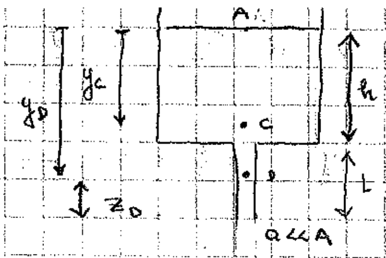
Solución 1er Parcial F2 25/09/2019



Prob 1: Parte 1

$\Delta P_e = P_D - P_C = \rho g (y_D - y_C)$.

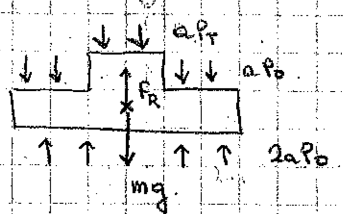
c/flujo: $P_D - \rho g y_D + \frac{1}{2}\rho v_D^2 = P_C - \rho g y_C + \frac{1}{2}\rho v_C^2$

$v_D >> v_C$: a) $P_D - P_C = \rho g (y_D - y_C) - \frac{1}{2}\rho v_D^2 = \Delta P_e - \frac{1}{2}\rho v_D^2 < \Delta P_e$

b) $P_0 = P_C - \rho g y_C \rightarrow P_C = P_0 + \rho g y_C > P_0$

$P_0 = P_D + \rho g z_D$ / $z_D = h + L - y_D$ $\quad P_D = P_0 - \rho g (h + L - y_D) < P_0$

Prob 1 : Parte 2



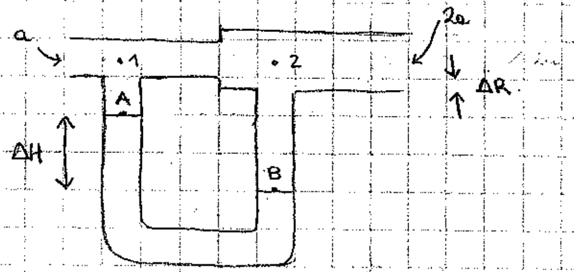
a) $F_R = mg + a(P_T - P_0)$ / $P_T = P_0 + \rho g (h + L)$

$F_R = mg + a\rho g (h + L) = 20,58$ N

b) $P_0 + \rho g h + \frac{1}{2}\rho v_A^2 = P_0 + \rho g L + \frac{1}{2}\rho v_S^2 \longrightarrow v_S \underset{v_A << v_S}{\cong} \sqrt{2g(h-L)} = \boxed{4,43 \text{ m/s} = v_S}$

$\frac{1}{2} v_S^2 = g h_{máx} \longrightarrow \boxed{h_{máx} = 1,0 \text{ m}}$

c)



$P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho v_2^2$

$a v_1 = 2a v_2 \longrightarrow v_2 = \frac{v_1}{2}$

$P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho \frac{v_1^2}{4}$

$P_2 - P_1 = \frac{3}{8}\rho v_1^2 \underset{v_1 = v_S}{=} \frac{3}{4}\rho (h - L) g$

$P_2 + \rho y_B g = P_1 + \rho y_A g + \rho_{Hg} \Delta H g \longrightarrow P_2 - P_1 = \left[\rho \underbrace{(y_A - y_B)}_{-\Delta H} + \rho_{Hg}\Delta H\right] g$

$\Delta R = \sqrt{\frac{2a}{\pi}} - \sqrt{\frac{a}{\pi}} = 3$ mm

$P_2 - P_1 = \frac{3}{4}\rho (h - L) g = (\rho_{Hg} - \rho)\Delta H g \longrightarrow \Delta H = \frac{3/4 (h - L)}{12,6}$

$\boxed{\Delta H = 6,0 \text{ cm}}$

PROB 2 : (1) $\dfrac{\partial^2 y}{\partial t^2} = v^2 \dfrac{\partial^2 y}{\partial x^2}$ / $v^2 = \dfrac{T}{\mu}$

$y(x,t) = f(x - vt) \longrightarrow \dfrac{\partial y}{\partial t} = \dfrac{\partial f}{\partial u}\dfrac{\partial u}{\partial t}$ / $u = x - vt \rightarrow \dfrac{\partial u}{\partial t} = -v$

$\dfrac{\partial u}{\partial x} = 1$

$$\left.\begin{aligned} \frac{\partial^2 y}{\partial t^2} &= +v^2 \frac{\partial^2 f}{\partial u^2} \\ \frac{\partial^2 y}{\partial x^2} &= \frac{\partial^2 f}{\partial u^2} \end{aligned}\right\} \text{cqd}$$

(2)

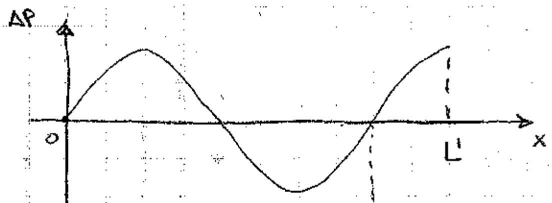
$L = \dfrac{5}{2}\lambda \longrightarrow \lambda = \dfrac{2}{5}L = 1{,}2\,m$. $\lambda \nu = v = \sqrt{\dfrac{T}{\mu}} \underset{\mu = \frac{m}{L}}{=} \sqrt{\dfrac{TL}{m}}$

$\nu = \dfrac{5}{2}\sqrt{\dfrac{T}{mL}} = 42{,}9\,Hz$

(3) $\nu = 42{,}9\,Hz \longrightarrow \lambda' = \dfrac{v_s}{\nu} = 8{,}00\,m$ / $L' = 10{,}0\,m$

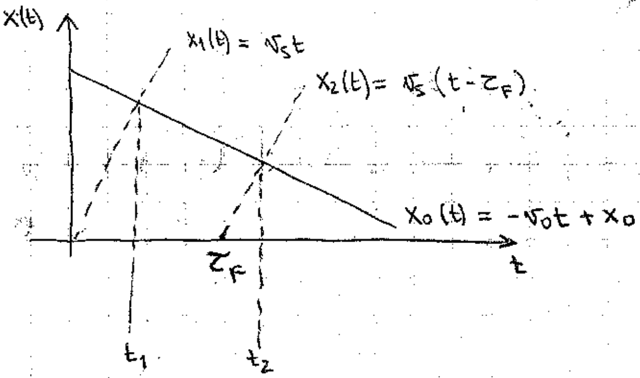
MODOS TUBO ABIERTO - CERRADO : $\lambda'_n = \dfrac{4L'}{2n-1} \longrightarrow 2n - 1 = \dfrac{4L'}{\lambda'_n}$

$n = 3$



$\lambda'_n = \dfrac{4}{5}L$

(4)



$\tau_o = t_2 - t_1 < \tau_F$ $\qquad \tau_o < \tau_F \longrightarrow \nu_o > \nu_F$ ↳ MÁS AGUDO

DEMO: ↓

$$\begin{aligned} v_s(t_2 - \tau_F) &= -v_o t_2 + x_o \\ - \quad v_s t_1 &= -v_o t_1 + x_o \end{aligned}$$

$v_s(t_2 - t_1) - v_s\tau_F = -v_o(t_2 - t_1) \rightarrow (v_s + v_o)(t_2 - t_1) = v_s \tau_F$

$$\tau_o = \frac{\tau_F}{1 + v_o/v_s} < \tau_F$$