CE100
Midterm Examination #1
Fall, 2003
October 10, 2003

Name ____

Student I.D. _____________________

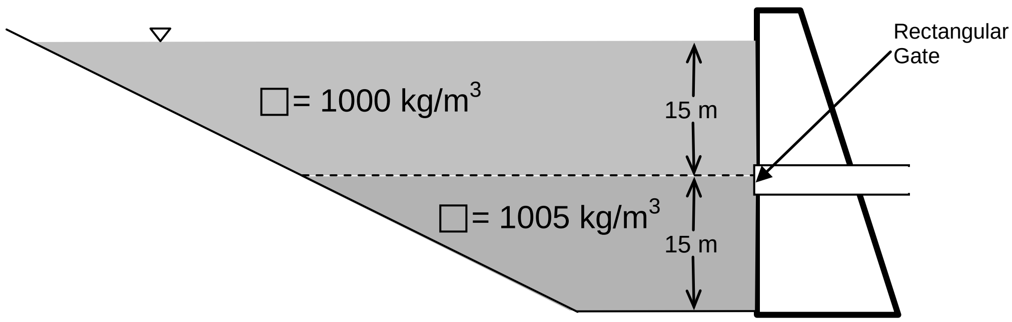
This exam is open book and open notes. You will be given fifty (50) minutes to complete two problems. Space is provided on each page for your solution, the back of the pages may also be used. Additional scratch paper is included at the back of the exam. If you need additional space, I will have scratch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

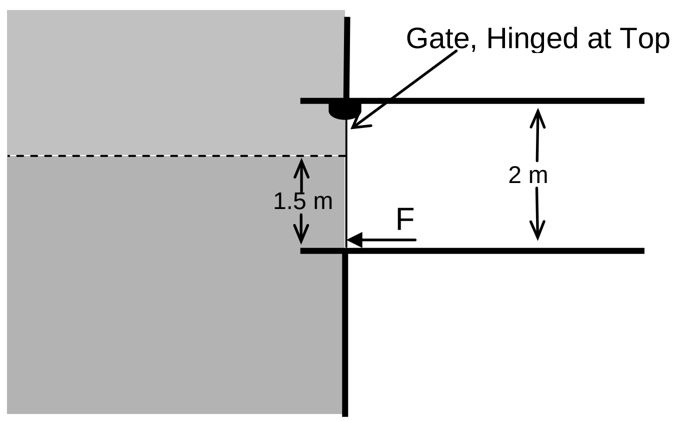
Atmospheric Pressure = p_{atm} = 100 kPa
Gravitational Acceleration = g = 9.8 m/s^2

Problem 1 (25 points):

During summer months, lakes and reservoirs develop a layered structure, with warmer, lighter water near the surface and cooler, more dense waters at depth. There is an outflow available through a rectangular conduit that is 1 meter wide and 2 meters high, with a vertical gate that is usually kept closed.



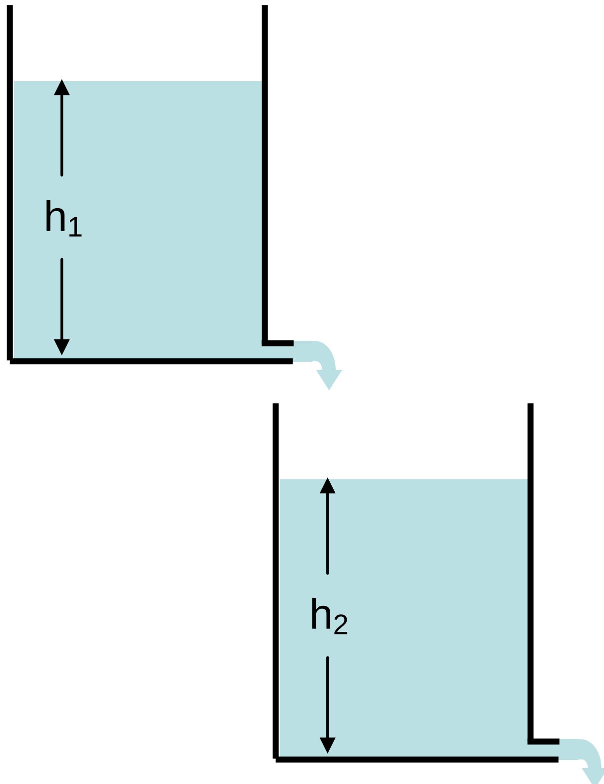
Close up of Gate:



(a) What is the maximum pressure in the reservoir? Where does it occur?
(b) For the conditions illustrated, what force must the applied at the base of the gate to keep the gate closed?

Problem 2 (25 points):

Two open tanks are arranged in series as shown, with the outflow from each tank behaving as a free jet. The cross-sectional area of each tank is 100 m^2, and the jets have cross-sectional area of 1 m^2. Both tanks are open to the atmosphere, and all of the outflow from tank 1 enters tank 2.



At a particular time, the depth in tank 2, h_2, is 10 m, and is increasing at a rate of 1 cm/s. Based on this information, determine the depth in tank 1, h_1, at that time.