

Florida International University
CWR 3201 Fluid Mechanics, Fall 2020
Mid-term

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

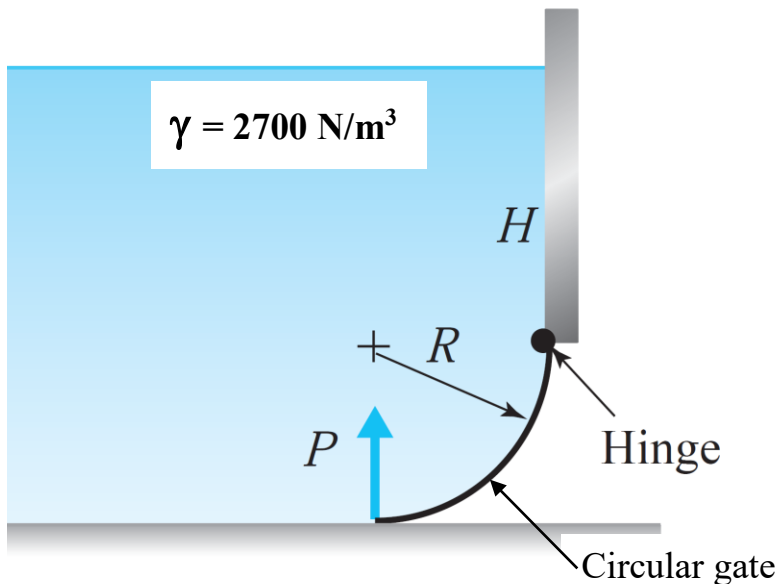
Student Name: _____

Date: 10/16/2020

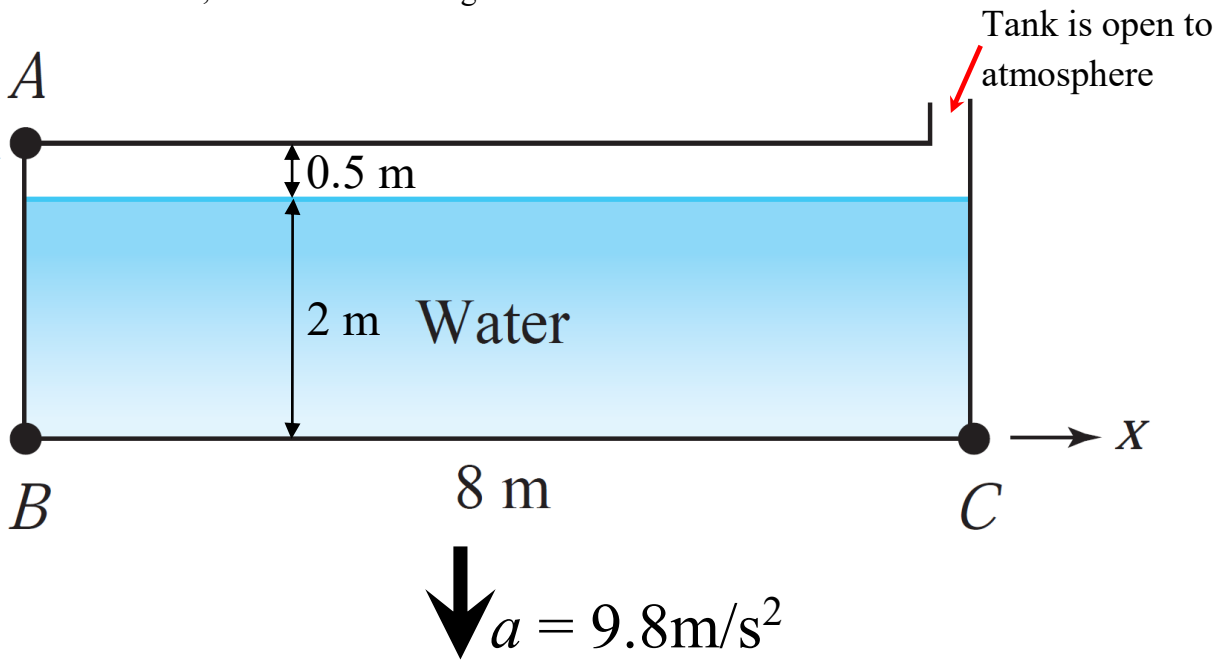
Panther ID: _____

- ✓ You will have 1h 40 minutes to complete the exam starting at 9:30 am. You will have an extra of 10 minutes to scan your solution and upload it to Canvas [Assignment "Upload your Mid-term Exam Solution HERE"]. **Canvas will not accept uploads after 11:20 am.**
- ✓ The exam is closed book and closed notes. You can use the one-page formula sheet provided via Canvas. Only one page (front and back) with handwritten equations are allowed.

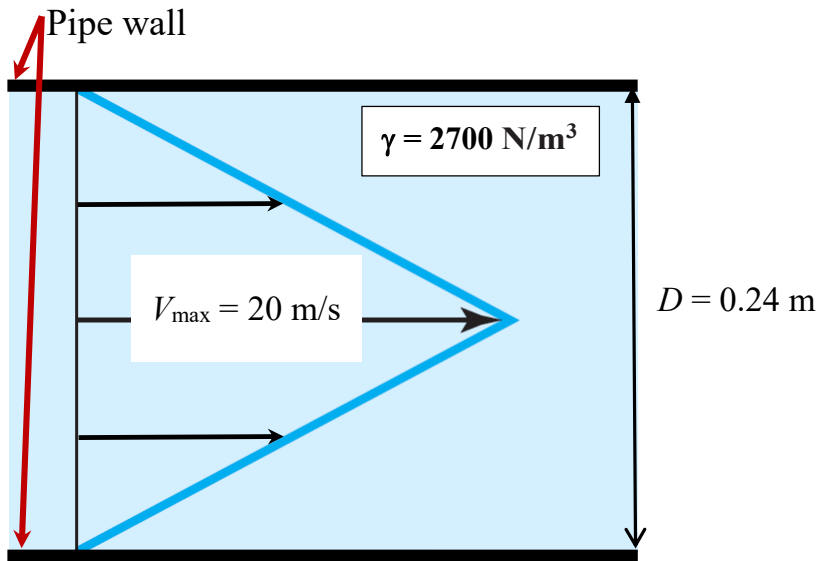
1. **(25 points)** What is the horizontal and vertical force of the liquid acting on the circular gate below? Use $R = 1.5$ m, $H = 6$ m, Gate width $b = 3$ m. The **liquid has a specific weight of 2700 N/m^3** .



2. (25 points) The tank shown in the figure below is accelerated vertically **down** at 9.8 m/s^2 . If the tank is 4 meters wide, find the force acting on the wall BC.



3. (25 points) A fluid with a specific weight of 2700 N/m^3 flows in a 24-cm-diameter pipe with the velocity profile shown below (i.e., the velocity increases linearly from zero at the pipe wall to a maximum at the center of the pipe). Find the flow discharge in the pipe if the maximum velocity at the center of the pipe (V_{\max}) is 20 m/s.



4. (25 points) Assuming hydrostatic pressure distributions ($P = \gamma h$), uniform velocity profiles (i.e., velocity doesn't change with depth), and negligible viscous effects, find the horizontal force needed to hold the sluice gate in the position shown below. The liquid has a specific weight of 2700 N/m^3 . The gate width is 5 m.

