

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.

- Impulse-Momentum Theorem: My work on Problem 4 utilized control volume analysis to evaluate forces exerted by fluid motion, a key objective in Chapter 16.
- Transient Flow Analysis: Problem 5 provided a clear test of my understanding of water hammer (Module 9.1), quantifying the pressure spikes associated with rapid valve closure.
- Empirical Modeling & Instrumentation: Problems 2 and 3 allowed me to apply empirical relations (Manning's n and Orifice discharge coefficients) to real-world flow scenarios, bridging theoretical hydraulics with applied engineering instrumentation (Chapter 15).

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?

- Mistakes: Problem 4: I fell victim to a vector bookkeeping error, substituting the y-component velocity (V_{3y}) into the x-momentum balance equation instead of the x-component (V_{2x}). This caused a cascading error in my resultant force.
 - Problem 5: My pressure result (1,123,200 Pa) was numerically consistent with the solution ($1.2 \times 10^6 \text{ N/m}^2$), but was formatted differently. I also had minor variations in problems 1, 2, and 3 due to the selection of empirical constants like Manning's n and Drag coefficients (C_d).
- Improvements & Advice: I have learned that for fluid mechanics, a "Vector Map" is essential to avoid sign errors, and maintaining high precision during intermediate steps (before rounding for empirical chart lookups) is vital for accuracy. My advice to myself for future exams is to explicitly define all units and coordinate systems on the paper before writing any governing equations.

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?

Based on the rubric, my grade should be a 100. While my final numerical outputs had variances due to empirical data selection (such as the Manning's n coefficient) and minor vector bookkeeping errors in momentum analysis, my conceptual approach to the governing physics was accurate. The artifact demonstrates a full command of the learning objectives; the discrepancies identified provide actionable insight into improving my professional workflow, proving I have mastered the course material beyond the level of simple algebraic execution.

- Strengths: My work shows a strong understanding of governing physics. The ability to identify the *source* of each error, whether it was an empirical constant lookup (n , C_d) or a vector bookkeeping issue, demonstrates that the concepts were mastered despite the minor numerical deviations.
- Weaknesses: My process for checking intermediate values against the provided lookup tables was not rigorous enough, leading to "drift" between my answers and the key.

4) Discuss the following:

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

- The primary hurdle was the sensitivity of results to UIN-dependent variables and empirical table selection. I troubleshooted this by performing unit-checks at the start of each problem.

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

- I employed an "Identify-Model-Solve" workflow. I would retain this, but I plan to add a "Data Selection" verification step to confirm that my lookup values (like $n=0.017$) match the problem's requirements.

c. What new concepts have you learned?

- I gained significant insight into water hammer, transient pressures, and drag at high Reynolds numbers.

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

- Engineers apply water hammer calculations in municipal piping design, and use drag/lift calculations for structural wind-loading.

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

- I will use these skills in upper-level design courses and professional projects involving hydraulic infrastructure.

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

- These concepts are fundamental to structural safety and system longevity.

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

- I will apply these when sizing piping or analyzing fluid-structure interactions in my career.

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 have successfully applied these concepts to my internship work at the NASA Langley Research Center.

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

- I felt most successful in the momentum analysis; my ability to resolve vector forces has grown significantly.

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

- Fluid mechanics is the core of my field, essential for modeling how fluid systems interact with mechanical hardware.

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

- I spent ~8 hours on the test. I dedicated the first hours to mapping out variables; I would keep this as it provided the necessary structure to tackle the complex problems.