CE100
Midterm Examination #1
Spring, 2006
February 22, 2006

Name _____

Student I.D. _____

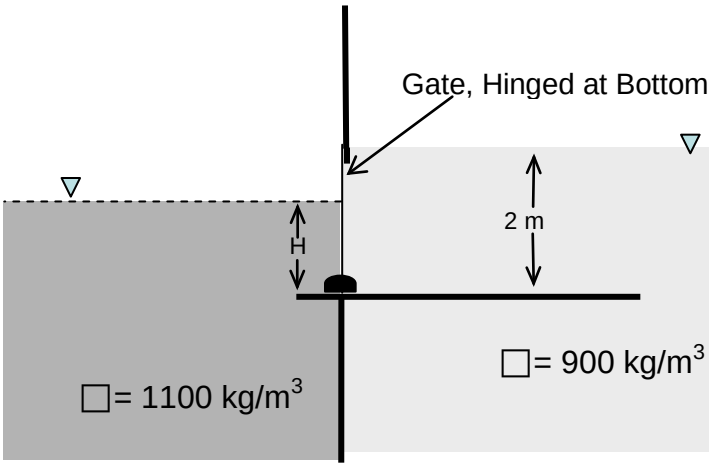
This exam is open book and open notes. You will be given fifty (50) minutes to complete two problems. Space is provided on each page for your solution, the back of the pages may also be used. Additional scratch paper is included at the back of the exam. If you need additional space, I will have scratch paper available. State clearly any assumptions you use in the solutions. Good Luck!

On all problems, you may assume that the fluid is water, unless otherwise noted. For your reference:

Atmospheric Pressure = p_{atm} = 100 kPa
Gravitational Acceleration = g = 9.8 m/s^2

Problem 1 (25 points):

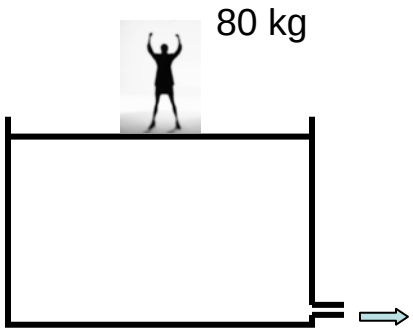
A very simple design for a tidal control gate is driven by hydrostatic forces. The following gate is designed open to the left (hinged at the bottom) as the free surface on the left drops.



Assuming that the gate is rectangular, and has a width W = 2 m, determine the depth on the left (H) at which the gate will open.

Problem 2 (25 points):

A large vat is being used as a wine press. The vat is cylindrical, with a diameter of 2 meters, and is 1 meter deep. The press is "operated" by having a person stand on the top surface of the vat, which rests on top of the grapes.



Calculate the velocity of outflow from an opening on the bottom of the tank.

You may make the following assumptions: (1) the entire interior volume of the vat is filled with liquid; (2) that you can neglect the weight of the top surface of the vat; (3) the outlet opening has an area of 25 cm^2; and (4) the "operator" weighs 80 kg.