

Test 1 Reflection

- 1) For test 1, the first question demonstrates course objective 2 and 3. Objective 2, is applying concepts of and computing pressure and the associated forces in stagnant fluid. This was needed to analyze the incline plane that the gate was on. Objective 3, determine the buoyancy and evaluate the stability of objects when floating or submerged in a fluid. This was also needed to answer the questions about the system being stable. The concepts of buoyancy proved the buoy is stable while opening the gate. The second question used objectives 1 and 2; similar to the first question, objective 2 was used to analyze the fluid's behavior while in the u-tube. The first objective was understanding the fundamental nature of fluids and defining different fluid properties like viscosity and pressure. We needed this to compute the pressure of the fluid in the u-tube using height and γ h.
- 2) During the first question, I realized that in order for the buoy to be submerged, F_b had to equal F_g . I solved for F_g , but couldn't solve fully for F_b , since I didn't know the radius of the buoy. A mistake I made was not using the sum of the moments to calculate my F_b . I also did not solve for the F_R because I did not think that would be needed to find the buoy radius. After reviewing the solution, I understand the relationship between the physics of the problems and the fluid mechanics to find the diameter of the buoy needed.

For the second part of the test, I did not find the equations with the unknown heights. I was very confused about the drawing because I did not see that $20\text{in} + h_1 = h + h_2$. I almost got the sketch correct but I ended up using a formula from a related homework problem. Change in pressure, which was given, equals density*gravity*height. The hard part was to get all the units to match and cancel out eventually. I also thought if there was no flow, there would not be a pressure difference, but that was untrue because the heights changed so there would be a pressure

difference. My graph does make sense because the relationship should be a linear relationship between deflection and pressure difference. Next time, to not make these same mistakes, I need to think longer and harder about the concepts of the test and not just the equations. Also, to make more accurate sketches to visually see the relationships.

PART 1)

1. Magnitude of the hydrostatic force on the gate 0/8 out of 1/8
2. Location of the hydrostatic force on the gate 0/8 out of 1/8
3. Solve for buoy force from moment conservation 0/8 out of 1/8
4. Using buoyancy eq to get sphere diameter 1/8 out of 1/8
5. Are the stability arguments correct? 1/8 out of 1/8
6. Proper excel spreadsheet 1/8 out of 1/8
7. Buoy size vs. gate angle plot & smallest buoy 1/8 out of 1/8
8. Correct results? 0/8 out of 1/8

4/8

PART 2)

1. Use geometrical relation 0/7 out of 1/7
2. Use $\gamma \cdot h$ procedure 0/7 out of 1/7
3. Proper manipulation of eqs and solve for "h" 0/7 out of 1/7
4. Pressure difference when no flow 1/7 out of 1/7
5. Proper excel spreadsheet 1/7 out of 1/7
6. Mercury deflection vs. Pressure difference plot 1/7 out of 1/7
7. Correct results? 0.5/7 out of 1/7

3.5/7

1. Purpose	0.5/10.0 out of 0.5/10.0
2. Drawings	1.0/10.0 out of 1.0/10.0
3. Sources	1.0/10.0 out of 1.0/10.0
4. Design considerations	1.0/10.0 out of 1.0/10.0
5. Data and variables	0.5/10.0 out of 0.5/10.0
6. Procedure	1.0/10.0 out of 2.0/10.0
7. Calculations	1.0/10.0 out of 2.0/10.0
8. Summary	0.5/10.0 out of 0.5/10.0
9. Materials	0.5/10.0 out of 0.5/10.0
10. Analysis	1.0/10.0 out of 1.0/10.0
TOTAL	8.0/10.0 out of 10.0/10.0

FINAL GRADE:

$$10.0 + (80/2) * (4/8 + 3.5/7) = 50 \text{ (self-graded)}$$

A. Some issues I ran into during the test were not having enough information, so I contacted the professor to get some guidance. Also, I had a hard time finding problems in the book or previous homeworks that related to the material on the test. Once I got stuck, I started drawing and writing what I know and what I was trying to find.

B. First, I took a couple days to think about the diagram and concepts we learned. Then I sat down for about 5 hours to work on the first questions before I got stuck on part 2. I started by writing what I knew then I looked back in the slides and homeworks to see if anything could help me. Next time, I will take more time thinking about concepts and if it makes sense, rather than the equations and numbers presented.

C. Each day in this class, I am constantly reminded of past Static concepts that are also needed for this class. I also learned how to deal with multiple unknown and manipulating equations to solve for what you need.

D. Engineers use these concepts constantly while working with boats and or anything that interacts with fluids or mainly water. The Navy would work with these same concepts on a daily basis, to make sure their ships are stable and correctly buoyant.

E. In my first engineering job, I am sure I will be asked to use these concepts to apply in other situations. Or if I'm ever in a situation where I am using properties of fluids.

F. Yes, I think this class will be helpful for me and my future career. To be given a problem without all variables defined, and try to solve for things with the information given.

G. In my first professional career, if I am given a problem involving fluid properties and concepts, I will be able to revert back to this class to solve the problem given. Since I have been given information and skills to use in my future profession.

H. No, I have not been able to use the concepts I have learned in this course to my other classes yet.

I. I feel like my diagrams and written work was the most successful part of this test. And I've most improved in my drawing for part b after talking with the professor.

J. The material I'm learning in this course is more concepts and applications than in any of my previous courses. This will be useful when I pursue a career in mechanical engineering after college.

K. I spent about 5-6 hours the first day working on the first part of the test. I tried to answer all the questions along with completing the excel file. Once I got to the second part, I got stuck on the unknown heights and stopped for the day. I spent about 7 hours the next day working on part b and completing the excel and write-up for the rest of the test. Next time, I will give myself an extra day to complete the write up so I can solely focus on the test while taking it. This will give me more time to think and ask questions about the test before the due date.