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MET330: Test 2 Reflection

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1) How and why the test demonstrates your work toward one, or more, of the course learning objectives. Be specific on the course objectives you decide to mention.

The test demonstrates my work towards several course learning objectives. The first one is to discuss and determine object stability while floating in a fluid. Sub-problem (f) required me to solve for the stability of the largest hickory log that could be carried in the open channel. While I did not get this portion correct, I utilized what I had learned and gave explanation for my work. Another was to use Bernoulli's equation to solve for friction losses in the piping system. I met this course objective in sub-problem (b) where I was required to solve for the relevant horizontal and vertical forces in the system pipe-elbow. This problem also included work towards an additional learning objective: computing the pressure and the forces such as magnitude, location, and direction which I completed for the elbow near the discharge of the system as well as in subproblem (g) where I solved for the forces acting upon the blind flange inside the tank. The last course objective was to identify and solve for different very specific industrial problems, such as, open-channel flow, cavitation, water hammer, drag, forces in pipes, and learn about different instruments to measure fluid flow quantities. This was demonstrated throughout the other sub-problems like the open channel when I solved for velocity and height of fluid and for the proposed flow nozzle where I solved for pressure difference.

2) How your test compares against the available solution. State the mistakes you made and what you will do next time to avoid making same mistakes. Please point out exactly where you made the mistake, say why you made the mistake, and how you should have done it. If you were taking this test again, what advice would you give yourself to ensure that you had a successful test?

My format is identical to the solution by having sections for purpose, diagrams, sources, data and variables, materials, procedure, summary, and analysis in that order. When comparing my procedure and calculations against the available solution, there are several mistakes worth noting. Starting with (a), I performed this solution correctly and got the correct answer, just in English units. For (b), I chose the wrong value from Moody's chart for by friction factor. I think I accidentally looked at the wrong value when reading the chart because my Reynold's number and D/e ratio were the same as the solution. Next time I will be more careful and triple check before I write down a number for f. This contributed to my value for pressure of the air in the tank being higher than the solution. The next mistake that I made was not interpreting the question correctly. I thought it was requiring me to solve for forces in the pipe elbow, but it wanted the pipe as well. This led to an answer different from the solution. To prevent this from happening again I will ask for clarification so that I don't solve for the wrong thing. Moving on to (c), I made my first mistake when I simplified my formula. This led to an answer for the max size of the log that was larger than the solution. This in turn led to my stability calculation being incorrect, although, I did use the proper formulas for both parts of this problem. Next time I encounter a problem like this, I will be more careful with setting up my equations. For (d), I

performed this solution correctly and was only off by 0.13 psi, which I would contribute to differences in rounding. For (e), my mistake was thinking that I had to calculate the nominal thickness using the equation in chapter 11 like in the project, when I should have simply used the thickness provided in the appendix table for 1-1/2 schedule 40 steel pipe. This threw off my answer by a good amount. Next time I will pay more attention and use critical thinking regarding what exactly I am solving for. In my paragraph I wrote after this calculation I was not thinking correctly and used the wrong term. For some reason I was referring to water hammer as cavitation. There should not have been cavitation is the system, just water hammer. I will pay attention to what I am writing next time because that will surely confuse whoever is reviewing my work. In (f), I made several mistakes when it came to data. First, I chose the wrong drag coefficient from the textbook, it should have been 1.6 and not 1.16. Next, my calculation was off due to making the mistake that I mentioned previously of the log size. Therefore, my answer was way smaller than it should have been. Lastly, for (g) I made the mistake of using the formula straight from the book to solve for the force at the blind flange instead of performing Bernoulli's as well as not calculating the location. For some reason I was thinking that because the tank was vertical with no slope that the force would be acting on the center of the flange no matter what. Next time I encounter a problem like this one I will fight the urge to use other equations and stick to solving using Bernoulli's equation.

3) What your grade should be. Base it on the writing rubric provided in the test and the correctness of your solution. What are the strengths and weaknesses of your test?

WRITING RUBRIC (Applied to the whole test, not to particular problems)

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

Based on the writing rubric, I did not have many weaknesses this time. If I had to pick anything I would say that the correctness of my calculations was my weakness. I did much better with adhering to the writing rubric this time.

