

CE 3305 – Fluid Mechanics Exam 2

Purpose

Demonstrate ability to apply fluid mechanics and **problem solving principles** covering topics such as: Conservation of mass, continuity, conservation of linear momentum, and conservation of energy (modified bernoulli).

Instructions

1. Put your name on each sheet you submit.
2. Use additional sheets as needed.
3. Begin each problem on a separate page. Ok to disassemble to keep pages in order.
4. Do not write on the back of sheets (I won't look)
5. Use the **problem solving protocol** in the class notes. The discussion section can simply be the word "discussion"
6. Label and/or underline answers, be sure to include units.

Allowed Resources

1. Your notes
 2. Your textbook
 3. The mighty Internet with following proviso
 4. **You may not communicate with other people during the exam**
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1. The pipe below transports 200 kg/s of water. The pipe tees into a 5-cm-diameter pipe and a 7-cm-diameter pipe. The average velocity in the smaller-diameter pipe (5-cm-diameter pipe) is 25 m/s,

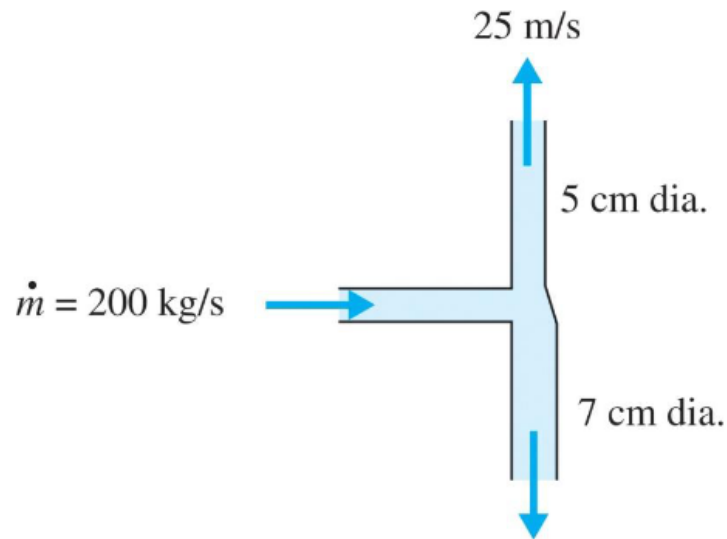


Figure 1:

Determine:

- (a) The flow rate in the larger pipe (7-cm-diameter pipe).
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2. A vertical pipe with a smooth-transition reducer is monitored by a mercury manometer system as shown.

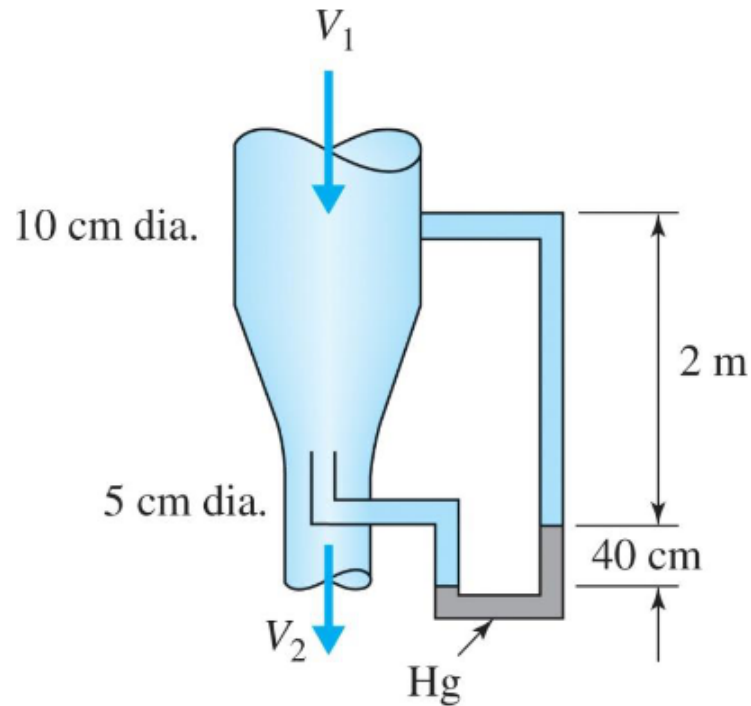


Figure 2:

Determine:

- (a) The approach velocity V_1 of the water in the vertical pipe; Assume negligible head losses (smooth-transition)

3. A pipe discharges to the atmosphere just downstream of a plug as shown below.

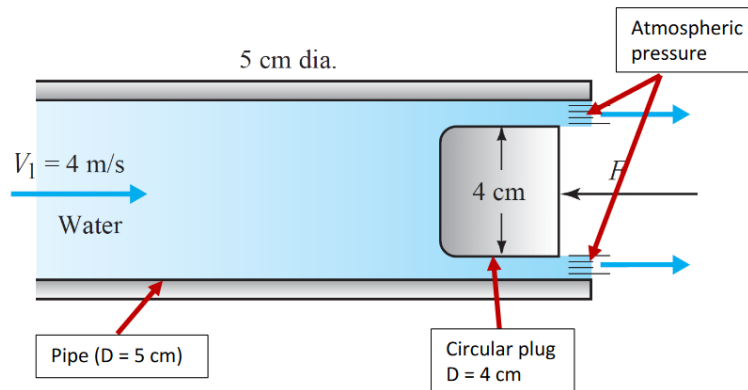


Figure 3:

Determine:

- (a) The force F , needed to hold the circular plug in the pipe as shown. Assume uniform velocity profiles; Neglect viscous effects.

4. A firehose on a boat is producing a 100 mm. diameter, horizontal, water jet with a speed of $V = 100$ kph. The boat is held stationary by a cable attached to a pier. The water temperature is 20°C .

Determine:

- (a) The tension in the cable in Newtons