Name: _______________________________________CM Box: ___________

Circle your section:

Sanders – 05 Sanders – 06 Lui – 07 Lui – 08

ES 202
Fluid & Thermal Systems

Examination III
February 9, 2005

Problem	Score
1	/35
2	/65
Total	/100

Show all work for credit
One page of equation sheet allowed
Laptops allowed

Problem 1 (35 points)

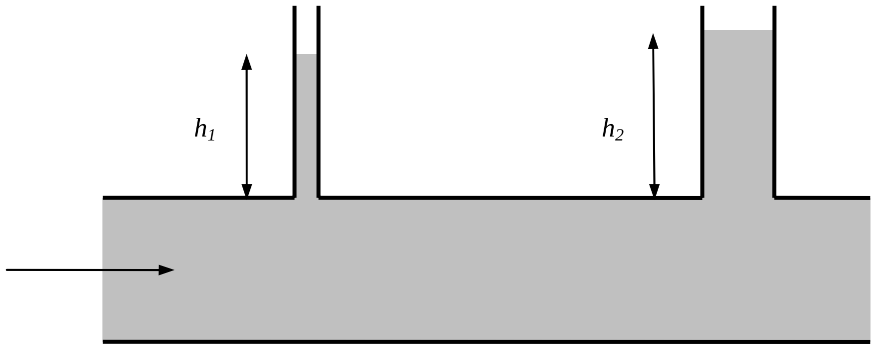
a) In the ABSENCE of fluid friction, which one of the following statements is correct?

i. $h_1 > h_2$

ii. $h_1 = h_2$

iii. $h_1 < h_2$

iv. indeterminate



b) Consider the same set up as Part (a) but fluid friction is PRESENT, which one of the following statements is correct?

i. $h_1 > h_2$

ii. $h_1 = h_2$

iii. $h_1 < h_2$

iv. indeterminate

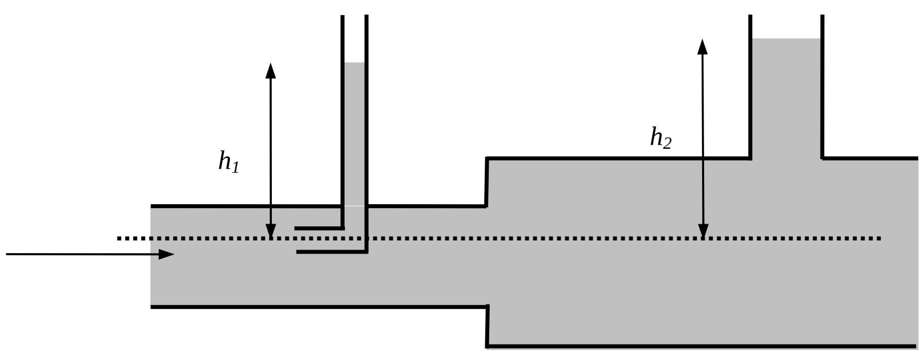
c) In the ABSENCE of fluid friction, which one of the following statements is correct?

i. $h_1 > h_2$

ii. $h_1 = h_2$

iii. $h_1 < h_2$

iv. indeterminate



d) Consider the same set up as Part (c) but fluid friction is PRESENT, which one of the following statements is correct?

i. $h_1 > h_2$

ii. $h_1 = h_2$

iii. $h_1 < h_2$

iv. indeterminate

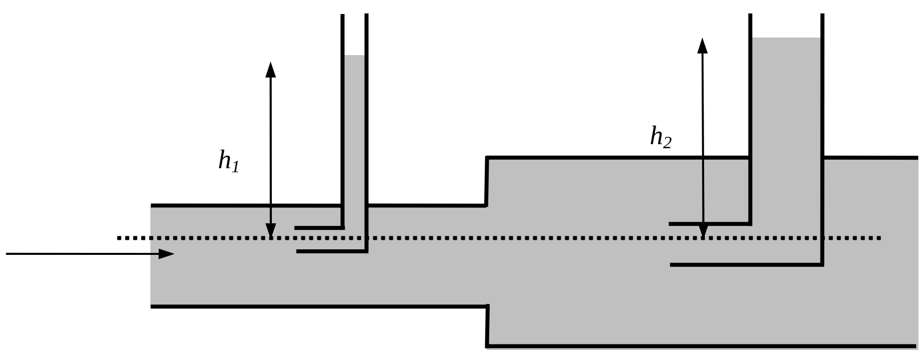
e) In the ABSENCE of fluid friction, which one of the following statements is correct?

