



ECHE 225: Spring 2024

Homework #7: The Bernoulli equation

Due: October 24

1. [Chapter 12] In a hydroelectric power plant, water enters the turbine nozzles at 900 kPa absolute with a low velocity. If the nozzle outlets are exposed to atmospheric pressure of 100 kPa, determine the maximum velocity to which water can be accelerated by the nozzles before striking the turbine blades.
2. [Chapter 12] A Pitot-static probe is used to measure the speed of an aircraft flying at 4000 m. Assume that the density of the atmosphere at that height is 0.82 kg/m^3 . If the differential pressure reading is 3.5 kPa, determine the speed of the aircraft.
3. [Chapter 12] While traveling on a dirt road, the bottom of a car hits a sharp rock and a small hole develops at the bottom of its gas tank. If the height of the gasoline in the tank is 35 cm, determine the initial velocity of the gasoline at the hole. Discuss how the velocity will change with time and how the flow will be affected if the lid of the tank is closed tightly.
4. [Chapter 12] Air at 105 kPa and 37°C flows upward through a 7-cm-diameter inclined duct at a rate of 70 L/s. The duct diameter is then reduced to 3 cm through a reducer. The pressure change across the reducer is measured by a water manometer. The elevation difference between the two points on the pipe where the two arms of the manometer are attached is 0.4 m. Determine the differential height between the fluid levels of the two arms of the manometer.

Answers

1. 40 m/s
2. 92.4 m/s or 333 km/hr
3. 2.62 m/s
4. 57 cm