

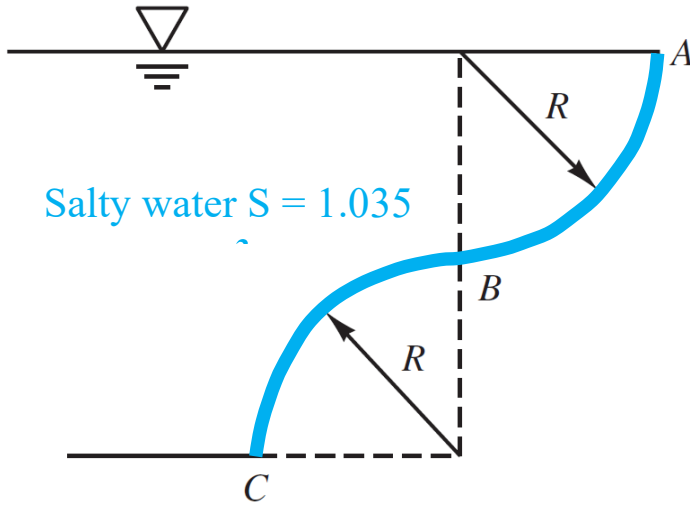
Florida International University
CWR 3201 Fluid Mechanics, Fall 2024
Final Exam

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

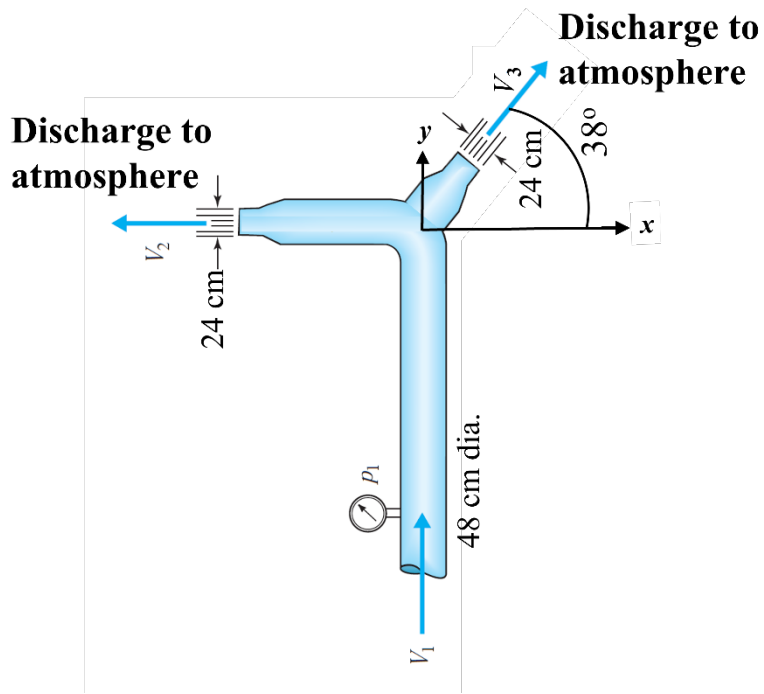
Student Name: _____ **Panther ID:** _____

- ✓ You will have 2 hours to complete the exam. The exam is closed book and closed notes
- ✓ Only two pages with handwritten equations are allowed (no photocopies or artificially reduced text will be allowed)
- ✓ No cell phones or any type of communication device will be allowed.

1. **(25 points)** Calculate the **horizontal** and **vertical** forces of **salty water** acting on the curved gate ABC . Assume that the specific gravity (S) of **salty water** is 1.035, $R = 4$ m and the gate width is 12 m.

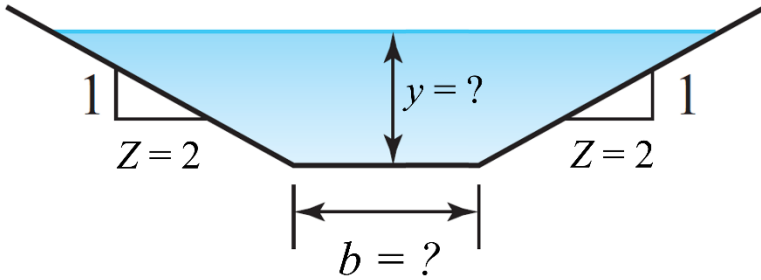


2. (25 points) Determine the force in the “ x direction (F_x) of the water on the **horizontal** bifurcation shown in the figure below if the pressure P_1 is 300 kPa. Neglect head losses.



3. (25 points) The trapezoidal channel below carries a discharge of $120 \text{ m}^3/\text{s}$ of **water** with a velocity of 3.5 m/s . If the channel is designed for **maximum hydraulic efficiency** conditions, what should be the channel bottom (b) and the water height (y) of the trapezoidal channel?

Derivative rule for a power function: $\frac{dx^n}{dm} = nx^{n-1} \frac{dx}{dm}$



4. (25 points) The 220-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: $D = 200$ mm, $L = 120$ m, $f = 0.025$, $\Sigma K = 3.8$. Determine the actual flow discharge (m^3/s) and pump head (m) when **two pumps in series** (220 mm-impeller diameter pump) are used. The elevation difference between the reservoirs is 85 m ($z_2 - z_1 = 85$ m).

