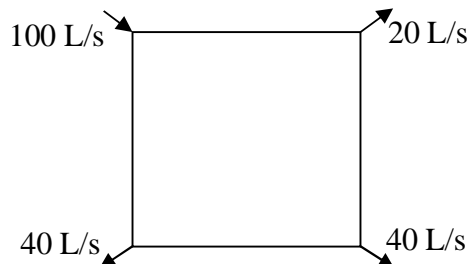## Assignment 01 – Pipe Analysis, Pumps and Space Air Diffusion

1. Fluid Network Analysis

For the square loop as shown in the figure below, find the discharge in all the pipes. All pipes are 1 km long and 300 mm in diameter, with a friction factor of 0.0163. Assume that minor losses can be neglected.

2. Pumps and Fans

A centrifugal pump has a 100 mm diameter suction pipe and a 75 mm diameter delivery pipe. When discharging 15 L/s of water, the inlet water mercury manometer with one limb exposed to the atmosphere recorded a vacuum deflection of 198 mm; the mercury level on the suction side was 100 mm below the pipe centerline. The delivery pressure gauge, 200 mm above the pump inlet, recorded a pressure of 0.95 bar. The measured input power was 3.2 kW. Calculate the pump efficiency.
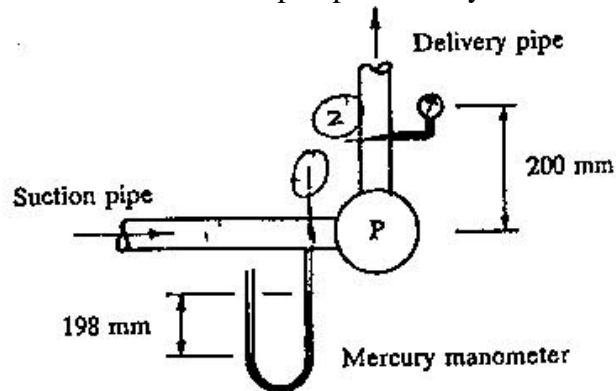
3. Space Air Diffusion

Briefly explain the characteristics of stratified mixing flow that can be found in a large indoor sport stadium designed for badminton competition. Discuss the main considerations and difficulties of arranging air distribution and ventilation in such a large volume space. Describe the design strategy for supply air outlet in such a situation. Illustrate your answer with diagrams or figures if needed.