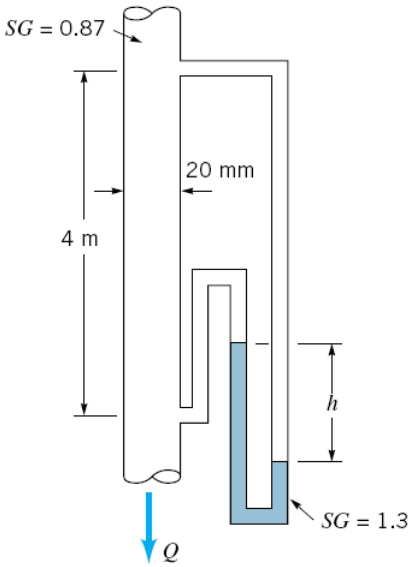
HOMEWORK 5 Assignement date: April 29, 2006 Quiz date: May 06, 2008

8.17 Glycerin at 20 °C flows upward in a vertical 75-mm-diameter pipe with a centerline velocity of 1.0 m/s. Determine the head loss and pressure drop in a 10-m length of the pipe.

8.22 Oil of $SG = 0.87$ and a kinematic viscosity $\nu = 2.2 \times 10^{-4}$ m^2/s flows through the vertical pipe shown in Fig. P8.22 at a rate of 4×10^{-4} m^3/s. Determine the manometer reading, h.

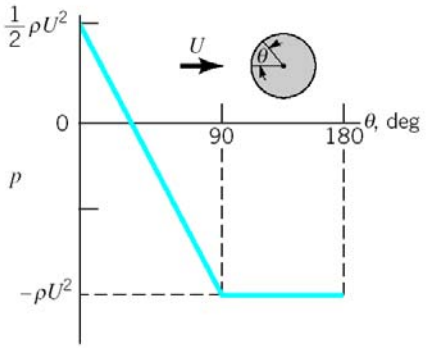


■ FIGURE P8.22

7.33 Glycerin at 20 °C flows with a velocity of 4 m/s through a 30-mm-diameter tube. A model of this system is to be developed using standard air as the model fluid. The air velocity is to be 2 m/s. What tube diameter is required for the model if dynamic similarity is to be maintained between model and prototype?

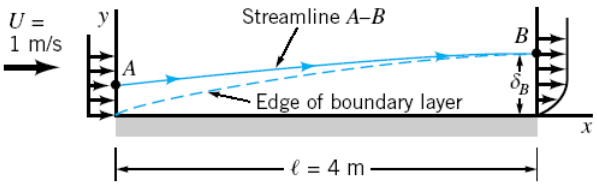
7.55 The drag on a small, completely submerged solid body having a characteristic length of 2.5 mm and moving with a velocity of 10 m/s through water is to be determined with the aid of a model. The length scale is to be 50, which indicates that the model is to be *larger* than the prototype. Investigate the possibility of using either an unpressurized wind tunnel or a water tunnel for this study. Determine the required velocity in both the wind and water tunnels and the relationship between the model drag and the prototype drag for both systems. Would either type of test facility be suitable for this study?

9.4 The pressure distribution on a cylinder is approximated by the two straight line segments shown in Fig. P9.4. Determine the drag coefficient for the cylinder. Neglect shear forces.



■ FIGURE P9.4

9.14 Because of the velocity deficit, $U - u$, in the boundary layer, the streamlines for flow past a flat plate are not exactly parallel to the plate. This deviation can be determined by use of the displacement thickness, δ^*. For air blowing past the flat plate shown in Fig. P9.14, plot the streamline A–B that passes through the edge of the boundary layer ($y = \delta_B$ at $x = \ell$) at point B. That is, plot $y = y(x)$ for streamline A–B. Assume laminar boundary layer flow.



■ FIGURE P9.14