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02/20/2022

MET 330

Professor Ayala

Test 2 Reflection

Introduction:

This test covered multiple objectives, to analyze a system with a pipe system with no pumps and determine the forces due to flowing and static fluid. Analyzing a system to see how strong a water hammer may be if a valve closes suddenly, and to determine the change in pressure across a flow nozzle if it is used to measure the flow. Another objective was to be able to analyze an open channel, to determine how to measure if an object will float or not and if it would be stable if it floats. Lastly to analyze an object and see what the drag force it would experience due to this open channel flow.

Problem: 1.a

This problem was about analyzing the open channel, the flow into the channel, material, and dimensions of the trapezoidal open channel were given and the height of water in the channel had to be determined. The height of the water in the channel is necessary to solve later problems so it must be an accurate value. My solution compared to the available solution uses the same equation to solve for this height, but I decided to use the lefthand right hand rule to iterate my height value where the available solution just manipulates the equation to directly solve for the height. I did this to save time in manipulating the equation to make sure I got a value that was correct. My height value was very close to the one derived by the available solution.

Problem: 1.b

This problem was to analyze the force exerted on the pipe and elbow of the system so a support system could be designed. For this problem I assumed to disregard the weight of the water in the pipe and the weight of the pipe itself because I thought the problem was only asking for the forces due to the flowing fluid. Only considering the force due to the flowing fluid I did get approximately the same value as the available solution did for the force acting in the X direction, but my force in the Y direction was much smaller than the solution.

Problem: 1.c

This problem makes use of the height of water in the open channel derived in part a. Using this height, the largest size of hickory log the channel can carry needs to be determined, and if the log is stable or not. I Made the same assumption that the height of the water is the same as the height of the water displaced by the log. The size of the log was the same as the one found by the available solution, and I got the same height of metacenter. I did not look close enough and accidentally said that it was not stable when it was stable.

Problem: 1.d

This problem used a flow nozzle and the pressure drop across the nozzle was necessary. I got a slightly smaller answer for this question but that was due to a difference in rounding the A/A value.

Problem: 1.e

For this problem the pressure increment from the water hammer generated by the valve being closed to quickly. My problem from this question is that I flipped my E and E_0 what had been given by the class notes, but the available solution uses the opposite of that. This also inflated the value of the pressure increment that was solved for using that speed.

Problem: 1.f

To find the force of drag used in this problem the speed of the water in the channel must be calculated, again due to rounding my answer was a little smaller. The assumed Cd that I used was significantly smaller, I used 1.16 and the available solution uses 1.6. Both of these factors is why my answer was basically half that of the one given by the available solution.

Problem: 1.g

For this problem the force acting on the flange at the bottom of the tank due to static fluid had to be calculated. I made a mistake when using Bernoulli's equation where I added the pressure at the tank exit instead of having it be 0 (gage). This inflated my pressure value for the air in the tank and resulted in a 50 lb gain in force. I assumed the location to be acting at the centroid of the area

Summary:

The main issue I had when taking this test was at first trying to figure out how to get the pressure of the air in the tank. This was overcome by Professor Ayala's notes on my pre-test. The steps I would take would be to write out my general calculations before writing the procedure so I have a better understanding of how I will complete the problem. That a slug/ft^3 is equal to a lb*s^2/ft^4. Open channel concepts can be used in real life if you ever must move a body of water or do irrigation. I feel that I was the most successful at the channel questions. I was least successful at the force questions. I may use this knowledge and concepts in my future career if I ever have a system that is using water. I spent about 8 hours on this test including the pre-test and then all the calculations. I could have spent some more time checking my answers to make sure there were no little mistakes (like the stability mistake).

WRITING RUBRIC (Applied to the whole test, not to particular problems)

1.	Purpose	0.5/10.0
2.	Drawings	0.75/10.0
3.	Sources	1.0/10.0
4.	Design considerations	1.0/10.0
5.	Data and variables	0.5/10.0
6.	Procedure	2.0/10.0
7.	Calculations	1.0/10.0
8.	Summary	0.25/10.0
9.	Materials	0.5/10.0
10.	Analysis	0.5/10.0
	TOTAL	**8.0/10.0**

PROBLEM 1)

1. Open channel depth (y)
   a. Correct equation 1/2
   b. Area and Hydraulic radius 1/2
2. Pipe-elbow forces
   a. Free body diagram and correct forces 0/3
   b. Force in x 1/3
   c. Force in y (weight) 0/3
3. Largest wood log
   a. Size 1/2
   b. Stable? 0.5/2
4. Flow-nozzle flowmeter pressure drop
   a. Right equation and A1/A2 1/2
   b. C value 1/2
5. Water hammer pressure increase
   a. Wave velocity (units?) 1/2
   b. Pressure increase 1/2
6. Drag force on a stuck log
   a. Correct area 1/3
   b. Correct velocity 1/3
   c. How Cd was obtained? 0.5/3
7. Force on the flange
   a. Magnitude 1/2
   b. Location 0.0/2
8. Final actual values of the results 0.75/1

Total 12.75/17

Final Grade 64.4%