Florida International University
CWR 3201 Fluid Mechanics, Fall 2023
Mid-term # 2

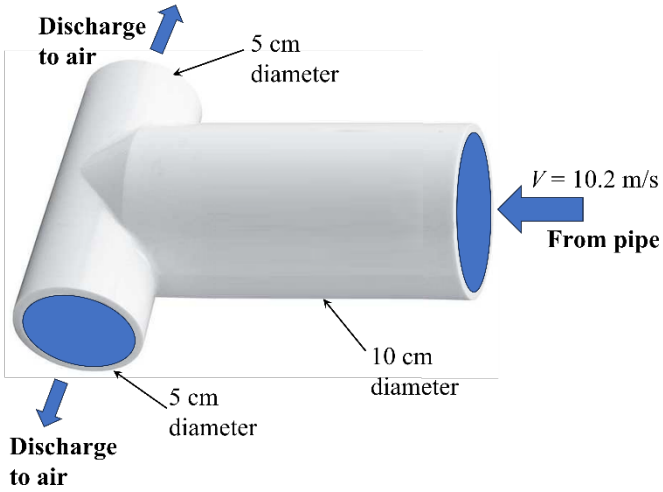
Instructor: Arturo S. Leon, Ph.D., P.E., D.WRE

Student Name: _____ Panther ID: _____

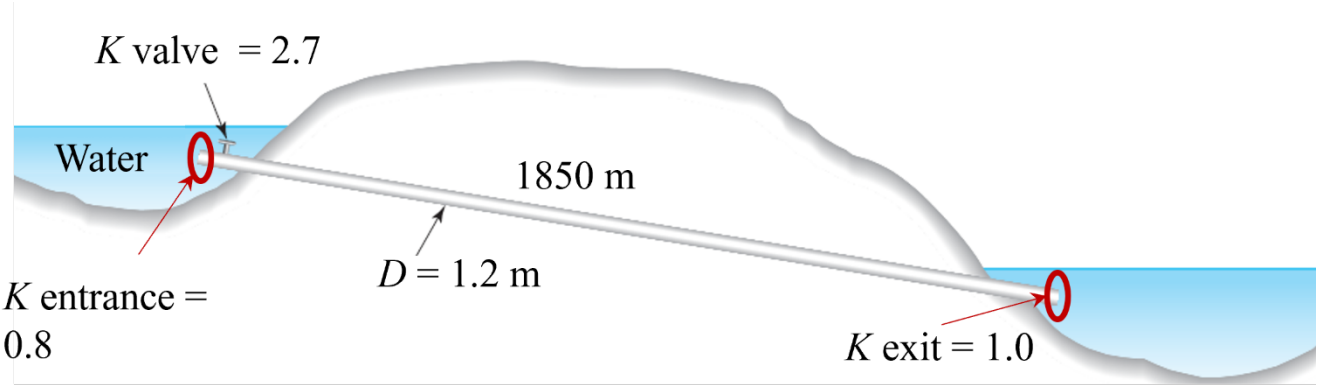
- ✓ **You will have 1 h 15 minutes to complete the exam. The exam is closed book and closed notes.**

Only one page (front and back) with handwritten equations are allowed

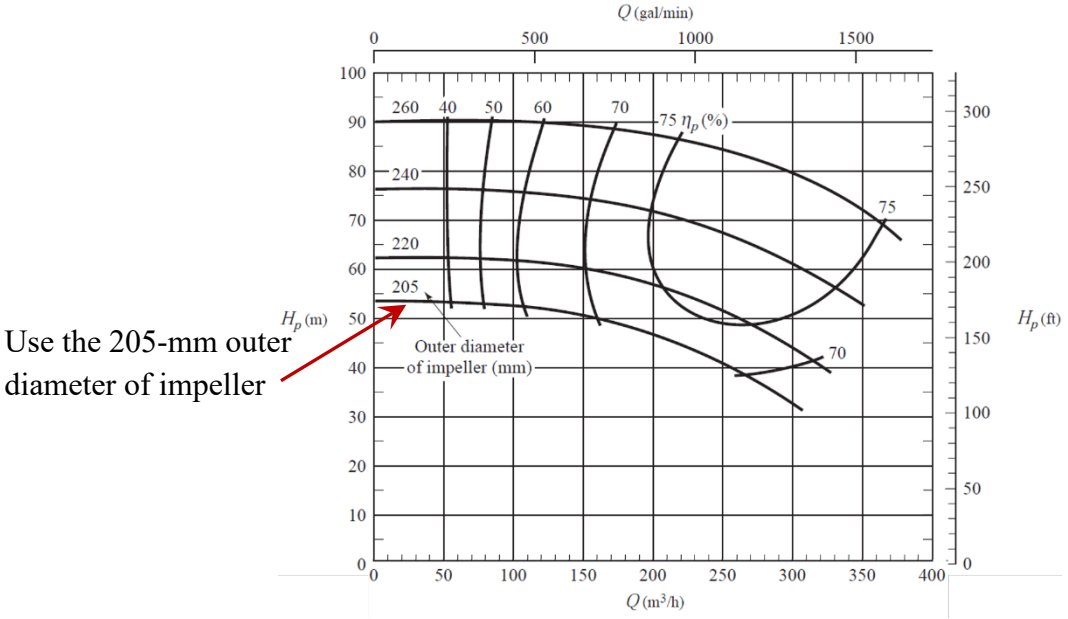
1. **(35 points)** Water flows at 10.2 m/s in a 10-cm-diameter stem of a horizontal T-section that branches into 5-cm diameter pipes as shown in the figure below. Find the force of the water on the T-section if the branches (e.g., 5-cm diameter pipes) discharge to the atmosphere (e.g., air). Neglect viscous effects.



2. (**30 points**) For the pipeline below, the friction factor f is 0.029, the pipe diameter is 1.2 m, and the flow rate through the pipe is 4.4 m^3/s. Determine the reservoirs elevation difference.



3. **(35 points)** The **205-mm**-outer diameter of impeller pump represented in the figure below is used to move water between two reservoirs through a pipeline with the following characteristics: $D = 125$ mm, $L = 70$ m, $f = 0.018$, $\Sigma K = 1.7$. Determine the actual discharge and pump head when **two pumps in parallel** are used (**each pump is 205-mm outer diameter of impeller**). The elevation difference between the reservoirs is 30 m ($z_2 - z_1 = 30$ m).



Use the 205-mm outer diameter of impeller