Florida International University
Department of Civil and Environmental Engineering

CWR 3201 Fluid Mechanics, Fall 2018
Instructor: Arturo S. Leon, Ph.D., P.E., D.WRE
TA: Thao Do, CEE Undergraduate
Homework Assignment 4
*Mechanics of Fluids (**Fifth edition**), by M.C. Potter, D.C. Wiggert and B.H. Ramadan.*

1. 4.35 (same number in *Fourth edition*)

   Water flows in the 5-cm-diameter pipe shown in Fig. P4.35 with an average velocity of 10 m/s. It turns a 90° angle and flows radially between two parallel plates. What is the velocity at a radius of 60 cm? What are the mass flux and the discharge?

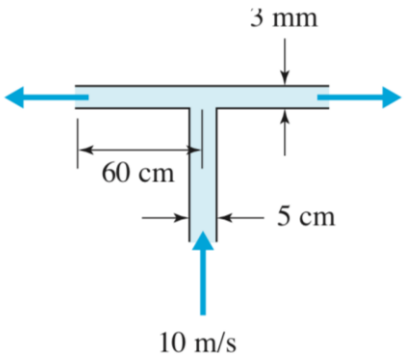


Fig. P4.35

2. 4.52 (same number in *Fourth edition*)

   In Fig. P4.52, if the mass of the control volume is not changing, find $\overline{V}_3$.

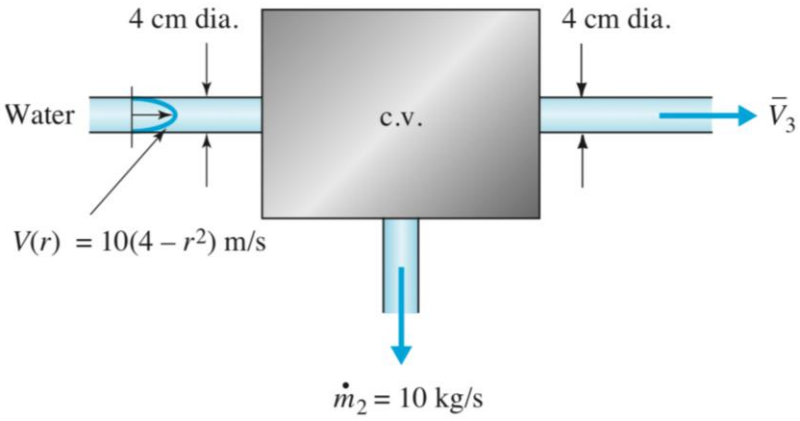


Fig. P4.52

3. 4.79 (same number in *Fourth edition*)

In Fig. P4.79, neglect all losses and predict the value of H and p if:

(a) $h = 15$ cm **(b)** $h = 20$ cm

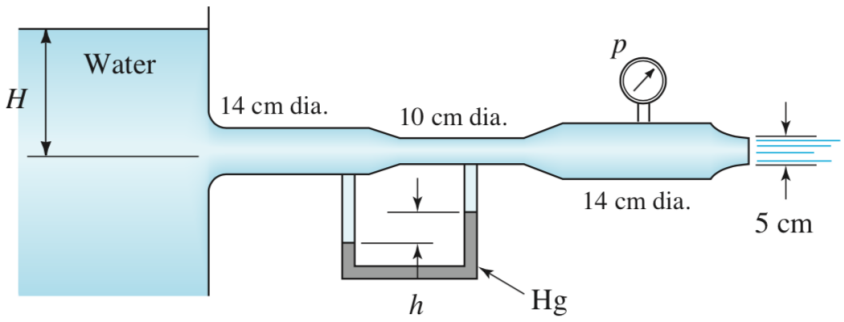


Fig. P4.79

4. 4.82 (same number in *Fourth edition*)

Water exits from a pressurized reservoir as shown in Fig. P4.82. Calculate the flow rate if on section A we:

(a) Attach a nozzle with exit diameter 5 cm
(b) Attach a diffuser with exit diameter 18 cm
(c) Leave as an open pipe as shown

Neglect losses for all cases.

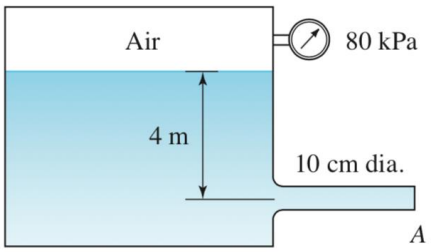


Fig. P4.82

5. 3.54 (same number in *Fourth edition*)

A pitot tube is used to measure the velocity of a small aircraft flying at 3000 ft. Calculate its velocity if the pitot tube measures:

(a) 0.3 psi **(b)** 0.9 psi **(c)** 0.09 psi

6. 3.68 (same number in *Fourth edition*)

For the flow shown in Fig. P3.68, estimate the pressure p_1 and velocity V_1 if $V_2 = 20$ m/s and:

