

ME 201

Thermodynamics

Exam #1

Open Book, Open Notes

Problem 1

As shown in the drawing below, two pipes merge into one. Determine the velocity (in m/s) of water in the merged pipe under the following conditions:

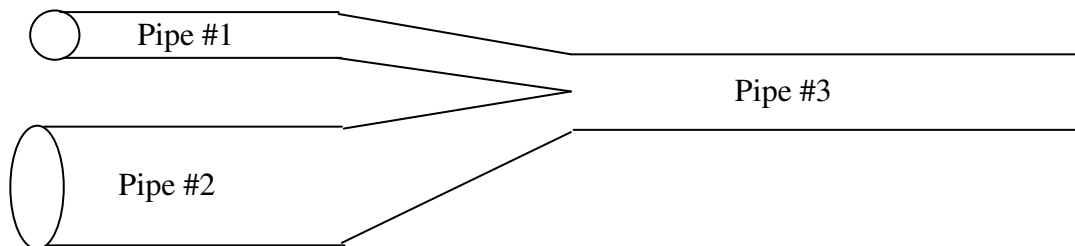
Pipe #1: diameter: 0.03 m, water flow rate: 0.75 kg/s

Pipe #2: diameter: 0.06 m, water flow rate: $1.07 \times 10^{-3} \text{ m}^3/\text{s}$

Pipe #3: diameter: 0.04 m

Density of water: 996 kg/m^3

Flow area of pipe: $\pi D^2/4$



Problem 2

It is proposed to use hydrogen, H_2 , as the fuel in an internal combustion engine. Determine the internal energy change in kJ/kg and final temperature as H_2 goes isentropically from 400K and 150 kPa to 785 kPa.

Problem 3

In a refrigeration system saturated liquid water at 25°C isenthalpically taken to a pressure of 1.5 kPa. Find the final state and the change in entropy kJ/(kg·K) for this process.