Fluid Mechanics Test 3 Reflection

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1) This test demonstrated my work toward applying the principles of conservation of energy (Bernoulli's equation) to fluid flow systems because I had to manipulate Bernoulli's equation to find multiple equations to find flow rate in pipe systems. This test also demonstrated my work toward computing friction losses in pipes and explaining the fluid dynamics in pipes and fittings because the test required me to find the losses from fittings and friction in a pipe system.

2) My test is fairly similar to the available solution. The flow rates that I got were similar to the flow rates that Professor Ayala acquired. This shows that I was on the right track to find the answer. For the valve, I decided to assume that the ball valve had a k value similar to that of a gate valve. Professor Ayala decided to assume that it had a k value similar to a globe valve. However, I disagree. I think the internal geometry of a gate valve is more similar to the internal geometry of a ball valve than a globe valve is. I have been working a lot with ball valves as my team is using one in our project. In a ball valve, once it is opened, the fluid simply runs through a straight channel unimpeded. In a gate valve, it does this as well, except for the gate which does not impede the flow too much. However, when a globe valve is opened, the fluid must zigzag through the vertical opening to pass through the pipe. This means the globe valve has a lot more losses. I don't think a ball valve would have that high number of losses.

1. Reasonable assumptions (reductions, valve, tubing diam, lengths) 1/10 out of 1/10
2. Apply Bernoulli twice or get 2 equations from Bernoulli 1/10 out of 1/10
3. Consider ALL minor losses? Handled them correctly? 1/10 out of 2/10
4. Handled correctly the pipe losses? 0/10 out of 1/10
5. Obtained 3 equations with 3 unknowns? 1/10 out of 1/10
6. Solved system of equations correctly (Excel?)? 2/10 out of 3/10
7. Final results 1/10 out of 1/10

TOTAL **7/10 out of 10/10**

FINAL GRADE:

(90)*(7/10) = 63

I think my strengths in this exam were time management and double checking my work. I think my weaknesses were in manipulating Bernoulli's equation. I was able to do it eventually, but I had a lot of mistakes that I had to correct in it.

4) Discuss the following:

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

The main issues I found while completing the test was forgetting to carry over variables in my equations. It was a very algebra heavy problem, so I had to be careful not to drop variables as I worked through the problem. As I copied down my work from the whiteboard to paper, I noticed several times that I had forgotten to carry over variables for the energy losses. I had originally forgotten to account for the elbow and that was throwing my calculations way off. I also dropped a plus one in the equation for the second flow rate and that was messing up my answer.

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

I mainly used the examples on canvas and the problems we completed in class to solve the test. I used the excel sheet Professor Ayala made for the problem we completed in class heavily as a guide for my own excel sheet. I would not change anything about how I solved the problem.

c. What new concepts have you learned?

I have learned a lot more about parallel pipeline systems. It makes sense but it is very tedious and long so there are a lot of places to make careless mistakes. It is important to label everything when you are sketching so you don't lose anything.

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

I think engineers use these concepts when designing sprinkler systems for buildings and for lawns. I also think they are used when designing air ducts to circulate air through buildings. It is probably also used a lot in plumbing because many flows come from the same source, so they all have to equal the flow rate of the original source.

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

I think I will use this in my career if I go on to design pipe systems as an engineer. Fluid mechanics is a difficult topic, but it makes sense, so I might try to pursue a career in it later in life. I could especially myself using this if I were helping to design a building because the sprinkler system would need to be a parallel system similar to the problem that I just completed on the test.

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

I do think that this is very important for my professional career. Even if I don't encounter problems that are similar to it, working through problems has improved my problem-solving skills and it has expanded my knowledge of fluid mechanics, so I am much more comfortable using Bernoulli's equation now.

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

I might use this information if I am working at a job that requires me to move fluids through parallel systems of pipes or ducts.

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 first learned this method of problem solving in thermal applications, so I have used this method in that class, and I have used it in my physics classes. I have begun utilizing Excel to complete more of my problems. I was originally daunted by how complicated it seemed, but once I learned a little more about it, I realized how useful a tool it is.

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

I felt like I was most successful at setting up the equations. Initially when we were learning how to make these equations, I got super lost. However, I was able to understand that it was just starting with

Bernoulli's equation and then having things canceled out, just like in all of the other problems we have completed for the class.

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

I am going into the Navy and many systems on the ships are parallel pipes. This will help me to become more familiar with the technological makeup of the ships and could potentially be important in damage control situations where bilges are being used to pump out water.

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

I spent roughly seven hours on the test. I knew I would not be able to work on it on the Friday it was due because I had to go to work that day, so I did most of the problems the day before on a big whiteboard so I could really see what was going on with the problems. Then that night I wrote them all down on paper. I completed the summary and analysis sections after work on Friday and then I turned it in. I was also able to work on it a little bit more during the week because it was open for longer. I worked a lot on the first day to finish the pretest to get some extra insight for the test. I will continue to organize my time in this manner because it gave me the final day to look over some of my work and I was able to fix some mistakes I had made.