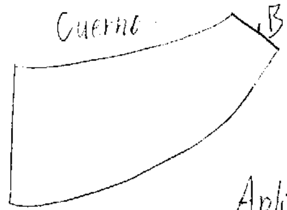
PAUTA P2 C3

a)



$$B_A = B_B + \lambda_s \Leftrightarrow \frac{P_A}{\gamma} + \frac{V_A^2}{2g} = \frac{P_B}{\gamma} + \frac{V_B^2}{2g} + K_C\frac{V_B^2}{2g} \Leftrightarrow K_C\frac{V_B^2}{2g} = \frac{P_A-P_B}{\gamma} + \frac{(V_A^2-V_B^2)}{2g} = \Delta h + \frac{V_A^2-V_B^2}{2g}$$

Aplicando Bernoulli desde el estanque(1) a la descarga final(2): (1,0)

$$B_1 = B_2 + \Sigma\lambda_f + \Sigma\lambda_s \Leftrightarrow z = \frac{V_B^2}{2g} + \frac{FL}{D}\frac{V_A^2}{2g} + \frac{fl}{d}\frac{V_B^2}{2g} + K\frac{V_A^2}{2g} + K_c\frac{V_B^2}{2g}$$

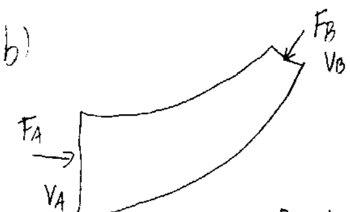
Continuidad: $Q = V_A\frac{\pi D^2}{4} = V_B\frac{\pi d^2}{4}$ (1,0)

$$\Leftrightarrow z = \frac{16Q^2}{2g\pi^2 d^4} + \frac{FL}{D}\cdot\frac{16Q^2}{2g\pi^2 D^4} + \frac{fl}{d}\frac{16Q^2}{2g\pi^2 d^4} + K\frac{16Q^2}{2g\pi^2 D^4} + \Delta h + \frac{1}{2g}\left(\frac{16Q^2}{\pi^2 D^4} - \frac{16Q^2}{\pi^2 d^4}\right) \Leftrightarrow z-\Delta h = \frac{8Q^2}{g\pi^2}\left[\cancel{\frac{1}{d^4}} + \frac{FL}{D^5} + \frac{fl}{d^5} + \frac{K}{D^4} + \frac{1}{D^4} - \cancel{\frac{1}{d^4}}\right]$$

$$\Leftrightarrow Q = \sqrt{\frac{g\pi^2(z-\Delta h)}{8\left[\frac{FL}{D^5}+\frac{fl}{d^5}+\frac{(K+1)}{D^4}\right]}} \ (0{,}7) = \sqrt{\frac{\pi^2\cdot 9{,}8\,(1-0{,}05)}{8\left[\frac{0{,}02\cdot100}{0{,}1^5}+\frac{0{,}016\cdot50}{0{,}05^5}+\frac{(0{,}75+1)}{0{,}1^4}\right]}} = 0{,}002\ [m^3/s] = 2\ [l/s]$$

(0,3)

b)



$F_A = P_A A_A$; Bernoulli desde el estanque hasta A.

$$B_1 = B_A + \lambda_f + \lambda_s \Leftrightarrow z = \frac{P_A}{\gamma} + \frac{V_A^2}{2g} + \frac{FL}{D}\frac{V_A^2}{2g} + K\frac{V_A^2}{2g} \Leftrightarrow z = \frac{P_A}{\gamma} + \frac{8Q^2}{\pi^2 g D^4}\left[(K+1)+\frac{FL}{D}\right]$$

$$\Rightarrow P_A = \gamma\left[z - \frac{8Q^2}{\pi^2 g D^4}\left[(K+1)+\frac{FL}{D}\right]\right] \ (1{,}0) = 9.800\left[1 - \frac{8\cdot0{,}002^2}{\pi^2\cdot9{,}8\cdot0{,}1^4}\left[0{,}75+1+\frac{0{,}02\cdot100}{0{,}1}\right]\right] = 9.094{,}8\left[\frac{kg}{ms^2}\right]$$

$$\Delta h = \frac{P_A}{\gamma} - \frac{P_B}{\gamma} \Leftrightarrow P_B = P_A - \gamma\Delta h = 9.094{,}8 - 9.800\cdot0{,}05 = 8.604{,}8\left[\frac{kg}{ms^2}\right]$$

$+(M_x)$: $$\frac{P_A\pi D^2}{4} - \frac{P_B\pi d^2}{4}\cos\alpha - F_x = \rho Q(V_B\cos\alpha - V_A) \Rightarrow F_x = \frac{\pi}{4}\left(P_A D^2 - P_B d^2\cos\alpha\right) - \frac{4\rho Q^2}{\pi}\left(\frac{\cos\alpha}{d^2} - \frac{1}{D^2}\right)$$ (0,8)

$$\Rightarrow F_x = \frac{\pi}{4}\left(9.094{,}8\cdot0{,}1^2 - 8.604{,}8\cdot0{,}05^2\cdot\cos(55°)\right) - \frac{4\cdot1.000\cdot0{,}002^2}{\pi}\left(\frac{\cos(55°)}{0{,}05^2} - \frac{1}{0{,}1^2}\right) = 61{,}08\ [N]$$ (0,2)

$+(M_y)$: $$F_y - \frac{P_B\pi d^2}{4}\text{sen}\,\alpha = \rho Q(V_B\,\text{sen}\,\alpha) \Rightarrow F_y = \left[\frac{4\rho Q^2}{\pi d^2} + \frac{P_B\pi d^2}{4}\right]\text{sen}\,\alpha$$ (0,8)

$$\Rightarrow F_y = \left[\frac{4\cdot1.000\cdot0{,}002^2}{\pi\cdot0{,}05^2} + \frac{8.604{,}8\cdot\pi\cdot0{,}05^2}{4}\right]\cdot\text{sen}(55°) = 15{,}5\ [N]$$ (0,2)