

Assignment 1

(Due: 25 September, 2017 by 17:00)

- Q1.** Figure 1 below shows a conical vessel having its outlet at A to which a U-tube manometer is connected. The manometer gauge fluid is mercury ($\rho_m = 13600 \text{ kg/m}^3$). The reading of the manometer given in the figure corresponds to an empty vessel. What will be the reading of the manometer when the vessel is completely filled with water ($\rho_w = 1000 \text{ kg/m}^3$).

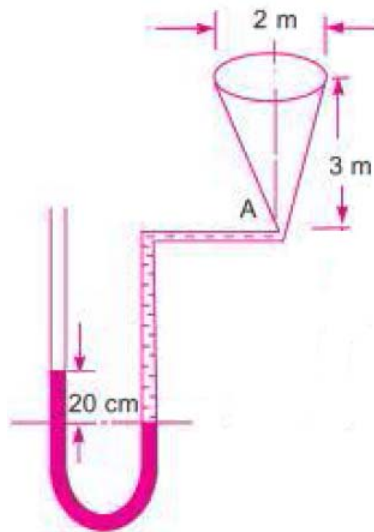


Figure 1

- Q2.** A syphon of diameter 200 mm connects two reservoirs having a difference in elevation of 20 m (Figure 2). The length of the syphon is 500 m and the summit is 3 m above the water level in the upper reservoir. The length of the pipe from the upper reservoir to the summit is 100 m. Determine the discharge through the syphon and the pressure at the summit. Neglect minor losses. Assume coefficient of friction for the pipe, $\lambda = 0.02$.

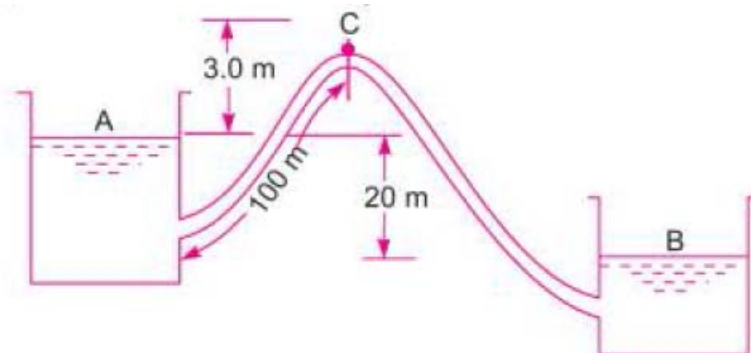


Figure 2

- Q3.** Determine the discharge of water through a pipe of diameter 20 cm and length 50 m when one end of the pipe is connected to a tank and the other end of the pipe is open to the atmosphere (see Figure 3). The pipe is horizontal and the height of water in the tank is 4 m above the centerline of the pipe. Consider all losses. Assume a square-edge entrance and take $\lambda = 0.036$.

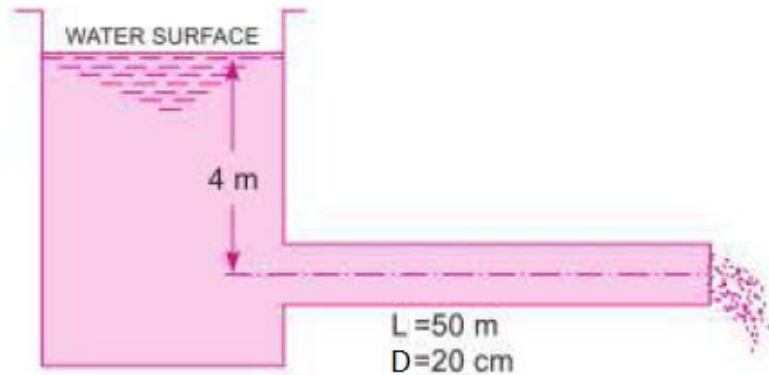


Figure 3

- Q4.** In Figure 4 below, when a sudden contraction from 50 cm to 25 cm is introduced in a horizontal pipeline, the pressure changes from 103005 N/m² to 67689 N/m². Determine the discharge through the pipeline. Following this, if there is a sudden expansion from 25 cm to 50 cm and if the pressure at the 25 cm section is 67689 N/m², determine the pressure at the 50 cm enlarged section.

Assume $K_L = 0.29$ at the sudden contraction and also consider the local losses due to sudden expansion.

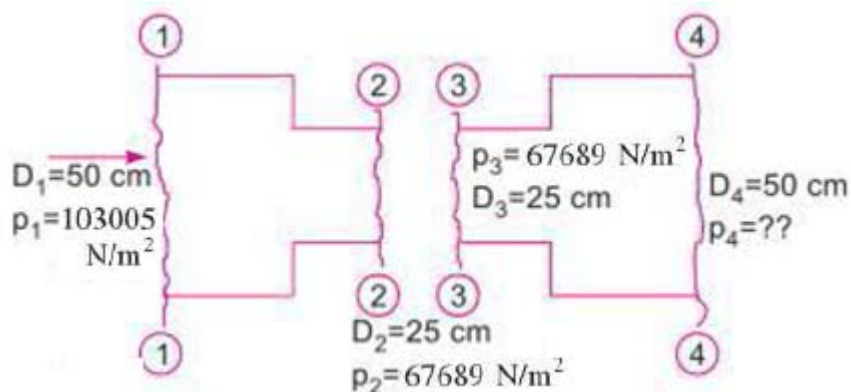


Figure 4