***SOUTHERN ILLINOIS UNIVERSITY***
***Department of Civil and Environmental Engineering***

**CE 370- Fluid mechanics**
Summer 2009

Assignment-4
Date Assigned: July 15, 2009
Date Due: July 22, 2009

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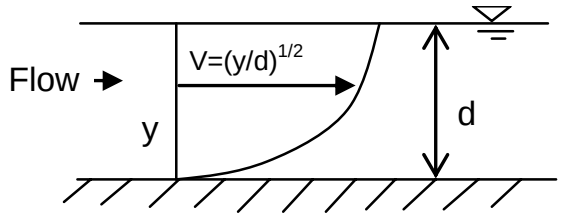
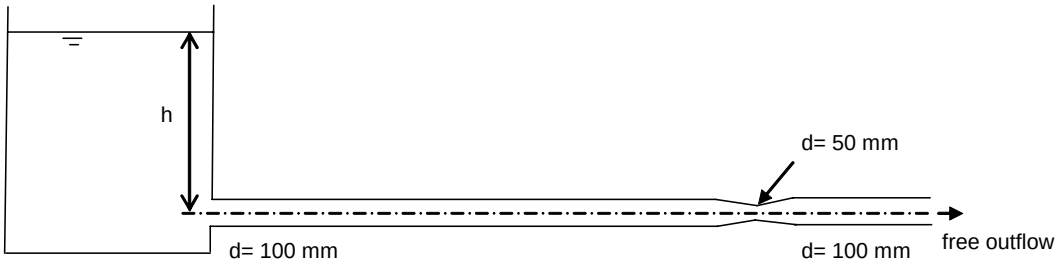
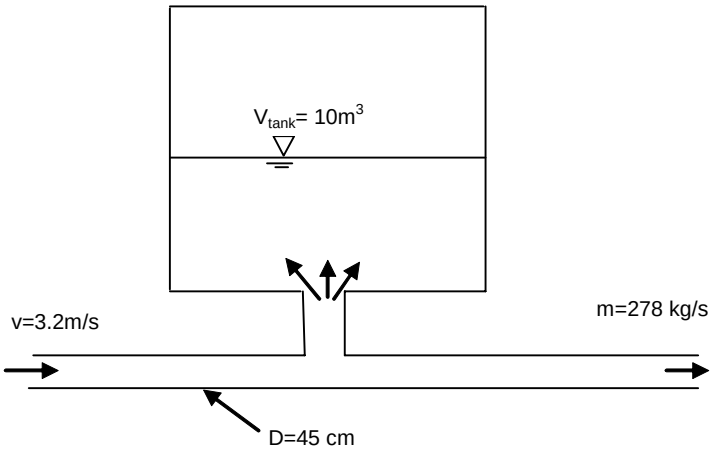
1. The velocity of water flowing in an open channel is described by $V= (y/d)^{1/2}$.
   a. What is the discharge if the channel depth, d, is 2 m and the width, B, is 5 m?
   b. What is the average velocity of flow in channel?




2. In the System shown, incipient cavitation occurs in 50-mm diameter section when h=0.6 m. The local atmospheric pressure is 101 kPa and the fluid's specific weight is 8910 $N/m^2$. Assuming the ideal fluid flow conditions, calculate the vapor pressure of the fluid.



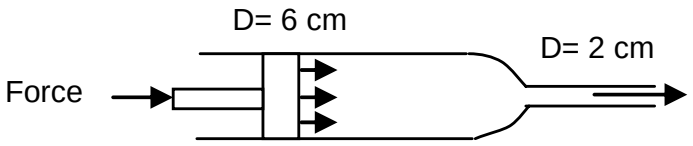

3. Water flows through the pipe system shown below. Compute the time required to fill the tank from an initial empty condition.




4. An ideal mixing chamber is used to mix two incompressible fluids. Alcohol (S=0.79) enters at section 1 at 8 m/s, and water enters at section 2 at 12 m/s. The mixture exits through pipe 3 at 9 m/s. Pipe 1 and 2 have a 2- cm diameter, while pipe 3 has a 3-cm diameter. Assuming a temperature of 10° C, determine the density of the mixture exiting the chamber.


5. Water flows through a 4-cm diameter pipe that is 10 –m long. The pipe wall is porous, leading to a small flow through a pipe wall. The inlet velocity id 10 m/s and the exit velocity is 9 m/s. Find the average velocity of the water that is passing through the porous surface.

6. Water is forced out of 2-cm nozzle by a 6-cm diameter piston moving at a speed of 5 m/s. Determine the force required to move the piston and the speed of the fluid jet ($V_2$). Neglect friction on the piston and assume irrotational flow. The exit pressure ($p_2$) is atmospheric.




7. From Engineering Fluid Mechanics, Crowe and Roberson, 8th Edition: Problem 6.31
8. From Engineering Fluid Mechanics, Crowe and Roberson, 8th Edition: Problem 6.37
9. From Engineering Fluid Mechanics, Crowe and Roberson, 8th Edition: Problem 6.61