Fluid Mechanics Test 2 Reflection

Brady Semtner

1) This test demonstrated my work toward describing the nature of fluids and define different fluid properties such as viscosity and pressure by me finding the pressure at different points in a system and finding the heights of a manometer using pressure. These also demonstrated my work applying the principles of conservation of energy (Bernoulli's equation). This test also shows my work towards understanding open channel flow and buoyancy and stability because I absolutely nailed the second half of the test which was on open channel flow and buoyancy and stability.

2) My test is fairly similar to the available solution. I got the second half of the test almost entirely correct except for not squaring something I was supposed to square. However, I had it in the original equation I wrote down on the test, I just forgot it when I was inputting the variables. If I were taking this test again, I would tell myself not to overthink the problems. Specifically on question 2 I made it much harder than I needed to. I split the system into five free body diagrams instead of putting the entire system into one free body diagram. I couldn't figure out how to find the pressure going into and exiting each of the parts.

3)

1.	Purpose	0.5/10.0 out of 0.5/10.0
2.	Drawings	0.5/10.0 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	**7.5/10.0** out of 10.0/10.0

1. Force on the flange
    a. Consider piezometric head (get pressure above fluid) 0/25 out of 1/25
    b. Force magnitude 0/25 out of 1/25
    c. Force location 1/25 out of 1/25
2. Pipe-elbow forces
    a. Free body diagram and correct forces 0.5/25 out of 1/25
    b. Force in x – solve for Rx 0/25 out of 1/25
    c. Force in y (weight) – solve for Ry 0/25 out of 1/25
3. Flow-nozzle flowmeter pressure drop
    a. Right equation and A1/A2 1/25 out of 1/25
    b. C value 1/25 out of 1/25
4. Water hammer pressure increase and cavitation
    a. Wave velocity (units?) 1/25 out of 1/25

b. Pressure increase and Pmax 1/25 out of 1/25
c. Pipe thickness 1/25 out of 1/25
d. Lowest pressure & compare to sat pressure (cavit) 1/25 out of 1/25

5. Flow in the open channel
   a. Lazy river dimensions 1/25 out of 1/25
   b. Correct equation 1/25 out of 1/25
   c. Area and hydraulic radius 1/25 out of 1/25
6. Drag force on the child
   a. Correct equation to use 1/25 out of 1/25
   b. Correct area and velocity 1/25 out of 1/25
   c. How Cd was obtained? 0.5/25 out of 1/25
7. Lazy river tube floating – stability
   a. Realize Fb=W and solve for distance into water 1/25 out of 1/25
   b. Compute metacenter location 1/25 out of 1/25
   c. Realize metacenter will always be above cg 1/25 out of 1/25

8. Correct results? 2/25 out of 4/25

10 + (80)*(18/25) = 67.6

I had everything set up properly, I just used incorrect diameter and friction factor values. My strengths were sketching, getting the proper equations, and calculating the equations. My weaknesses were in finding the proper values to put into the equations.

4) Discuss the following:

a. What issues did you encounter in completing the test? How did you troubleshoot them?

I overthought a lot of stuff on it. For the second problem, rather than just take the entire system as one for my free body diagram, I split it into five different parts and tried to find the forces on each part individually. In hindsight, it makes sense to just take the system as a whole because the resultant forces would still be the same.

b. What steps did you take to complete the whole test? Would you change something?

I used the examples on Canvas heavily to find inspiration for how to complete the test. I also used Professor Ayala's recorded lectures that were on Canvas to see how he worked through problems in real time to get a better understanding of the structure.

c. What new concepts have you learned?

I have learned a lot about open channel flow. It is a lot simpler than I had realized, at least the problems we have worked on so far have been. I also learned more about pressure location and magnitude. I also learned about buoyancy and stability.

d. Where you think engineers use those concepts (provide specific examples)?

I think engineers use these concepts a lot in water parks on slides and especially when designing lazy rivers. These concepts are also used often when designing drainage systems for things like agriculture and stormwater management.

e. Where do you think you will be using everything you learned?

I will be using it later on in the semester while I am polishing up the design for my project. I might also be using these skills in the industry if I am working on a project that involves pipes or open channels.

f. Do you think what you learn is important for your professional career?

I do think that this is very important for my professional career. Even if I don't encounter problems that are similar to it, working through problems has improved my problem-solving skills and this is the first time I have designed something in a way resembling a professional fashion.

g. How, when, where, and why you might use this information or skill in the future?

I might use this information if I am working at a job that requires me to move fluids through open topped troughs and half pipes.

h. Have you been able to apply concepts you have learned in the course to what you do at work or in other courses?

I first learned this method of problem solving in thermal applications, so I have used this method in that class, and I have used it in my physics classes.

i. What areas did you feel you were most successful, or improved the most?

I felt I was most successful at the second half of the test because I was designing something from the ground up. It was much more interesting than just working another problem of which I'd seen many similar ones.

j. How do you see this course's content intersecting with your field or career?

I have the potential to work with reactors in the Navy and they have cooling systems with pressurized pipes which would use these equations. Open channel flow is also quite applicable for the Navy because the ships exist in open channels.

k. How much time did you spend on the test? How was the time organized? What would you do differently? Why?

I spent roughly ten hours on the test. I knew I would not be able to work on it on the Friday it was due because I had to go to work that day, so I did most of the problems the day before on a big whiteboard so I could really see what was going on with the problems. I wasn't able to work on it before that because I had obligations for my other classes. Then the next day I wrote them all down and finished the other problems after work. I worked a lot on the first day to finish the pretest to get some extra insight for the test. I will continue to organize my time in this manner because it gave me the final day to look over some of my work and I was able to fix some mistakes I had made.