Dylan Arnold
MET330 – Summer 2023 Semester
Test 3 Reflection
July 18th, 2023
Professor Ayala
University ID: 01166349

Test 3 Reflection

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.
    a. Test 3 for the MET330 class at Old Dominion University demonstrates works towards 4 of the 9 class objectives. These objectives are: 1. Compute pressure and the forces (magnitude, location, and direction) associated with it in a stagnant fluid. 2. Explain the fluid dynamics in pipes and fittings. 3. Apply the principles of conservation of energy (Bernoulli's equation) and mass to fluid flow systems. 4. 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.) Problem 1 uses #1 because we deal with determining the moment about a pole base. Problem 2 uses #4 because we deal with an open-channel flow. Problem 3 uses #2 and #4 because we deal with a manometer and an orifice plate and determining values such as Q (flow). Problem uses #1 and #3 because we deal with determining forces in the x direction and the y direction as well as using Bernoulli's equation to determine pressure at different reference points. Problem 5 uses #2 and #4 dealing with velocities and water hammer.
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?
    a. Problem 1:
        i. I set up the problem correctly using the correct lengths and the correct formula to determine the Cd value. However, it looks as if I didn't use the right area formula (since I thought it was a force against a cylinder using the book's formulas in the associated chapter and not just a circle. My Cd values matched the solutions, but since my Area values were slightly off, my final results were different from the test solutions. I did set up all the formulas the same (minus Area) as the test solutions so that's a good thing!
    b. Problem 2:

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i. I used a n value of 0.013 as I had some trouble determining exactly what cement was in the table (later found to be unfinished concrete n = 0.017) so this causes some values to have some variation. I did however still set up the formula correctly and iterated the same way that the test solutions did. I did as well find that the flow was subcritical so heading in the right direction, just needed to get some constant values correct at the beginning.

c. Problem 3:
    i. I had a Reynolds number value of 1.7 x 10^6 while the test solutions had a Reynolds number value of 1.84 x 10^6. However, I still came close to the C value of 0.601 with a value of 0.602. It also looks as if I had the height formula set up correctly but didn't have the A value set up correctly, so my height value came out to 3.7 feet instead of 4.7 feet.

d. Problem 4:
    i. This problem was one of my worst from the entire test. I thought from the beginning that there would be pressure leaving the 3in jet, but after further investigation, pressure = 0 if water leaves to the atmosphere. So, this messed me up from the beginning, but I set up some of the formulas the same as the test solutions for Rx and Ry, R, and theta. I didn't have V2 the same as the test solutions which caused my velocity value to be 3 off the test solutions. I also messed up with the velocity direction and had Rx positive and Ry negative and those were flipped in the test solutions and this costed me a lot because of the large variation in final values due to the mess up of direction (positive vs negative).

e. Problem 5:
    i. This one was one of the best I've had throughout the 3 tests for MET330 Fluid Mechanics. I set up all the formulas the same as the test solutions and I even caught the N/cm^2 catch and converted to N/m^2.

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?
    a. Problem 1:
        i. Moment with respect to A 1/5 out of 1/5
            1. 1/5
        ii. Correct distances 1/5 out of 1/5

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1. 1/5

iii. Correct Cd using Re and forces 2/5 out of 2/5
 1. 2/5
iv. Results 1/5 out of 1/5
 1. 0/5
v. Total Score 4/5

b. Problem 2:
 i. Correct Q equations (look at constant) 1/6 out of 1/6
  1. 1/6
 ii. Correct A and Hydraulic radius R 1/6 out of 1/6
  1. 1/6
 iii. Solving by iteration 2/6 out of 2/6
  1. 2/6
 iv. Is it critical? 1/6 out of 1/6
  1. 1/6
 v. Results 1/6 out of 1/6
  1. 0/6
 vi. Total Score 5/6
c. Problem 3:
 i. Correct eq for Q for nozzle 1/5 out of 1/5
  1. 1/5
 ii. Use Re to get C 1/5 out of 1/5
  1. 1/5
 iii. Solving by “h” 2/5 out of 2/5
  1. 2/5
 iv. Results 1/5 out of 1/5
  1. 0/5
 v. Total Score 4/5
d. Problem 4:
 i. Compute pressures using Bernoulli’s 1/7 out of 1/7
  1. 1/7
 ii. Compute height with length 1/7 out of 1/7
  1. 1/7
 iii. Appropriate control volume? 1/7 out of 1/7
  1. 1/7
 iv. Rx (be careful with velocity direction) 1/7 out of 1/7
  1. 0/7

