

CE 3305 Engineering Fluid Mechanics
Exercise Set 11
Summer 2018 – GERMANY

Purpose : Application of Conservation of Mass for a System

Assessment Criteria : Completion, plausible solutions, use **R** as a calculator.

Exercises

1. (Problem 5.32 pg 198) Figure 1 is a cross section of a heat exchanger comprised of three circular pipes housed inside a larger circular pipe. The internal diameter of the three smaller pipes is 2.5 cm and the pipe wall thickness is 3 mm . The inside diameter of the larger pipe is 8 cm . If the velocity of the fluid in the region between the smaller pipes and the larger pipe is 10 m/s , what is the discharge in m^3/s ?

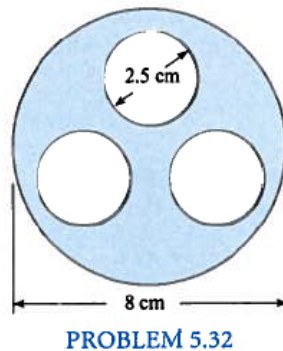


Figure 1: Cross-section of heat exchanger

2. (Problem 5.55 pg 200) Figure 2 is a schematic a tank with a drain in the bottom that has cross-sectional area of 0.0025 m^2 and an inlet line on the side with a cross-sectional area of 0.0025 m^2 , as shown. The cross-sectional area of the tank is 0.1 m^2 . The velocity of the liquid flowing out the bottom hole is $V = \sqrt{2gh}$, where h is the height of the water surface above the outlet. At an instant in time, the water level in the tank is 1 m and rising at the rate of 0.1 cm/s . The liquid is incompressible. Find the velocity of the liquid through the inlet.

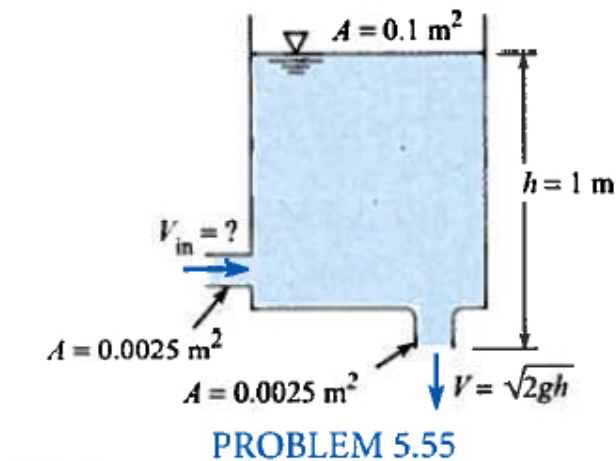


Figure 2: Surge tank with two inlet/outlet connections.