MEMS 0071
Fall 2019
Midterm #2
10/25/2019

Name (Print): _____

This exam contains 3 pages (including this cover page) and 4 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books or notes. Calculators are permitted on this exam.

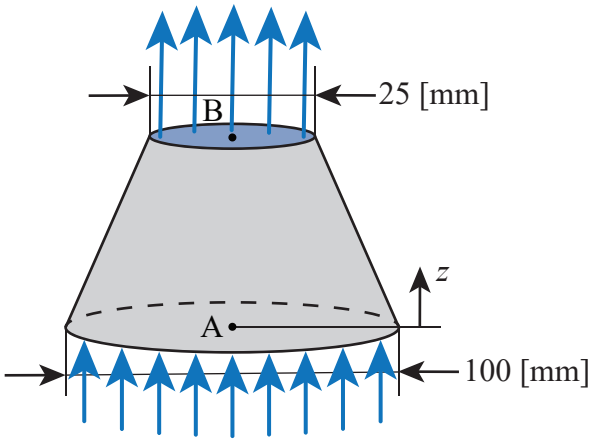
The following rules apply:

- All work must be done in the blue testing book. Any work done on the exam question sheet will not be graded.
- All work must be substantiated. A result with no methodology and mathematics will not be graded.
- Do not write in the table to the right.

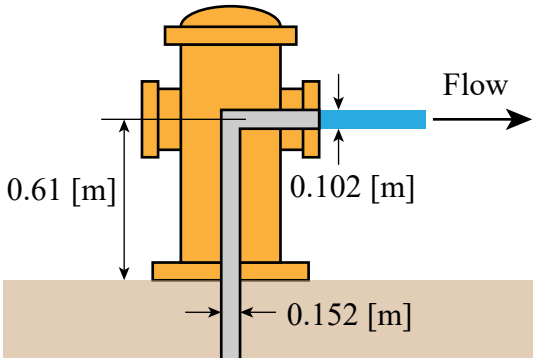
Problem	Points	Score
1	25	
2	25	
3	25	
4	25	
Total:	100	

Bonus: This day, October 25$^{\text{th}}$, 1917, marked the start of the Bolshevik Revolution, which brought which party to pre-eminence in Soviet Russia?

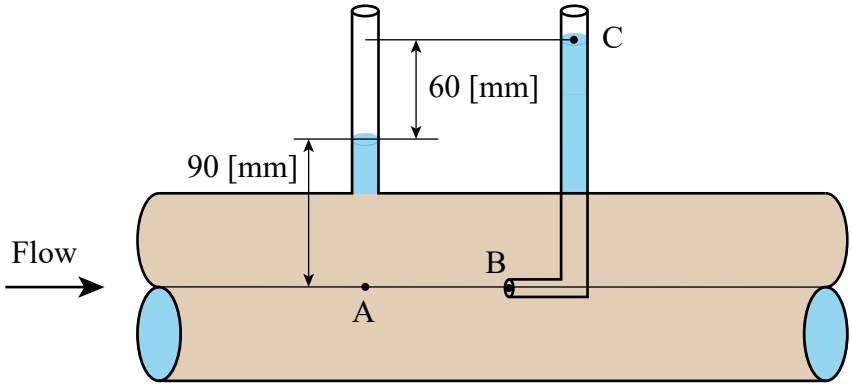
1. (25 points) If a nozzle is attached to the end of a pipe, and the pressure at point A is 200 [kPa], determine the reactionary force needed to hold the nozzle in place.



2. (25 points) Consider a fire hydrant that weights 27.22 [kg]. If water is flowing through the hydrant at a rate of 0.057 [m^3/s], determine the reactionary forces and moments at the base of the hydrant.



3. (25 points) Given the following static and dynamic pressure port set-up, determine the average velocity of water flowing through a pipe.



4. (25 points) A tank, with a volume of 1.5 [m^3], is being filled with air. The air enters the tank (point A) with a velocity of 8 [m/s], through a pipe with a diameter of 10 [mm]. The air is entering the tank at a temperature of 303 [K] and a pressure of 500 [kPa]. Determine the rate at which the density within the tank changing at this instant. The gas constant is taken as 0.287 [kJ/kg-K].