Reflection for Fluid Mechanics Test 1

1)

The test Demonstrates my work towards Multiple concepts that were learned and practiced during class. For starters I was able to use Bernoulli's Principle and equation, in part 1a, to manipulate it to get to the height of the fluid in the gasoline tank. Another way that the test demonstrated my work was the concept of Viscosity of Fluids and pressure; is for part 1b, I was able to use that equation to relate the relationship between pressure and elevation. This allowed me to find the minimum length of PVC that was needed for the manometer. I was able to use my knowledge of excel to build a spreadsheet where I could test different radii of a tank to get the right the right diameter needed to stay within the 1% margin of depth drop in the gasoline over five minutes.

2)

One of the places that I made a mistake at was the beginning of the test when I was calculating the height of the gasoline in the tank. I went off the write up and information for Test 2 Fall 2016 solutions, which had the same diagram. I was able to get most of my information off that write up such as the "K values" for each component. Assuming that they are the same drawing and the problem in this test did not state whether the elbow was a long radius or short radius elbow I went with the 2016's long radius k value. Of course, I went into the book myself and confirmed that all the information I was gathering from the 2016 test was correct in all the tables. I used 20 as the "K" value for the elbow when solving for the minor loss which is why I got 2.83m as my answer. If I had assumed that the elbow was a short radius elbow and gone with the 30 "K" value in the book I would have gotten the same answer as the solutions (2.936m). While the height was off by only 0.025 it still had an impact on my Flow rate of, I calculated when there was a ¼ open gate valve in the equation. Again, this is why the numbers are close but not quite what the solutions said they are. The root source of all my numbers being off in this test ae since my minor loss value was slightly off because I had picked the long radius elbow over the short radius elbow. Another factor to why I could have gotten some small departures is I rounded the Friction factor to 0.017 instead of the 0.0168 that was in the solutions. One of the main things I did not get close on was the length of the manometer, I assumed that the manometer would not come all the way to eye level, instead I thought that there would be a ladder for people to use when they wanted to read the manometer, so I did not add the additional 2.8 meter of pipe to make that possible. There for my answer was 2.851 meters off. Other than that, if you compare the answers, I am a little under 2 inches off the correct length of pipe needed for the manometer. If I were to take this test again, I would have emailed my professor and asked which elbow he would want us to use since it was not clearly stated in the problem. I feel as though resolving which elbow was being used in this problem, I would have been able to be more successful in the finding of the solutions of this 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 the PVC was picked from the book based on calculations.

Analysis 1.0/10, good understanding of the material on this test.

Total: 10/10

Part 1a)

Show drawing with Bernoulli's points and reference	1/8 out of 1/8
Apply Bernoulli's, simplify it, and solve for "h"	1/8 out of 1/8
Compute velocity with Q=VA	1/8 out of 1/8
Compute pipe energy losses correctly (estimate L)	1/8 out of 2/8
Compute minor energy losses correctly	1/8 out of 1/8
Create spreadsheet with all calculations	1/8 out of 1/8
Correct results?	1/8 out of 1/8

Total: 7/8

Part 1b)

Select U-tube tubing diameter	1/6 out of 1/6
Decide U-tube right leg length	1/6 out of 1/6
Apply “gamma*h” equation and solve for “h” of Hg	2/6 out of 2/6
Mass or volume of required mercury	1/6 out of 1/6
Correct results?	0/6 out of 1/6

Total: 5/6

Part 1c)

Compute transferred volume in 5 minutes	1/4 out of 1/4
Use cylinder volume equation and get tank diameter	1/4 out of 1/4
Compute percentage of the energy losses	1/4 out of 1/4
Correct results?	1/4 out of 1/4

Total: 4/4

Part 2)

Use spreadsheet from “Part 1” to get “h” for diff Q.

Make sure the K value or Leq value of valve changed.

Make sure energy losses change when changing Q	2/8 out of 2/8
Plot “h” vs Q	1/8 out of 1/8
Read Q for “h” equal to the “h” in part 1	1/8 out of 1/8
What is the new manometer reading?	1/8 out of 1/8
%Drop of the gasoline level after 10 minutes	1/8 out of 1/8
Compute percentage of the energy losses	1/8 out of 1/8
Correct results?	0/8 out of 1/8
	Total:7/8

FINAL GRADE:

If getting everything right:

10 + (80/4)*(7/8 + 5/6 + 4/4 + 7/8) = 81.6667

4)

a) One issue I had during the test was figuring out the diameter of the tank, I didn’t know which equation to use so I created a ratio in excel to determine my diameter.

b) I would figure out what I’m solving for first then think about the physics behind the problem, then search for the equation I need to use. I would not change this process.

c) I have learned Bernoulli's principle can be used in almost every situation, I have also learned the concept of viscosity and the relation it must pressure.

d) I think engineers use these concepts when designing water piping systems for cooling building and other pump areas that involve fluids.

e) I know for a fact that I will be using everything that I learned in the lab for this class, but I will also use this information when I am out in the field.

f) I 100% believe that what I have learned from this test is and will be important for my professional career as an engineer, not just on the design side, but the application side.

g) I might use this information if I'm deigning a cooling system for a building, I would need to know how much water or fluid to have always stored so that I can have a good flow rate, good pressure. I might need to figure out how much pipe I need to get from one place to another with a certain flow rate.

h) I have been able to apply knowledge learned from this class to other classes, as well as work in the HVAC industry.

i) I feel that I was the most successful in determining the height of the fluid in the tank, as well as the diameter of the tank. Areas that I was not so good in, were figuring out the amount of mercury needed in the manometer and figuring out the length the pipe coming out of the gasoline tank.

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 48 hours on the Test, I managed my time poorly with starting later than I wanted, but when I got into the test I started with the process and test write up before I even touched calculating a problem. I think taking the time at the beginning to focus on the procedure and steps to solve a problem were very important to my success on this test.

I will state at the end that a lot of things can be assumed in this problem and others solving this problem might assume other things such as not having the manometer at a readable height. Instead, someone like me might assume that the manometer is higher up providing less possibilities of it being accidentally tampered with giving it more possibilities to get damage. Instead, I thought it would be better to have the meter at a higher level so instead of 6ft off the ground. Another thing that I would like to mention is that I assumed that the elbow in the figure was a long radius elbow giving it a lower k value than that of the short radius elbow, this caused some but not all my calculations to be off. Other than that, my calculations may not match exactly to those of the solutions, but the processes taken to get to the answer are correct.