

- Consider the system of branched pipes in figure 1.1 below. Pipe 1 is **1800m** of **1.25m** diameter, pipe 2 is **458m** of **0.84m** diameter, and pipe 3 is **1534m** of **0.7m** diameter. The velocity of flow in pipe 1 is **2.06m/s**.

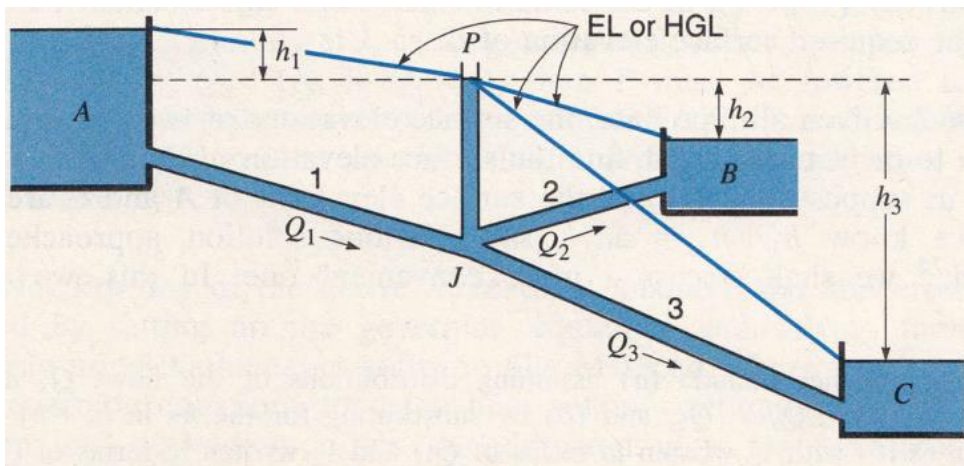


Figure 1.1

- Predict and label on the diagram the elevation height of **P** for which the following conditions would be true.

- $Q_1 = Q_3$
- $Q_1 > Q_3$
- $Q_1 < Q_3$

- If  $h_1 = 15.4\text{m}$ , determine the friction factor for pipe 1 (neglect minor losses).

- The pipes 1, 2 and 3 in the figure 2.1 are 300m of 30cm diameter, 150m of 20cm, 250m of 25cm diameter respectively, of new cast iron conveying  $15^\circ\text{C}$  of water. If  $h = 10\text{m}$ , find the rate of flow from A to B. Estimate the friction factors using the moody diagram.

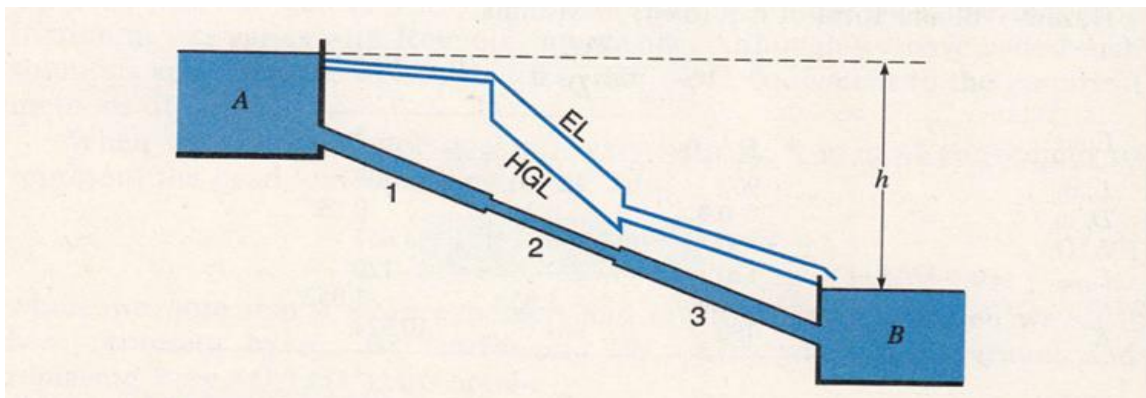


Figure 2.1

3. Water flows from a nozzle to the spray tank shown in figure 3.1 Determine flow rate if the loss coefficient for the nozzle, (based on the upstream,) is 0.75 and the friction factor for the rough hose is 0.11.

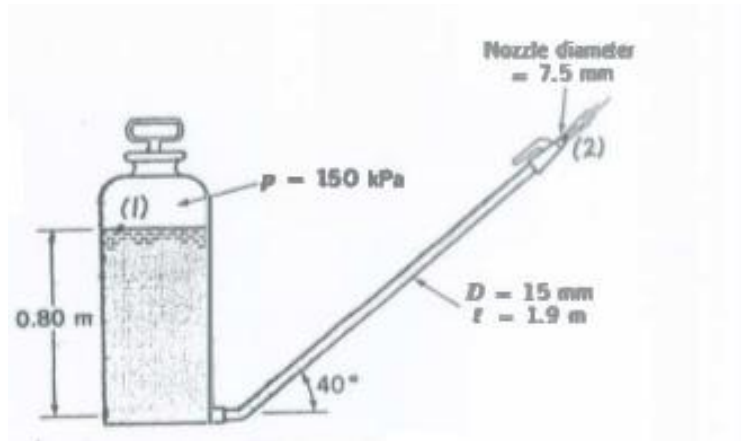


Figure 3.1

4. If the flow into and out of the loop pipe are as shown in figure 4.1, determine the flow in each pipe, given the K values as shown.

