編號： 129 **國立成功大學 106 學年度碩士班招生考試試題**

系　　所：系統及船舶機電工程學系

考試科目：流體力學　　考試日期：0213，節次：2

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Short answer questions (20%)

(1) Does the viscosity of (a) liquids, and (b) gases, increase or decrease with temperature? (4%)

(2) What is the so-called 'non-slip' condition? (4%)

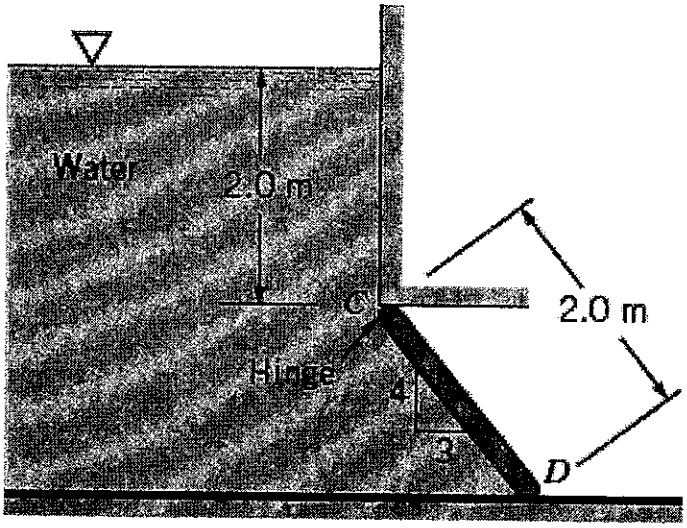
(3) What's Pascal law? (4%)

(4) What is the Newtonian fluid? (4%)

(5) What are the absolute pressure and gage pressure? (4%)

2. (20%)

The rectangular gate CD of Fig.1 is 1.8 m wide and 2.0 m long. Assuming the material of the gate to be homogeneous and neglecting friction at the hinge C, determine the weight of the gate necessary to keep it shut until the water level rises to 2.0 m above the hinge.



■ FIGURE

Fig. 1

3. (20%)

It has been suggested that the angular velocity, ω, of a rotating body or shaft can be measured by attaching an open cylinder of liquid, as shown in Fig.2, and measuring with some type of depth gage the change in the fluid level, H-h_0, caused by the rotation of the fluid. Determine the relationship between this change in fluid level and the angular velocity.

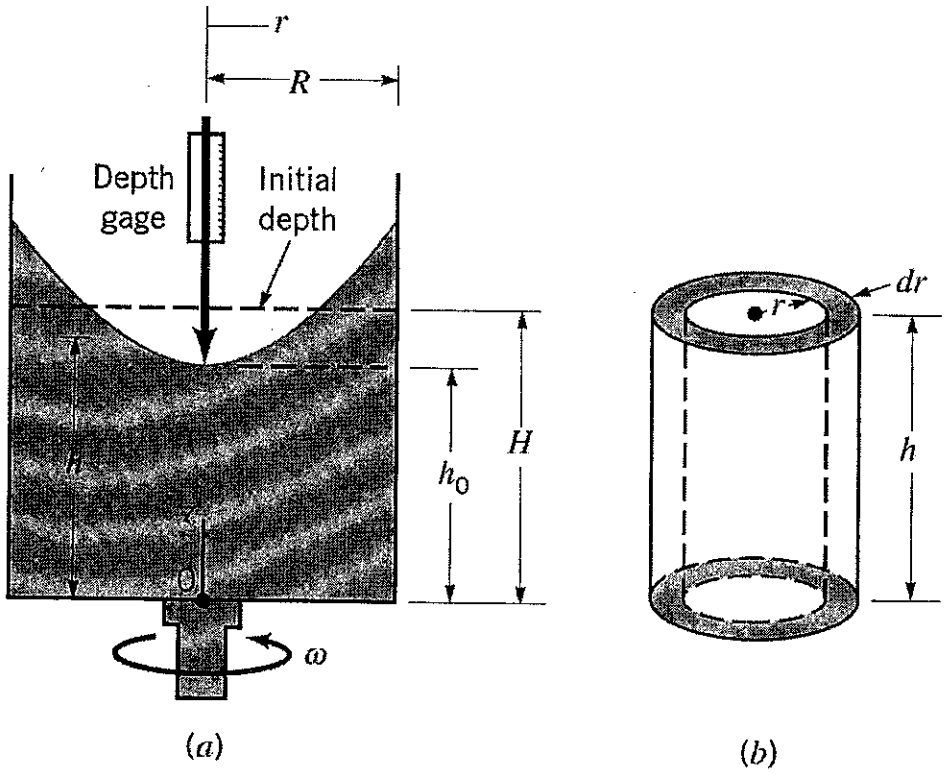


Fig. 2

4. (20%)

A capillary tube has an 8-mm inside diameter through which liquid fluorine refrigerant R-11 (ρ_r=1480kg/m^3 and μ_r=4.2 x 10^{-4} N.s/m^2) flows at a rate of 0.03 cm^3/s. The tube is to be used as a throttling device in an air conditioning unit. A model of this flow is constructed by using pipe of 3 cm inside diameter and water as the fluid medium (ρ_w=1000kg/m^3 and μ_w=8.9 x 10^{-4} N.s/m^2). Please answer the following questions.

(a)What is the required velocity in the model for dynamic similarity?

(b)When dynamic similarity is reached, the pressure drop in the model is measures as 50 Pa. What is the corresponding pressure drop in the capillary tube?

5. (20%)

A wide moving belt passes through a container of a viscous liquid. The belt moves vertically upward with a constant velocity, V_o. Because of viscous forces, the belt picks up a film of fluid of thickness h. Gravity tends to make the fluid drain down the belt. Assume the flow is laminar, steady, and fully developed in the vertical direction.

(1)Use the Navier-Stokes equations to determine an expression for the velocity distribution of the fluid film as it dragged up the belt.

(2)Determine the minimum V_o so that there will be a net upward flow of fluid.