

### **Test 3: Reflective Essay**

This test not only demonstrates my work towards the course learning objectives but also serves as an accomplishment and step toward being an engineer. In this test, the class was given two problems in which we had the option of choosing the one we wanted to solve. I ended up choosing the second problem since it seemed to better reflect the problem worked out in class, and also posed two parts that I knew I would be able to handle. The first objective was to determine the pressure drop of water flowing through a straight steel tube. The second was to determine the change in flow rate through the system given the same pressure drop as the first. This problem challenged me to think logically and utilize the knowledge I had attained throughout the class. Once data was collected and the purpose of each objective was clear to me, I was able to apply what I had learned in a seemingly easy way. Easy in that the logical application of Bernoulli's Equation gave me a clear pathway to finding the solutions. Hard in that the process was tedious and time-consuming. With that being said, the repetitive fluid mechanics concepts learned in class paved a road to this test, fulfilling numerous course learning objectives, such as:

- Compute friction losses in pipes for a variety of configurations
- Apply the principles of conservation of energy (Bernoulli's equation) and mass to fluid flow systems
- Explain the fluid dynamics in pipes and fittings
- Describe the nature of fluids and define different fluid properties such as viscosity and pressure

These course learning objectives are basic fluid mechanics need-to-knows that were each applied to Test 3. In seeking to determine the flow rates throughout a system, I was forced to use Bernoulli's Equation. In that equation is the requirement of energy losses throughout a system. Calculating these energy losses was a tedious process as the problem included fittings such as tees, reductions/expansions, and elbows that all had an effect on the fluid's energy losses. Knowing the fluid, water, and understanding its fluid properties was crucial in working out the problem.

In comparison to the available test solution, I am extremely satisfied with my work. I understood the process necessary to solve the problem objectives, and was able to execute the right equations and data to obtain the solution. Although my numerical values do not match the solutions perfectly, use of dissimilar data (most likely from Moody Chart readings and reduction/expansion readings) definitely has an impact on the variance. Also, mistypes in excel equations or numbers could have also led to a difference in test solutions. If I were to take this test again, the only advice I would give myself was to time-manage better so that I could have done the first problem option as well. I am confident that I would have succeeded in solving that problem and got the available extra credit points.

## Writing Rubric

### **Problem 2**

Reasonable assumptions (reductions, valve, tubing diam, lengths): 1/10 out of 1/10	1/10
Apply Bernoulli twice or get 2 equations from Bernoulli: 1/10 out of 1/10	1/10
Consider ALL minor losses? Handled them correctly?: 2/10 out of 2/10	2/10
Handled correctly the pipe losses?: 1/10 out of 1/10	1/10
Obtained 3 equations with 3 unknowns?: 1/10 out of 1/10	1/10
Solved the system of equations correctly (Excel?)?: 3/10 out of 3/10	2/10
Final Results: 1/10	1/10
<b>TOTAL</b>	<b>9/10</b>

**FINAL GRADE: 81% (without homework grade included)**

### Discussion

Some issues I encountered in completing the test were all related to collecting data and ensuring the right values before proceeding towards the solution. There were a lot of factors to take into consideration such as the tube material properties and collecting/measuring the right data off of charts. I ensured I had the right data through communication with the professor and in reducing what I believed to be correct values. The steps I took to complete the test were simple: analyze the system, figure out what's needed, collect data, write down Bernoulli's Equation, solve for energy losses, and solve for the flow rates using systems of equations. I did not learn new fluid mechanics concepts, I just applied what I knew to a system with more unknowns. Engineers use the fluid mechanics concepts discussed in this test when working with pipes, fittings, and systems that have branches and fittings. I believe it is important to think critically and understand these types of fluid systems when in a professional engineering career, and I know I will be able to apply the same logic applied to this test with real life situations. I feel I was most successful in understanding the system and logically forming a procedure to solve for unknown values. I am not sure if I will be entering the field as a fluid mechanics engineer, but I now feel that I can. In conclusion, the test took around 4-5 hours to complete and was successful.