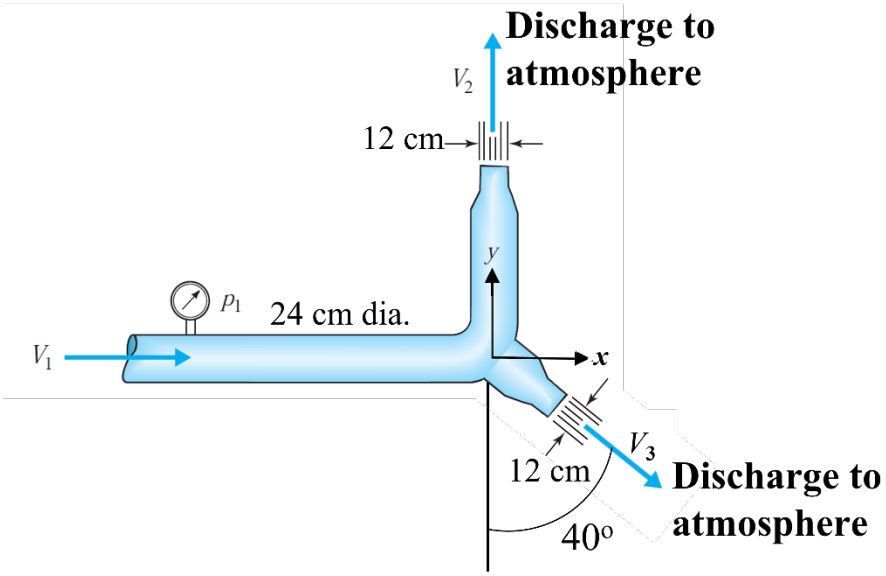
Florida International University
CWR 3201 Fluid Mechanics, Fall 2024
Mid-term # 2

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

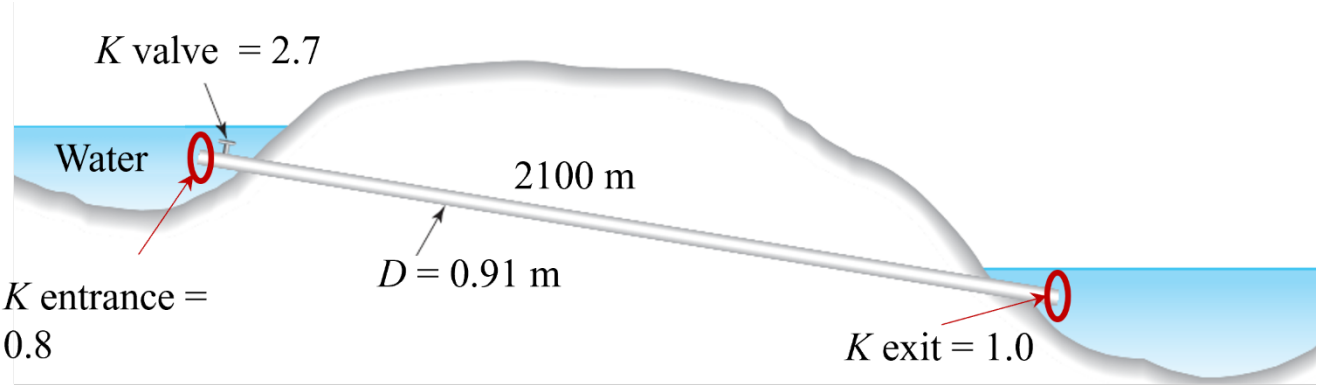
Student Name: _____ Panther ID: _____

- ✓ **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)** Determine the force in the "x direction ($\boldsymbol{F_x}$) of the water on the **horizontal** bifurcation shown in the figure below if the pressure P_1 is 450 kPa. **Neglect head losses**.



2. (**30 points**) For the cast iron pipeline below (ε = 0.26 mm), the reservoirs elevation difference is 30 m and the pipe diameter is 0.91 m. Determine the flow rate through the pipe. Use a kinematic viscosity of 10^{-6} m^2/s.



3. **(35 points)** The **260**-mm-outer impeller diameter pump represented in the figure below is used to move **water** in a piping system. The pipeline has the following characteristics: $D = 300$ mm, $L = 350$ m, $f = 0.02$, $\Sigma K = 4.2$. Determine the actual flow discharge (m^3/s) and pump head (m) when **four pumps in series** (**260** mm-impeller diameter pump) are used. The elevation difference between the reservoirs is 275 m ($z_2 - z_1 = 275$ m).