Devon Moore

MET 330

Dr. Ayala

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Exam 1 Reflection

1. The following objectives were addressed in this exam:

   Objective: Describe the nature of fluids and define different fluid properties such as viscosity and pressure

   Explanation: Pressure and viscosity both had to be used to find the pressure in the tank on the right in problem 1.

   Objective: Explain the fluid dynamics in pipes and fittings;

   Explanation: The minor and major losses of the piping system had to be determine to find a more accurate pressure for the tank on the right.

   Objective: Apply the principles of conservation of energy (Bernoulli's equation) and mass to fluid flow systems;

   Explanation: Bernoulli's equation had to be used for almost the entire test. It could have even been used for the manometer heights by canceling down to the gamma*h equation.

2. The first difference I see between my work and the solution for problem 1 is where the points are placed. I had originally placed my second point at the outlet of the pipe in the 40 psig tank, but I decided to move the point to the surface so the velocity for both tanks could be assumed as zero. The solution shows calculations for a velocity of 23.875 ft/s and I used the Q=VA formula to get a velocity of 24.97 ft/s. Since this is less than a 10% difference, by Ayala's law this should be negligible to the final answer. However, this did cause my Reynold's number to be slightly higher than the solutions which gave me a friction loss in the pipes of 124.51 ft, this difference leads back to the difference in velocity calculation. I did not account for entrance loss at all. I simply did not consider this as a factor and will remember to account for entrance loss in the future. My difference in the pipe bend minor losses is

again only about 10% due to the difference in velocity calculations. The same reasoning goes for a very slight difference in fiction loss for the gate valve. Overall my total friction losses are less than 10% different than the solution due to the reasons I described. My difference in pressure of the tank on the right stems back to the difference in velocities and neglection of entrance los, which caused a difference in total minor losses. My difference in the height of the manometer is caused by a few problems, one is I did not compute a different pressure for the point where the manometer meets the pipe. I didn't do this because I assumed pressure only changes vertically. This is true, but my point 2 is at a 4 ft vertical difference than the point where the manometer connects to the pipe. This is something that did not strike me as important until seeing the solution. To account for this I should have compared the height at point 3 to the height at point 1. Because I did not compute a pressure for point 3, I also didn't compute energy loss at point 3. My formula for the height was correct however I used the pressure at point 2 rather than at point 3. This pressure difference combined with my pressure difference for the right tank pressure cause my manometer height to be almost 2 time as much as the solutions. For problem 2 my difference in pressure came solely from my Z difference. Because I did not properly add my heights considering the correct signs. I could have still obtained a vertical difference of 20 ft if I had the correct signs. This would have changed the outcome of my pressure for problem 1 as well. For future test and homework problems I need to pay close attention to my signs and maybe even annotate my drawing with the correct signs to mitigate mistakes. The manometer reading I obtained for problem 2 difference from the solution because I never found a pressure at 3. The difference in flow rate at p1 = 75 psig occurs from my initial differences in velocity and friction losses, if these were lower like the solutions, it would have lowered the starting point of the curve on my graph and allowed me to obtain a value closer to that of the solutions. In the future I will spend more time analyzing the practice problems from the lecture to not only get the same answer, but understand why I got that answer and what fundamentals I need to take away from that problem.

3. I would give my test a **10/10** for the rubric because based on how I did the problems I covered each section of the rubric.

   Problem 1: I am deducting 0.25 of a point because I did not find the energy losses for the entrance. I'm deducting a full point for not finding the pressure at the second elbow. And a full point for not having the correct results.

   4.75/7

   Problem 2: I am deducting 0.25 of a point for not having the correct Z distance when solving for air pressure. And a full point for having the incorrect results.

   1.75/3

   Problem 3: I am deducting a full point for not having the correct results.

   3/4

4.
   a. One of the issues I encounter during the test was determining where to place my points. I initially had the way the solution showed but I ended up changing to the surfaces of the fluids in the tanks to eliminate velocity. I do not think this impacted me as much as my sign mistakes with the Z distances when dealing with my reference point. Another issue I had was determining the height of the manometer in both parts one and two. This initially was also a sign mistake, after discussing with Dr. Ayala I noticed the height used for the alcohol was the same thing I had done initially, however I had the wrong signs Infront of my terms which caused me a lot of headache. It is obvious signs caused me a lot of problems throughout this test and I need to spend more time on that in the future.
   b. First, I picked my points and made a reference line on my drawings. I then set up Bernoulli's and canceled out terms I did not need. Next, I found the information needed from tables in the textbook and solved for energy losses in the pipes, elbows, and gate valve. One thing I would have changed here would be accounting for entrance losses (all of this information was simultaneously plugged into my excel

spreadsheet to aid towards problem 3). Once I found the pressure in the tank on the right, I should have found the pressure in the second elbow before continuing on to the manometer. I set up the manometer equation and solved for the height. I then moved on to problem 2, using Bernoulli's again and canceled out energy losses because the flow rate was zero. I then set up the manometer equation and solved for the height of the new manometer deflection. I then played with the flow rates on my spreadsheet to find where the pressure was equal to 75 psig.

c. A few concepts I knew but forgot about were solving for entrance losses and finding a new pressure at the second elbow because it is at a different Z distance and has different losses than the system as a whole does.

d. Engineers use these concepts to design piping systems for all types of machinery. I used a similar concept recently at work to determine if a defect at the head of an ellipsoidal tank could be accepted or not based on the allowable stress of the tank.

e. I hope to be an automotive engineer, so I would be using these concepts to determine how fluid will flow through a system such as the coolant for a radiator in a car.

f. These concepts are definitely important to my professional career and I wish to have a better understanding of them as the class continues.

g. I might use this information in the future to determine how much pressure I need in a tank to run a piping system without a pump. This could be used in the automotive industry to get coolant flowing on start up with a pump and then use the pressure acquired to continue without the pump running.

h. Yes, I recently applied the concepts to determining the allowable stresses on the head of an ellipsoidal tank.

i. I was most successful on the arrangement of Bernoulli's equation and knowing what to cancel out based on my points.

j. The content will intersect with my career because there are multiple fluid systems in automobiles and it will be essential that I understand them.

k. I spent approximately 15-20 hours on this test. Most of my time was spent trying to figure out why my answers did not make sense. A lot of time could have been saved if my signs were correct for the z distances. In the future I will spend more time examining the drawing and my logic before I start solving to make sure my set up is correct.