(a) $H = 1$ cm
(b) $H = 5$ cm
(c) $H = 10$ cm

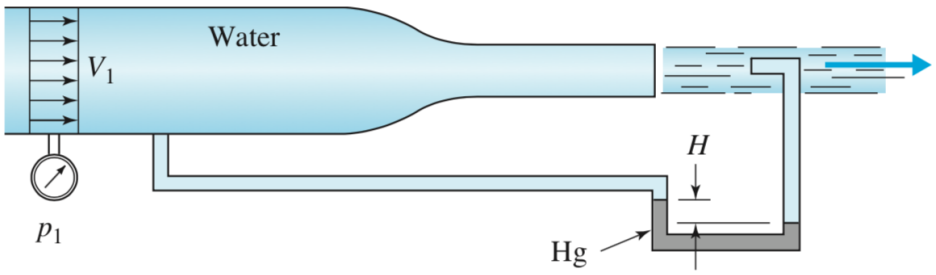
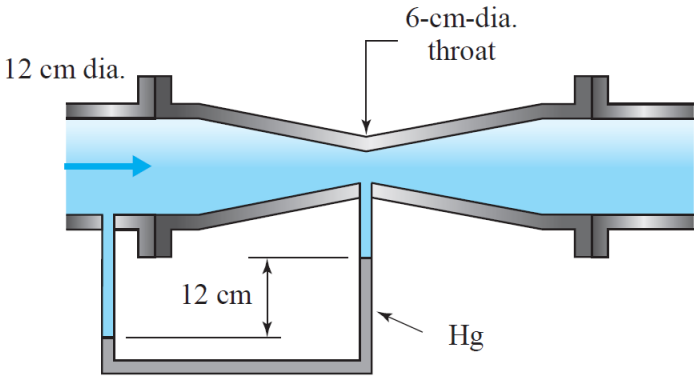
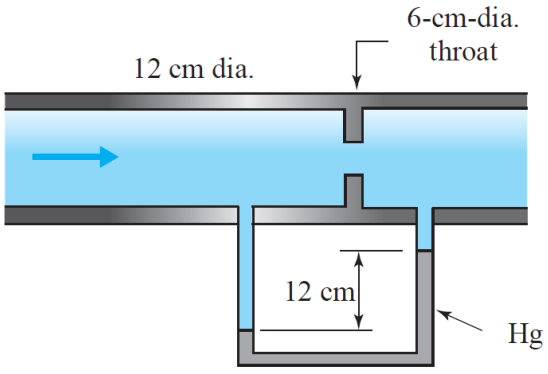


Fig. P3.68

7. 13.9 (same number in *Fourth edition*)
Calculate the flow rate of 40°C water in the pipes shown in Fig. P13.9.



(a)



(b)

Fig. P13.9

8. 4.123 (same number in *Fourth edition*)

Neglect viscous effects, assume uniform velocity profiles, and find the horizontal force component acting on the obstruction shown in Fig. P4.123.

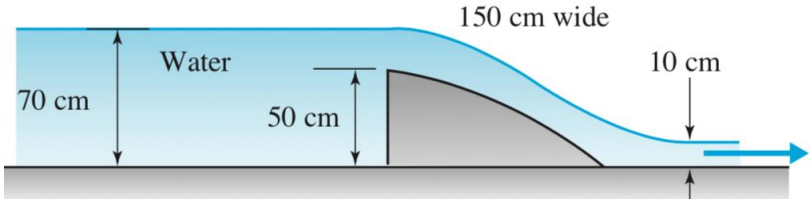


Fig. P4.123

9. 4.131 (same number in *Fourth edition*)

Water flows steadily through the double elbow shown in Fig. P4.131. Water flows into the elbow from the top at 5 m/s, and from the left at 15 m/s. Determine the vertical and horizontal components of the force needed to hold the elbow in place.

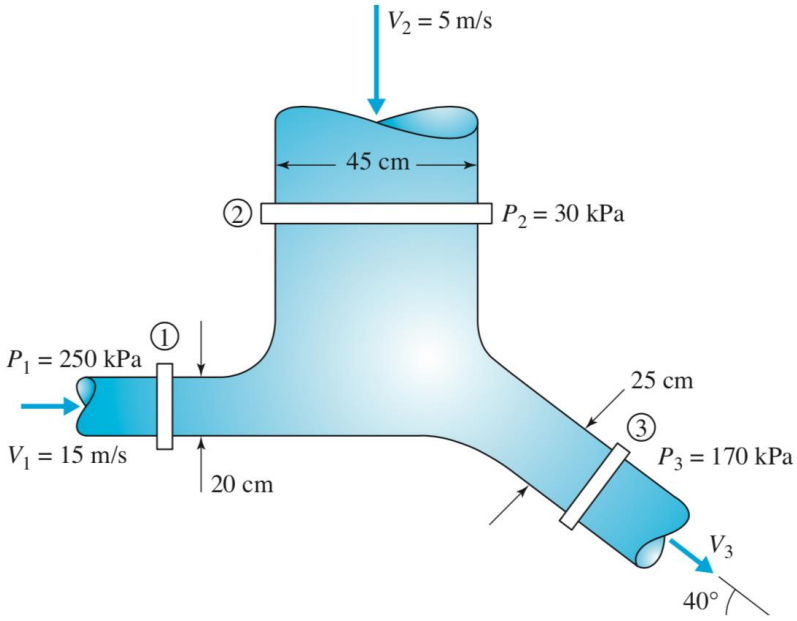


Fig. P4.131

10. 4.164 (same number in *Fourth edition*)

A four-armed water sprinkler has nozzles at right angles to the 30-cm-long arms and at 45° angles with the ground. If the outlet diameters are 8 mm and 4 kg/s of water exits the four nozzles, find the rotational speed.