Assignment 283

The due date for submitting this assignment has passed. As a result, you have not submitted this assignment.

1. A 3.0 m diameter pipe with a uniform flow is inserted into a tank to create a suction. The pipe has a level section which is 1.5 m above the water level and the discharge of 3.0 m below the water level, as shown in the figure below. Find the velocity of the discharge.

2. The cross section of the exit section of a certain surface ensuring an air pocket is 0.2 m. The mean value of air velocities at the entry section of the air pocket is 10 m/s. Using the density of air ρ = 1.23 kg/m³, calculate the mass flow rate of the air pocket. Answer: No. The answer is incorrect.

3. A pipe with a diameter of 100 mm is closed by a valve. The water flows out of the pipe through a valve with a diameter of 40 mm. The water flows out of the pipe at a rate of 2.0 m/s. Calculate the change in the water level after 15 minutes.

4. A fluid with density 800 kg/m³ is flowing steadily through the tube as shown in the figure. The elevation at section 1 and 2 are 2.0 m and 1.5 m, respectively. If the fluid flows at a velocity of 0.6 m/s at section 1 and 0.5 m/s at section 2, find the gauge pressure at section 1.

5. Air is flowing through a constant area duct. The velocity of the air at section 1 is 50 m/s. The air undergoes an isothermal process inside. If the fluid flow is such that the pressure changes from 100 kPa at section 1 to 80 kPa at section 2. Find the mass flow rate at section 2 and also the amount of heat exchange between the fluid and the surroundings.

6. A fluid, with a specific heat of 3.0 J/kg·°C, flowing through a constant area duct undergoes an adiabatic process such that its temperature changes from 270°C to 250°C. (Pressure and velocity remain constant) If the velocity of the fluid at section 1 is 50 m/s and the pressure at section 2 is 750 kPa, calculate the pressure at section 1, the flow rate, and the pressure at section 2.

7. Air is flowing through an isotropic constant area duct as shown in the figure. The air undergoes a polytropic process with m = 3 such that its pressure changes from P = 100 kPa to P = 150 kPa. If the temperature at section 1 is 300°C and the pressure at section 2 is 300 kPa, find the height of the polytropic process, C, such that at 100 kPa.