pm \sum F_x^E = 0$, $OA = OB$

$+\uparrow \sum F_y^E = 0$, $2OA\,SEN(30^\circ) = P$

$\boxed{OA = P}$ . . . ①

⇝ DCL (W_2)

$\rightarrow \sum F_x^E = 0$, $f_2 = P\cos(30^\circ)$

$+\uparrow \sum F_y^E = 0$, $N_2 = W_2 + P\,SEN(30^\circ)$

$+\circlearrowleft \sum M_O^E = 0$, $X_G W_2 - \delta N_2 - P\cos(30)\cdot 3 + P\,SEN(30^\circ)\cdot 1.5 = 0$

$X_G = ?$, $X_G = 0.5$ m POR SIMETRÍA

$$\begin{cases} f_2 = \frac{\sqrt{3}}{2} P \quad \ldots \text{②} \\ N_2 = W_2 + \frac{1}{2} P \quad \ldots \text{③} \\ \frac{1}{2} W_2 - \delta N_2 - \frac{3\sqrt{3}}{2} P + \frac{3}{4} P = 0 \quad \ldots \text{④} \end{cases}$$

⇝ DCL (W_1)

$\pm \sum F_x^E = 0$, $P\cos(30) = f_1$ . . . ⑤

$+\uparrow \sum F_y^E = 0$, $N_1 = W_1 + P\,SEN(30)$ ⑥

$+\circlearrowleft \sum M_i^E = 0$, ⇒ SE ASUME BLOQUE W_1 NO PUEDE VOLCAR

$P_{MIN} = ?$

(a) P^* REQUERIDA PARA DESLIZAMIENTO DE W_1 ⇒ $f_1 = (f_1)_{MÁX} = \mu_s N_1$

⇝ ⑤ $P^* = \frac{2}{\sqrt{3}} \mu_s N_1 = \frac{2}{\sqrt{3}} \mu_s \left(W_1 + \frac{1}{2} P^*\right)$ ⇒ $P^* = \frac{2\mu_s W_1}{(\sqrt{3} - \mu_s)} = 0.838$ kN

(b) P' REQUERIDA PARA DESLIZAMIENTO DE W_2 ⇒ $f_2 = (f_2)_{MÁX} = \mu_s N_2$

②, ③ ⇝ $P' = \frac{2}{\sqrt{3}} \mu_s N_2 = \frac{2}{\sqrt{3}} \mu_s \left(W_2 + \frac{1}{2} P'\right)$ ⇒ $P'\left(1 - \frac{\mu_s}{\sqrt{3}}\right) = \frac{2}{\sqrt{3}} \mu_s W_2$

$P' = \frac{2}{(\sqrt{3} - \mu_s)} \mu_s W_2$ ⇒ $P' = 0.419$ kN

(c) P'' REQUERIDA PARA VOLCAMIENTO DE W_2 ; $\delta = \delta^* = 0$

⇝ ④ $\frac{1}{2} W_2 + \frac{1}{2}\left(\frac{3}{2} - 3\sqrt{3}\right) P'' = 0$ ⇒ $P'' = \frac{2}{3} \frac{W_2}{(2\sqrt{3} - 1)}$ ⇒ $P'' = 0.27$ kN

$P'' = P_{MIN}$ ⇒ VERIFICANDO QUE $f_2 < (f_2)_{MÁX}$ POR ② $f_2 = \frac{\sqrt{3}}{2} P''$

$f_2 = 0.234$ kN , $(f_2)_{MÁX} = \mu_e \left(W_2 + \frac{1}{2} P''\right) = 0.34$ kN

$f_2 \leq (f_2)_{MÁX}$

LA P_{MIN} NECESARIA PARA INICIO DE MOVIMIENTO ES 0.27 kN.