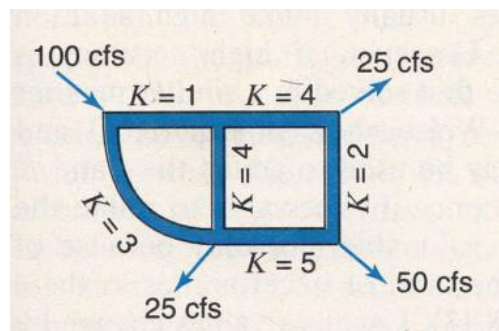


Figure 4.1

5. Water on the horizontal apron of the **30.48 m** wide spillway shown in Fig. 5.1 has a depth  $y_1$  of **0.30m** and a velocity ( $V_1$ ) of **5.48 m/s**. Determine the depth,  $y_2$ , after the jump, and the head loss ( $h_L$ ).

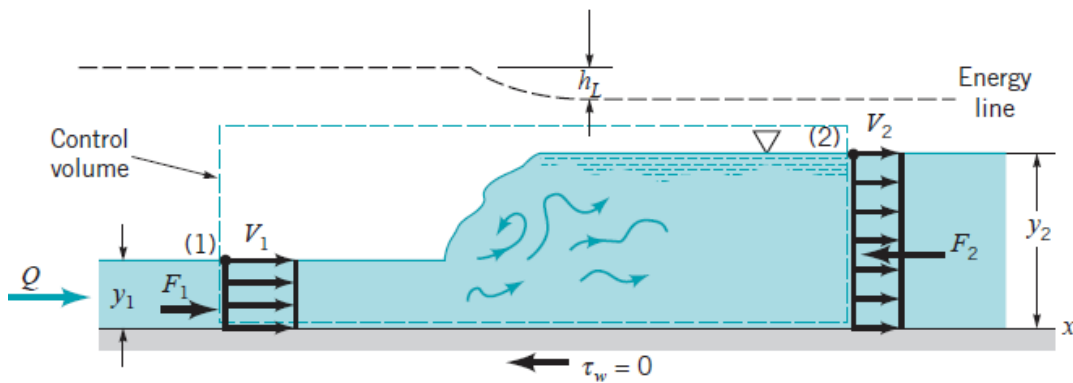


Figure 5.1

# Moody diagram

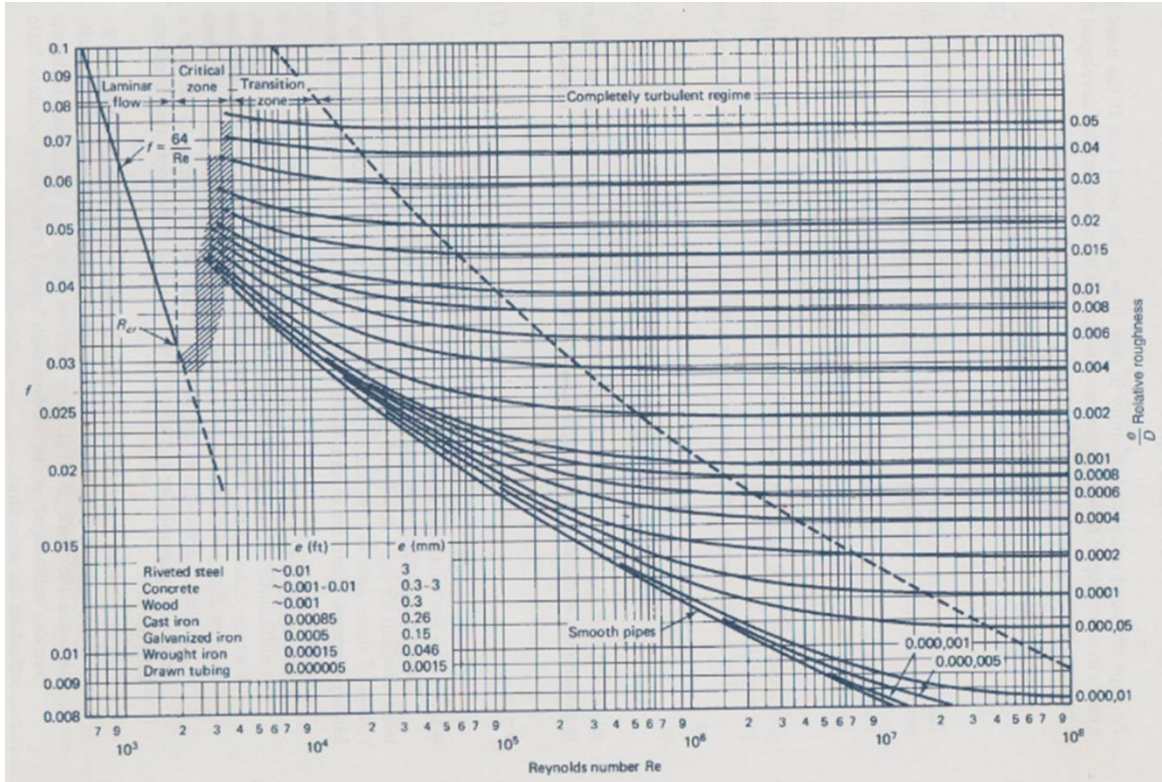


Figure 7.13 Moody diagram. (From L. F. Moody, *Trans. ASME*, Vol. 66, 1944.)