Mason Finn

Reflection For Fluid Mechanics Test 2

1)

The test demonstrates my work towards Multiple concepts that were learned and practiced during the class. I am able to do work more proficiently in excel sheets to better calculate my problems. Also doing such problems helps me to understand pressure more, and they also help me to know forces that a moving fluid can have on a pipe/ system. Being able to iterate in excel is a good tool to have during the process of the test as doing a lot of the calculations by hand would be more time consuming.

2)

To start, I was able to use the force acting on the gate to solve for the buoyancy force of the buoy. This would then give the volume of the buoy, i would use this to then solve for radius to find out the diameter for the minimum size of the buoy. For part b I was not able to find the correct pressure of the system to solve for the forces in the x and y direction of the fluid moving through the pipe. Part C i was able to Use the Pressure change Equation that was discussed during class to calculate the change in pressure after the flow nozzle is installed. My C value is off slightly so i believe that to be the reason as to why my answer is slightly off from the one in the solutions. For part D I was able to manipulate the flow rate equation to where y, the depth of the open channel, was the only unknown. In doing so I was able to input into excel to do some iteration. I would iterate through different y values until I got the matching flow rate of the system. For part E I used a series of different Equations that allowed me to calculate the pressure change due to the water hammer. I was able to confirm that the calculated thickness is less than the actual thickness which meant that the pipe would not fail. I was also able to report that there would be cavitation that occurs around the valve. There is an area of low pressure around the gate vale that would create cavitation. I was able to get an answer close to one of the solutions, however I believe that the reason why I did not get the exact answer is because my E value and n value are not correctly solved for. Also my density # is different from that used in the solutions, so I have a strong belief that this is also a factor to some errors in my solutions. Other than that, if those values were correctly solved / found. I would be able to get the same values as the solutions. For part F, because my n and s values were off my answer for the y value is off as well. MY maximum pressure value is off by a few too so this would also contribute to my error in calculations. One of the main errors that i made was not being able to find the Cd value on a table. I was not able to find How to derive the weight equation out of the Drag force equation so I struggled to find an equation that worked for this problem. I found an object to have at most the weight of 1.87 kg. If I were to take this test again, I would have taken time over spring break to prepare for the test. Also, I would have emailed my professor more about any questions that I had. In

doing so I believe that I could have been more successful in the solving of the problems on the test.

3)

My purpose 0.5/10, this is because I used the previous tests as a reference.

Drawings 1.0/10, my drawing was representative of the problem being solved.

Sources 1.0/10, I was able to source most of my information from the book and google.

Design Considerations 1.0/10, I included all the major things to consider when doing this problem.

Data & Variables 0.5/10, my data is pulled from the textbook and reputable sources.

Procedure 2.0/10, My procedure was good so that I knew what it was I was solving for.

Calculations 2.0/10, My calculations are very close if not the same as the ones in the solutions.

Summary 0.5/10, I feel that my summary is representative of my calculations.

Materials 0.5/10, The materials were stated in the problem, and some of the "materials" were stated to be neglected.

Analysis 1.0/10, Material is not as clear, but once reading over the solutions I was able to identify where I went wrong.

Total: 10/10

1a)

Design of buoy to open gate

a. Hydrostatic force on the gate
   i. Magnitude and location 1/4 out of 1/4
b. Solve for buoy force with moment conservation 1/4 out of 1/4
c. Using buoyancy, get sphere diameter. 1/4 out of 1/4
d. Buoy stability 1/4 out of ¼

Total:4/4

2. Pipe-elbow forces

a. Free body diagram and correct forces 1/4 out of 1/4
b. Handling of the pressures 1/4 out of 1/4
c. Force in x 1/4 out of 1/4
d. Force in y (weight) 1/4 out of ¼
Total:2/4

3. Flow-nozzle flowmeter pressure drop
   a. Right equation and A1/A2 1/2 out of 1/2
   b. C value 1/2 out of ½
   Total:2/2
4. Open-channel design
   a. Correct equation 1/2 out of 1/2
   b. Area and hydraulic radius 1/2 out of ½
   Total:2/2
5. Water hammer & cavitation
   a. Water hammer
      i. Wave velocity (units?) & pressure increase 1/4 out of 1/4
      ii. Operating pressure & Max pressure 1/4 out of 1/4
      iii. Pipe thickness 1/4 out of 1/4
   b. Cavitation
      i. Lowest pressure 1/4 out of ¼
      total:2/4
6. Drag force on object at the bottom
   a. Right eq: Fdrag>Ffriction 1/4 out of 1/4
   b. Correct area 1/4 out of 1/4

c. Correct velocity 1/4
out of 1/4
d. How Cd was obtained? 1/4
out of ¼
Total:1/4

FINAL GRADE:
(if everything is correct)
10 + (80/6)*(4/4 + 2/4 + 2/2 + 2/2 + 2/4 + 1/4) = 66.67

4)

a) One of the issues that I had was manipulating the equations that were supposed to be used, into an equation that I could use to solve for an unknown.

b) The process that I used during this test probably was not the best. I would find the equations and immediately start plugging in numbers opposed to thinking about the problem itself. I would only think about the problem after trying to solve the question.

c) I have learned that by using the drag force equation that you can derive the maximum weight an object can be. I also learned that there is a Cd value chart in table 17.1
d) I think that engineers use these concepts and equations when they are designing systems so that in worst case scenarios, they have it covered and won't have to re-engineer the system.
e) I know that the information that was solved for and gathered during this test will be used when I'm in the field making design calculations for my career.
f) I know for a fact that the material that was covered in this test is material that I will use when designing systems.
g) I would use this information if I was working for a company that designs piping systems for buildings or devices. I might need to size the piping for certain applications and make sure that in the case that a water hammer may occur that the pipe will not fail. I may also use this information to create an open channel for spill areas or water run off projects to maintain that the open channel can handle certain flows of fluids.

h) I have been able to take material learned from this class and apply it in my maintenance engineering class, as well as my thermal applications class.
i) I feel that I was most successful in finding the diameter of the buoy and the change in pressure across a flow meter. Areas that I was not very successful in were finding the forces caused by the moving fluids in part b and part f where I had to find the weight of the object in the open channel.
j) I want to be in the field dealing with managing systems such as pumps, HVAC chiller, and water-cooled systems so learning as much as I can about fluids and the way they work in systems is advantageous for me and my field of interest
k) I spent 72 hours on this Test. I managed my time really poorly with this test and Think that if I took the 5 day span to solve one problem a day would have increased my score on this test significantly. I think pulling the equations from the book and thinking about how to manipulate them would have been a good start to this test as well. My Score on this test is a direct representation of my understanding of the material and how much time I took on this test.

I will conclude that this test made me think hard about the problems and how to better manage my time with the tests in this class. One of the values that I was tripped up on was the density of the gasoline. I googled it using the right temperature and received a value of 737 g/ml which was different from that of the one found in the textbook. Another thing that I wish I could have done better at is manipulating the equations to solve for the unknown that I am solving for. I will state that the way that i solved for Q1 a is similar to the way that the solutions solved for a. I found the force in the cable needed to open that gate, which should be the same as the buoyancy force needed to open that gate. Other than some of the problems that I had when solving the questions of these problems, I believe I did decent on this test and that the material administered on this test is fair. I just need to spend more than 72 hours on the Tests that are given.