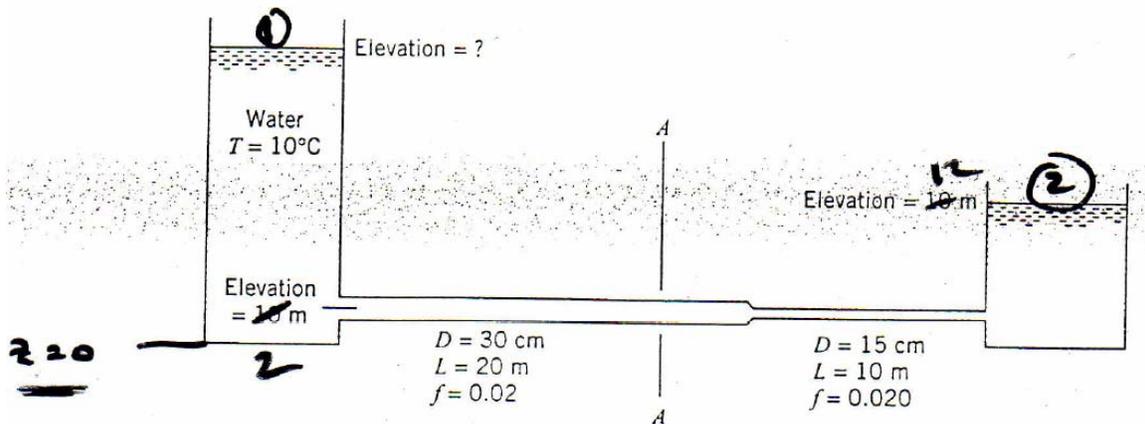


**10.95** Determine the elevation of the water surface in the upstream reservoir if the discharge in the system is  $0.15 \text{ m}^3/\text{s}$ . Carefully sketch the HGL and the EGL, showing relative magnitudes and slopes. Label  $V^2/2g$ ,  $p/\gamma$ , and  $z$  at section  $A-A$ .



**Solution:**

Reservoir to exit ( $z = 0$  exit)

$$\frac{p_1}{\gamma} + \frac{V_1^2}{2g} + z_1 = \frac{p_2}{\gamma} + \frac{V_2^2}{2g} + z_2 + \sum h_L$$

$$z_1 = 12 + \frac{V_{30}^2}{2g} \left( 0.5 + f \frac{L}{D} \right) + \frac{V_{15}^2}{2g} \left( K_C + f \frac{L}{D} + 1.0 \right)$$

$$V_{30} = \frac{Q}{A_{30}} = 2.12 \text{ m/s}$$

$$V_{15} = \frac{Q}{A_{15}} = 8.5 \text{ m/s}$$

$$K_C = K_C \left( 15/30 = 0.5 \right) = 0.37$$

Therefore:

$$z_1 = 22.3m$$

$$HGL = \frac{p}{\gamma} + z$$

$$EGL = HGL + \frac{V^2}{2g}$$

