Devon Moore MET 330 Dr. Ayala November 3, 2021

Exam 2 Reflection

1. The following objectives were addressed in this exam:

Objective: Explain the fluid dynamics in pipes and fittings;

Explanation: The minor and major losses of the piping system had to be determine to find a more accurate pressure for the tank on the right.

Objective: Apply the principles of conservation of energy (Bernoulli's equation) and mass to fluid flow systems;

Explanation: Bernoulli's equation had to be used in part B to determine the pressures and losses at the new flow rate.

Objective: Discuss what buoyancy is and determine object stability while floating or submerged in a fluid

Explanation: This objective was addressed in part A to determine how deep the body sank in the lazy river and the person's stability.

Objective: Identify and solve for different very specific industrial problems, such as, open-channel flow, cavitation, water hammer, drag, lift, forces in pipes, and learn about different instruments to measure fluid flow quantities (such as, pressure, fluid velocity, flow velocity, etc.)

Explanation: This objective was used to design the lazy river and determine the drag force on a child in part A and check the piping system in part B for water hammer and cavitation.

2. The first difference I see between my exam work and the solution was in the selection of variables and data used to solve part A. I chose to only allow for an additional 8 cm of space in the lazy river because I wanted to keep the flow rate as low as possible, this however was a value we were allowed to choose. The depth of my lazy river was also different, I used half the height of the average 3-year-old rather than 2/3 height of the shortest girl. It does make more sense to account for the shortest girl in this situation. These minor differences account for a difference in flow rate and velocity, however I do not think they are technically wrong based on procedure and allowance to choose certain variables. The difference in Reynold's number and draft force on the child are due to the variables as well, I believe my procedure was correct. By Ayala's law my X only differs by about 10% so It is an insignificant difference, however process-wise, I did not subtract the inner diameter of the tube from the outer diameter, this accounts for the small difference. This same error occurred when I calculated the moment of inertia for the tube and accounts for my difference in MB. My difference in metacenter is caused by the difference in X and MB. My Fy is correct, however my Fx is not. My entire equation was wrong for Fx.

In part B the differences begin with the pressure at the inlet, however it is a very small difference that is negligible by Ayala's law. My difference in Rx was a sign error, I divided instead of multiplying. My Ry was correct. My calculation for c was off by a lot. I used the correct formula, however, my unit conversion caused errors. The difference in c caused a difference in the rest of part 7, my procedures for the rest of 7 were correct but output incorrect answers due to the c errors. My mistake in cavitation comes from mixing up which pressure should be higher for cavitation to occur.

3. I would give my test a **10/10** for the rubric because based on how I did the problems I covered each section of the rubric.

Problem 1: 4/4

Problem 2: 4/4

Problem 3: I am deducting 0.25 for not subtracting the inner diameter from the outer diameter when solving for X. I am deducting 0.25 for not subtracting the inner diameter from the outer diameter when solving for MB. I am deducting 0.5 for my metacenter being below cg because I only came to this conclusion due to the mistakes above. I will deduct 1 point for correctness.

2/4

Problem 4: I am deducting 2.5 points for horizontal location, magnitude, and correctness. 1.5/4

Problem 5: I am deducting 0.5 points for my mistake in dividing rather then multiplying when finding Rx.

3.5/4

Problem 6: 3/3

Problem 7: I am deducting 1 point for wave velocity. And 1 point for correctness, my other procedures were correct. I am deducting 0.5 for mistaking Psuction > Psat means their will be cavitation.

2.5/5

Total: 10+(80)*(20.5/28) = 68.57

4.

- a. One of the issues I encountered during the test was determining which reaction forces were created by the piping system in part B. I spent time looking at the textbook and my notes and spoke with Dr. Ayala to resolve this. Another issue I had was incorrect units due to a typo in the textbook, Dr. Ayala helped me fix this issue, but I should have noticed it on my own.
- b. I first looked through the questions and wrote down my variables and picked dimensions for the parts that were not given. I then worked through each part based on what I said I would do in my pretest. The majority of the test was without hiccup aside for the two examples I listed in part a. In the future I would check my work more carefully for simple mistakes before submission.
- c. One concept I learned from the solution is you have to subtract the inner diameter from the outer diameter when determining the moment of inertia, MB, and displacement volume of a donut shaped object.
- d. Engineers use these concepts in water parks to design rides and other attractions similar to what we did in this exam. Engineers would also use concepts from part A to design sewage and other water ways as open channels.
- e. Yes, one of the most common jobs for mechanical engineers is doing work like this for civil engineering firms. I am interviewing at Allan Myers today and I am sure this would be important to know if I get the job.
- f. These concepts are definitely important to my professional career, and I wish to have a better understanding of them as the class continues.
- g. If I get a job with Allan Myers, I may use these concepts to design a drainage system for an interstate onramp.
- h. I have not used the concepts professionally yet. However, the flow nozzle part of part B was like the orifice plate experiment done in the lab recently.
- i. I feel like overall I did better on this test. A few of the parts I believe I will receive full points for and most of the sections I didn't do as well on were for small mistakes. I do think I need to get a better understanding of how reaction forces work in the X direction.

- j. These concepts are used in a lot of industries, specifically if I work at a civil engineering firm this is a lot of what the mechanical engineers do.
- k. I spent less time on this test than the last one, somewhere between 10-12 hours. My time was organized by doing the pretest Friday, then working the problems after receiving the feedback Saturday afternoon and finishing up Sunday morning by writing out my equations since I used excel to do the work. I am satisfied with how I spent my time on the test, the next test I will spend more time reviewing my answers before submission.