

Florida International University
CWR 3201 Fluid Mechanics, Fall 2019
Mid-term # 1

Instructor: Arturo S. Leon, Ph.D., P.E., D.WRE
TA: Mohammad R. Safaei, Ph.D.

Student Name: _____

Date: 09/27/2019

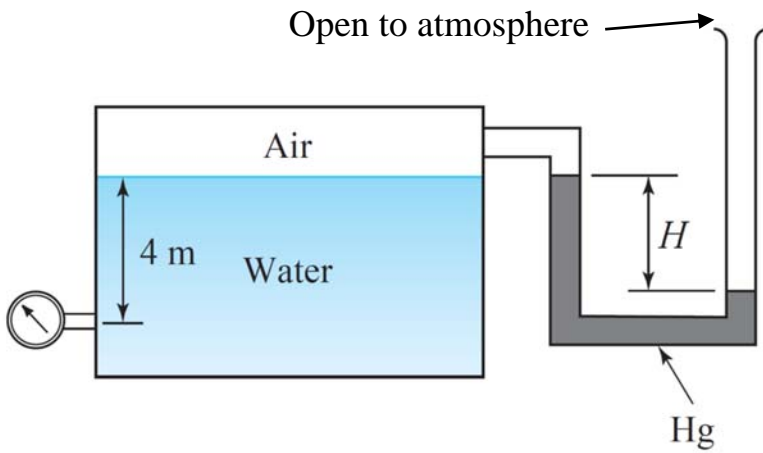
✓ You will have 1h 15 minutes to complete the exam. The exam is closed book and closed notes.

Only one page (front and back) with handwritten equations are allowed (no photocopies or artificially reduced text/graphics will be allowed).

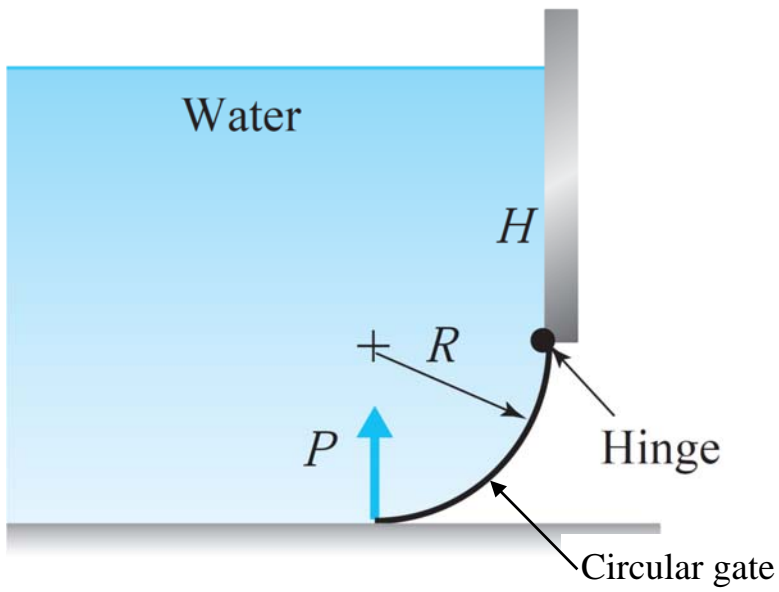
1. **(15 points)** The velocity distribution in a 4-cm-diameter pipe transporting 20°C water is given by $u(r) = 10(1 - 2500r^2)$ m/s. What is the shear stress at the pipe wall in Pascals?
Assume $\mu = 10^{-3}$ N.s/m²

2. **(15 points)** A body, with a volume of 2 m^3 , weighs 40 kN in the air. Determine its weight when submerged in a liquid with $S = 1.59$.

3. (20 points). In the figure below, the initial H is 16 cm. If the air pressure in the tank is increased by 10 kPa, what is the magnitude of the new H ?



4. (25 points) A force $P = 300$ kN is needed to just open the circular gate below with $R = 1.2$ m and $H = 4$ m. How wide is the circular gate?



5. **(25 points)** The gasoline tank below, with an initial pressure of $p = 20$ kPa, is accelerated to the right at the rate of 5 m/s^2 . What is the force on the 4-cm-diameter plug? The density of gasoline is 680 kg/m^3 ($S = 0.68$).

