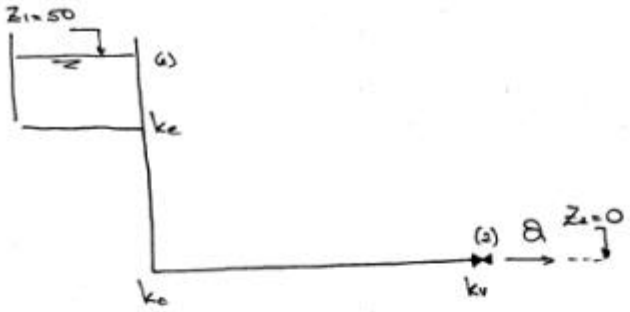

$L = 100\ m$

$D = 200\ mm$

$B_1 = B_2 + h \quad ; \quad h = h_f + h_s$

$h_f = J \cdot L \quad ; \quad J = \frac{f}{D}\frac{v^2}{2g} \quad ; \quad f = 0{,}03$

$h_s = (k_e + k_c + k_v)\frac{v^2}{2g}$

$B_1 = z_1 + \cancel{\frac{p_1}{\gamma}} + \cancel{\frac{v^2}{2g}} = 50 \qquad y \qquad B_2 = \cancel{z_2} + \cancel{\frac{p_2}{\gamma}} + \frac{v^2}{2g} = \frac{v^2}{2g}$

$$\Rightarrow 50 = \frac{v^2}{2g} + \frac{fL}{D}\frac{v^2}{2g} + (k_e + k_c + k_v)\frac{v^2}{2g}$$

$$50 = \frac{v^2}{2g}\left(1 + \frac{fL}{D} + k_e + k_c + k_v\right)$$

pero $v = \frac{Q}{A} = \frac{Q}{\frac{\pi D^2}{4}}$

$$Q = \frac{\pi D^2}{4}\sqrt{\frac{50 \cdot 2g}{\left(1 + \frac{fL}{D} + k_e + k_c + k_v\right)}}$$

$$\Rightarrow \quad Q = 0{,}226\ \frac{m^3}{s} = 226\ \frac{l}{s}$$