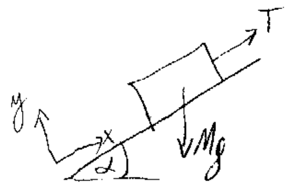
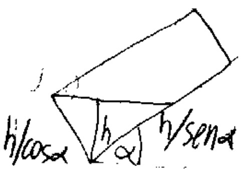
P3) DCL



$\sum F_x = T - Mg\,\text{sen}\,\alpha$

Pero, $M = \rho\forall$



$\Rightarrow M = \frac{\rho b h}{2\,\text{sen}\,\alpha}\cdot\frac{h}{\cos\alpha}$

$\Rightarrow M = \frac{\rho b h^2}{2\,\text{sen}\,\alpha\cos\alpha}$

TCM $\hat{x}$: $\rho Q(V_s - \cancel{V_e}^{\,0}) = T - \frac{\rho b h^2 g}{2\cos\alpha}$; Pero, $V = \sqrt{2gh}$ y $Q = \nu V$

$\Rightarrow \rho\nu\sqrt{2gh}\cdot\sqrt{2gh} = T - \frac{\rho b h^2 g}{2\cos\alpha} \Leftrightarrow T = \frac{\rho b h^2 g}{2\cos\alpha} - 2\rho\nu g h$

Falta ver como varia h con el tiempo, para eso, aplicamos continuidad:

$\frac{d\forall}{dt} = \cancel{Q_e}^{\,0} - Q_s \Leftrightarrow \frac{d}{dt}\left(\frac{bh^2}{\text{sen}(2\alpha)}\right) = -\nu\sqrt{2gh} \Rightarrow \overbrace{\frac{b}{\nu\sqrt{2g}\,\text{sen}(2\alpha)}}^{A}\cdot\frac{dh^2}{dt} = -h^{1/2}$

Cambio de variables: $h^2 = u \Rightarrow A\cdot\frac{du}{dt} = -u^{1/4} \Leftrightarrow Au^{-1/4}du = dt \Leftrightarrow A\int u^{-1/4}du = -\int dt$

$\frac{4}{3}Au^{3/4} = t + K \Leftrightarrow \frac{4}{3}Ah^{3/2} = -t + K$; $h(0) = a\cdot\cos(\alpha) \Rightarrow \frac{4}{3}A(a\cos(\alpha))^{3/2} = K$

$\Leftrightarrow \frac{4}{3}Ah^{3/2} = \frac{4}{3}A(a\cos\alpha)^{3/2} - t \Leftrightarrow h^{3/2} = (a\cos\alpha)^{3/2} - \frac{3t}{4A} \Leftrightarrow h(t) = \left[(a\cos\alpha)^{3/2} - \frac{3t}{4A}\right]^{2/3}$

$\Rightarrow T = \frac{\rho b g}{2\cos(\alpha)}\left((a\cos\alpha)^{3/2} - \frac{3t}{4A}\right)^{4/3} - 2\rho\nu g\left[(a\cos\alpha)^{3/2} - \frac{3t}{4A}\right]^{2/3}$

$\Rightarrow T = \frac{\rho b g}{2\cos\alpha}\left[(a\cos\alpha)^{3/2} - \frac{3t\nu\sqrt{2g}\,\text{sen}(2\alpha)}{4b}\right]^{4/3} - 2\rho\nu g\left[(a\cos\alpha)^{3/2} - \frac{3t\nu\sqrt{2g}\,\text{sen}(2\alpha)}{4b}\right]^{2/3}$