i. $h_1 > h_2$

ii. $h_1 = h_2$

iii. $h_1 < h_2$

iv. indeterminate



f) Consider the same set up as Part (e) but fluid friction is PRESENT, which one of the following statements is correct?

i. $h_1 > h_2$

ii. $h_1 = h_2$

iii. $h_1 < h_2$

iv. indeterminate

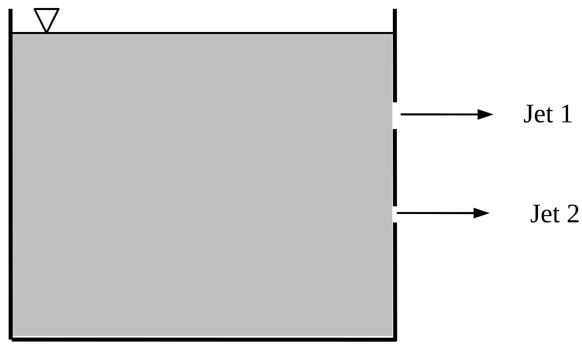
g) Regarding the jet exit plane pressure, which one of the following statements is correct?

i. $P_{jet\ 1} > P_{jet\ 2}$

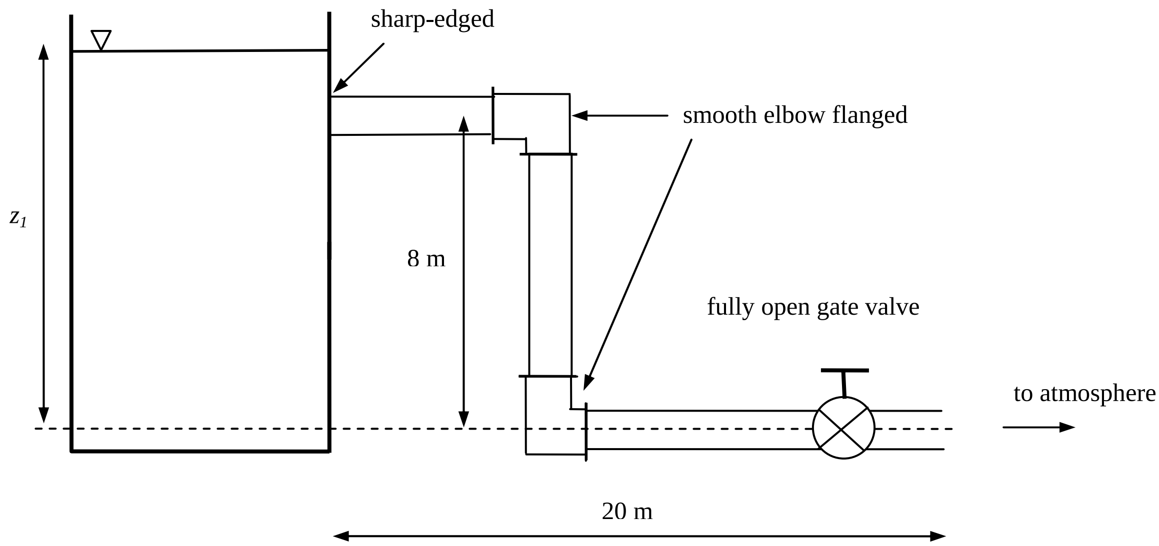
ii. $P_{jet\ 1} = P_{jet\ 2}$

iii. $P_{jet\ 1} < P_{jet\ 2}$

iv. indeterminate



Problem 2 (65 points)
Water at 10 ^oC flows from a large reservoir as shown through a 5-cm diameter cast iron pipe. Water properties: ρ = 999.7 kg/m3, μ = 0.001307 kg/m-s.



a) For a flow rate of 6 L/sec, find the elevation z_1.

b) We wish to DOUBLE the flow by adding a pump in the 5-cm diameter pipe. Assume that the non-dimensional loss coefficients (friction factor, minor loss coefficient) do NOT change, how much pump power is required to deliver the desired flow rate?