

5-90 Water enters a hydraulic turbine through a 30-cm-diameter pipe at a rate of $0.6 \text{ m}^3/\text{s}$ and exits through a 25-cm-diameter pipe. The pressure drop in the turbine is measured by a mercury manometer to be 1.2 m. For a combined turbine–generator efficiency of 83 percent, determine the net electric power output. Disregard the effect of the kinetic energy correction factors.

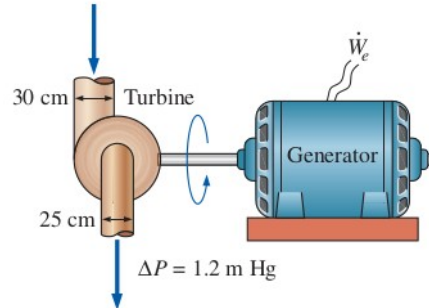


FIGURE P5-90

5-94 Underground water is to be pumped by a 78 percent efficient 5-kW submerged pump to a pool whose free surface is 30 m above the underground water level. The diameter of the pipe is 7 cm on the intake side and 5 cm on the discharge side. Determine (a) the maximum flow rate of water and (b) the pressure difference across the pump. Assume the elevation difference between the pump inlet and the outlet and the effect of the kinetic energy correction factors to be negligible.

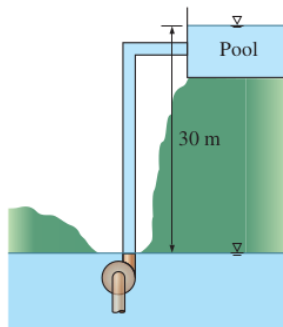
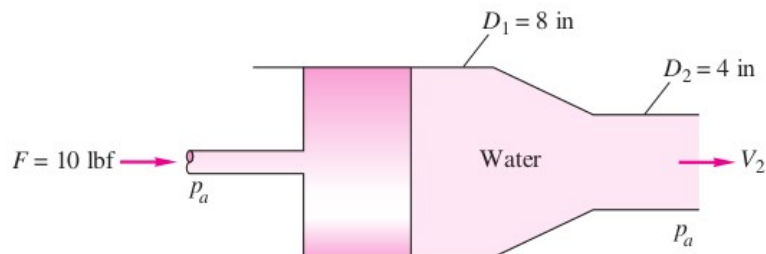


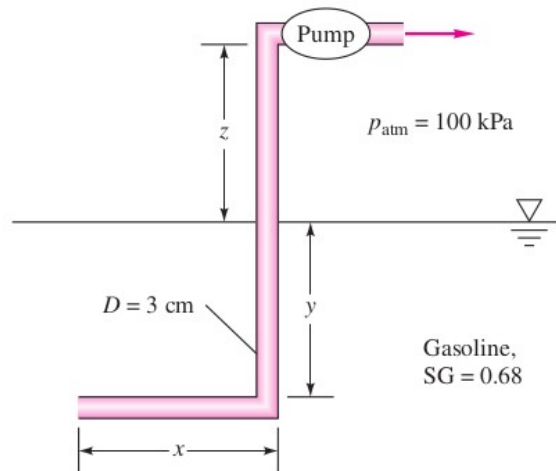
FIGURE P5-94

P3.137 In Fig. P3.137 the piston drives water at 20°C . Neglecting losses, estimate the exit velocity V_2 ft/s. If D_2 is further constricted, what is the maximum possible value of V_2 ?



P3.137

P3.147 For the system of Prob P3.146, let the pump exhaust gasoline at 65 gal/min to the atmosphere through a 3-cm-diameter opening, with no cavitation, when $x = 3$ m, $y = 2.5$ m, and $z = 2$ m. If the friction head loss is $h_{\text{loss}} \approx 3.7(V^2/2g)$, where V is the average velocity in the pipe, estimate the horsepower required to be delivered by the pump.



P3.146

3. La figura presenta un sistema de flujo de agua con diferentes equipos de medición de presión y una bomba (equipo que aumenta la energía), según los datos que presenta la figura calcular (Suponga que entre 2 y 3 no hay pérdida de energía):
- Caudal circulante en el sistema
 - Altura manométrica y potencia útil de la bomba
 - Diferencia de alturas en los meniscos del manómetro diferencial del venturímetro
 - Peso específico relativo del líquido manométrico del conjunto del Pitot más piezómetro abierto
 - Altura R' que señala el manómetro acoplado al Pitot en la salida a la atmósfera del sistema
 - Altura h que alcanzará el líquido en un piezómetro abierto situado a la entrada de la bomba

