國立交通大學九十二學年度碩士班入學考試試題

科目名稱：流體力學(232)　　　考試日期：92 年 4 月 20 日　第 2 節
系所班別：土木工程學系　　組別：丙組(一般生)　　　　第 / 頁, 共 2 頁
＊作答前, 請先核對試題、答案卷（試卷）與准考證上之所組別與考試科目是否相符！！

1. (20%) A cylindrical container, as shown in the attached figure, filled with water ($\gamma_w = 9.81$ kN/m^3) rotates at a constant angular speed of ω. If the pressures at points A and B are equal, find the required ω of the rotation.
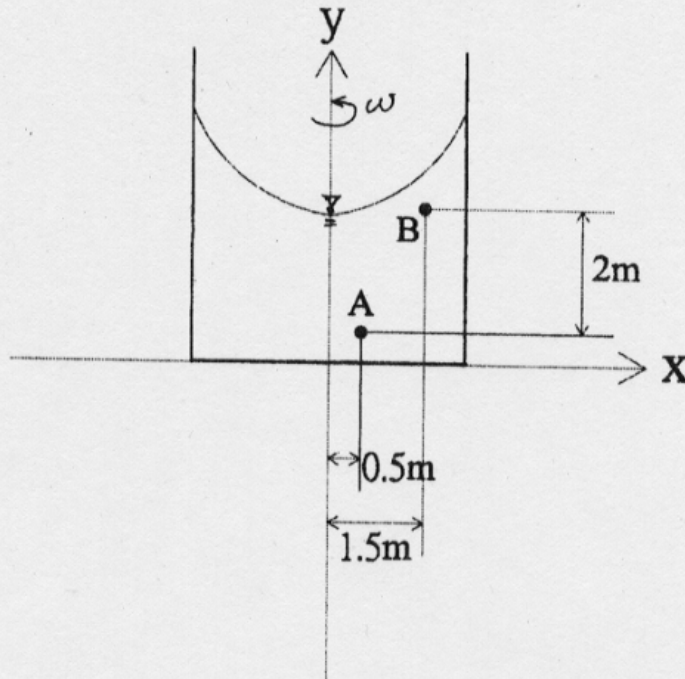
2. (20%) A prototype pipe with a diameter of 1 cm is designed to carry a full-pipe flow of 0.05 cm^3/s. The density of the fluid in the prototype is 1.48 g/cm^3 and the dynamic viscosity is 0.42×10^{-3} Ns/m^2. A model pipe of diameter 3 cm is used to study the flow characteristics in the prototype pipe. The fluid in the model pipe is water with the dynamic viscosity of 0.89×10^{-3} Ns/m^2. Under the condition of dynamic similarity, what is the water velocity in the model pipe?

3. (20%) A velocity field is given by $V = u_0 \sin[\omega(t - y/v_0)]\,\mathbf{i} + v_0\mathbf{j}$, where V is the velocity vector; u_0, v_0, and ω are constants; t is time; and $\mathbf{i}$ and $\mathbf{j}$ are the unit vectors in the x and y directions, respectively. Determine the pathline of the fluid particle that was at the origin at $t = 0$.

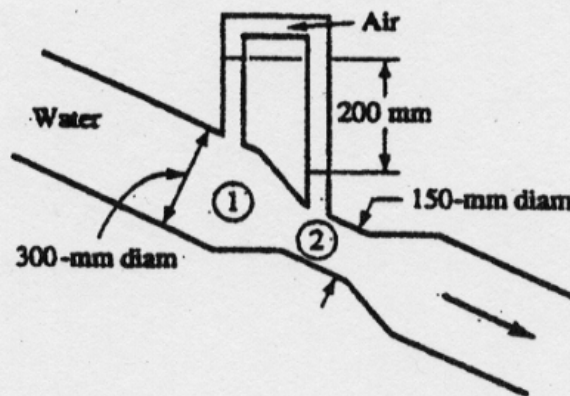國立交通大學九十二學年度碩士班入學考試試題

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4. (20%) Neglecting losses, find the discharge through the following Venturi meter.

5. (20%) A barge with a flat bottom and square ends has a draft of 6.0 ft when fully loaded and floating in an upright position, as shown in the following figure. The center of gravity (CG) of the barge when fully loaded is on the axis of symmetry and 1.0 ft above the water surface. Is the barge stable? If it is stable, what is the righting moment when the angle of heel is $12°$?

(a) Top view

(b) End view