        v. Ry (be careful with velocity direction) 1/7 out of 1/7
            1. 0/7
        vi. Compute Q with Bernoulli's 1/7 out of 1/7
            1. 1/7
        vii. Results 1/7 out of 1/7
            1. 0/7
        viii. Total Score 4/7
    e. Problem 5:
        i. Correct C (be careful with units) 2/4 out of 2/4
            1. 2/4
        ii. deltaP 1/4 out of 1/4
            1. 1/4
        iii. Results 1/4 out of 1/4
            1. ¼
        iv. Total Score 4/4
    f. Total Grade = (90/5)*(4/5 + 5/6 + 4/5 + 4/7 + 4/4)= 72.1 test points + 10 HW points = 82.1 for Test 2. With an additional 5 coming from the eP extra credit, that would be a total score of 87.1 for Test 3.
    g. Strengths for Test 3 were setting up the foundational formulas correctly and using the correct units. Weaknesses were getting hung up on simple things like area formulas or some constant formulas (V = 4Q/piD2). Use the book! The chapters write out all the formulas very well. If you can't find it in the book (water hammer), look at the Canvas modules!
4. Discuss the following:
    a. What issues did you encounter in completing the test? How did you troubleshoot them?
        i. I had some trouble finding the water hammer equation in the book (used search function, looked in index, etc). Found out that it was in the Canvas modules and not in the book. I also got hung up on which Reynolds number formula to use (one with density versus one without). I found out that it was helpful to look at example problems either in the chapter readings or looking at the example problems that Professor Ayala did for the modules.
    b. What steps did you take to complete the whole test? Would you change something?
        i. Broke it up into two whole nights of work (Problems 1, 2, and 3 one night and problems 4 and 5 another night). I would not change this, I

seem to work best this way. It's a little difficult having homework, a lab report, and the test due in the same week but Professor knows this and is lenient with homework/lab report grading due to this.

c. What new concepts have you learned?
    i. That algebra is used heavily! Using formulas that values equal and plugging those into the main Bernoulli's equation to find certain values we need. Using tables and constant values to plug into foundational formulas to find other values. I've learned that it's critical to get your reference points right as it can cause you some confusion down the road with your formulas.
d. Where you think engineers use those concepts (provide specific examples)?
    i. Pole design for flags. Open channel water flow (rivers/dams/etc). Valve openings with water hammer (opening valves slowly vs fast, larger diameters/etc).
e. Where do you think you will be using everything you learned?
    i. I may use it on my own when doing a simple to-do project around the house, (creating a flag pole or putting a valve at the end of a pipe), but I don't believe I'll use it at my career due to the fact we are in mechanical design and not dealing with fluids.
f. Do you think what you learn is important for your professional career?
    i. As mentioned above, it may not be critically important in my career field, but it's still good to know that formulas can be used to compute certain values required. Set up excel spreadsheets so you can just plug and play values!
g. How, when, where and why you might use this information or skill in the future?
    i. As mentioned above, it will be beneficial to know these formulas if I wanted to put a flagpole up for a family member or myself. Or if I wanted to see how deep/wide I needed to dig a channel to get the right amount of flow (French drains/etc).
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. No, not personally since I deal in the mechanical design world (brackets/electrical/etc) vs fluids.
i. What areas did you feel you were most successful, or improved the most?
    i. Better at getting the formulas down and using those to figure the problem out. Need to realize that there are some values that have a

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constant value/formula that can be used to figure out. Area and velocity are the ones that slightly messed me up this test.

j. How do you see this course's content intersecting with your field or career?
    i. More in tune with the foundational formulas of figuring out certain values for Pressure/Force/Flow/Velocity are some of the key values.
k. How much time did you spend on the test? How was the time organized? What would you do differently? Why?
    i. Roughly 9 hours. 4.5 hours night 1 and 4.5 hours night 2. That was time dealing with solving the problems. Roughly another hour in loading the files to the google drive, the website, compressing the .pdf/etc.
    ii. I would not do this differently as spending 9 hours in one day would be tough to do with a full time job, being a husband, and a father to two young boys.