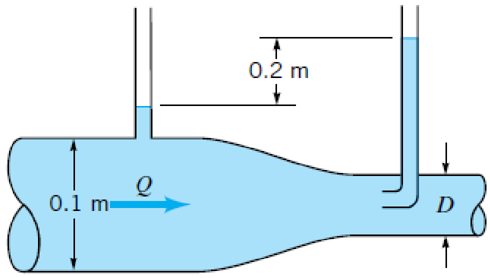
Fluid Mechanics

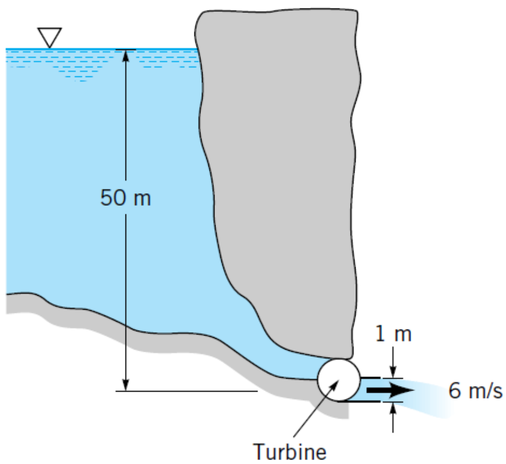
Assignment # 8

3.32 Water flows through the pipe contraction shown in Fig. P3.32. For the given 0.2-m difference in the manometer level, determine the flowrate as a function of the diameter of the small pipe, *D*.



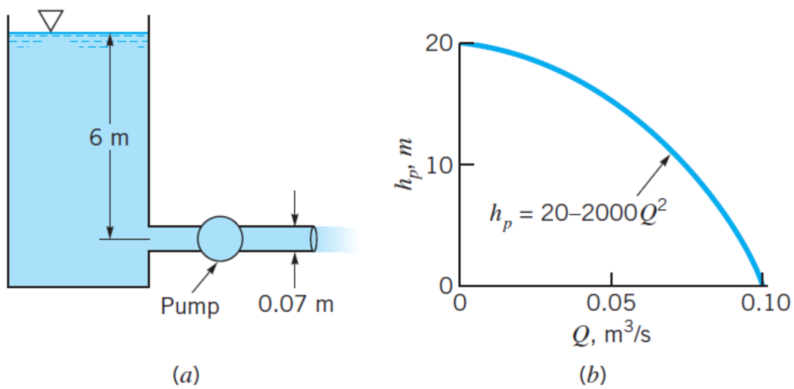
■ FIGURE P3.32

5.108 What is the maximum possible power output of the hydroelectric turbine shown in Fig. P5.108?



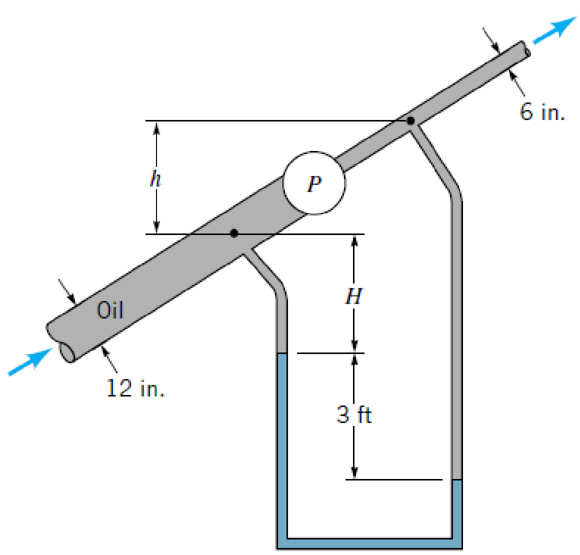
■ FIGURE P5.108

5.115 Water is pumped from the tank shown in Fig. P5.115*a*. The head loss is known to be $1.2\, V^2/2g$, where V is the average velocity in the pipe. According to the pump manufacturer, the relationship between the pump head and the flowrate is as shown in Fig. P5.115*b*: $h_p = 20 - 2000\, Q^2$, where h_p is in meters and Q is in m^3/s. Determine the flowrate, Q.



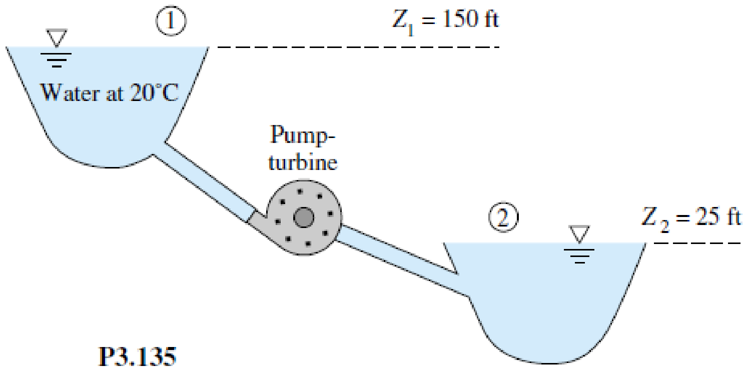
■ FIGURE P5.115

5.122 Oil ($SG = 0.88$) flows in an inclined pipe at a rate of 5 ft^3/s as shown in Fig. P5.122. If the differential reading in the mercury manometer is 3 ft, calculate the power that the pump supplies to the oil if head losses are negligible.



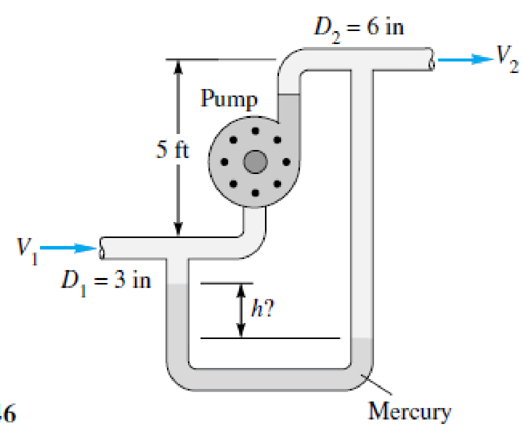
■ FIGURE P5.122

P3.135 The *pump-turbine* system in Fig. P3.135 draws water from the upper reservoir in the daytime to produce power for a city. At night, it pumps water from lower to upper reservoirs to restore the situation. For a design flow rate of 15,000 gal/min in either direction, the friction head loss is 17 ft. Estimate the power in kW (*a*) extracted by the turbine and (*b*) delivered by the pump.



P3.135

P3.146 Kerosine at 20°C flows through the pump in Fig. P3.146 at 2.3 ft^3/s. Head losses between 1 and 2 are 8 ft, and the pump delivers 8 hp to the flow. What should the mercury-manometer reading *h* ft be?



P3.146