PROBLEM 1)

1. Open channel depth (y)
    a. Correct equation 1/2
    b. Area and Hydraulic radius 1/2
2. Pipe-elbow forces
    a. Free body diagram and correct forces 1/3

b. Force in x 1/3

c. Force in y (weight) 1/3

3. Largest wood log

    a. Size 1/2

    b. Stable? 1/2

4. Flow-nozzle flowmeter pressure drop

    a. Right equation and A1/A2 1/2

    b. C value 1/2

5. Water hammer pressure increase

    a. Wave velocity (units?) 1/2

    b. Pressure increase 1/2

6. Drag force on a stuck log

    a. Correct area 1/3

    b. Correct velocity 1/3

    c. How Cd was obtained? 0/3

7. Force on the flange

    a. Magnitude 1/2

    b. Location 1/2

8. Final actual values of the results 0/1

Final Grade: 10+(80/8)*(2/2 + 3/3 + 2/2 + 2/2 + 2/2 + 2/3 + 2/2 + 0/1) = 76.67

4) Discuss the following:

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

One issue that I encountered was solving for the depth. I had the right process and correct answer, however, I kept re-working it because it didn't seem right that the channel would be that shallow. I reached out to the professor for reassurance that my math was correct. Another issue that I had was solving for the pressure increase due to the sudden closing of the valve. For some reason I was confusing myself by thinking variable C was like Cd for the drag force equation and that it would be unitless when it was a velocity. This made me scratch my head for a while because I couldn't seem to get my units to cancel. I troubleshot this issue by reaching out to the professor for clarification and referring to the course lecture on water hammer where the diagrams are given and show that C is a velocity in the opposite direction as flow velocity.

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

I took the steps in the format of the writing rubric. This led to an organized solution and made everything neat and logical. I would not change anything about this.

c. What new concepts have you learned?

I learned how to solve for water depth in an open channel if not given any dimensions for the channel. I learned how to solve for horizontal and vertical forces in a pipe system like the problem through the provided test solution. I learned how to calculate the largest possible object that can be carried in a channel. I learned how to find location of force on a blind flange on a vertical tank wall. I may be missing a few things but these are the ones that first come to mind.

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

When designing supports for piping systems, when designing an open channel for a specific purpose like carrying objects at a desired velocity, when calculating the required thickness and material that a blind flange and fasteners must be on a storage tank.

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

I believe I will be using this information if I am in a design engineering position in the future or if I have to troubleshoot why something isn't working properly. While it may not be the exact same scenarios, aspects of each of these problems could be useful in many applications related to fluid mechanical systems in the engineering field.

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

Yes, I believe it is crucial that I learn these skills so that I am competent and don't make mistakes when designing or evaluating systems. If not able to be done correctly, this could result in damage to components resulting in high costs for repair and replacement or the endangerment of others.

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

If or when I become a practicing engineer, I would use this information for designing systems for customers. It would be specifically for designing pressurized fluid systems or open channel systems.

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

Yes, definitely. I am currently an engineering technician that deals with fluid mechanical systems everyday. For my position, I develop technical documents and system tagouts for work to be performed on reactor plant mechanical systems. I also test these systems after all work has been completed for certification before it is handed over to the customer. I honestly wish that I was able to take this class sooner because the things that I learn in here are 100% applicable to what I do. I have a better understanding of why systems are designed the way that they are and am better at troubleshooting unexpected system responses due to my better understanding of fluid mechanics.

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

The area that I have improved the most is problem solving. I am now able to look at a problem and figure out a good starting point to build from and how to analyze what I know, don't know, and what to solve for. The types of problems in this course can be overwhelming but through practice, familiarizing myself with the material, and learning from mistakes I am much better at solving these types of problems. I may not get them correct all of the time, but I am able to get farther than I ever would have at the beginning of the course.

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

Because I want to be a mechanical engineer, I can see the knowledge that this course provides being an integral part for being successful in my future career.

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

I would say I spent around 16 hours total on this test. This was partially due to hitting a few roadblocks and having to work through them. There were also a few times that I had to manipulate formulas or equations to solve for specific things which I had not practiced yet. If I could do anything differently it would be to read the textbook chapters with more scrutiny. There is a lot of useful concepts and information in there that you won't get unless you read it and practice it and it is helpful to completely understand the concepts when solving problems like the ones on this test.