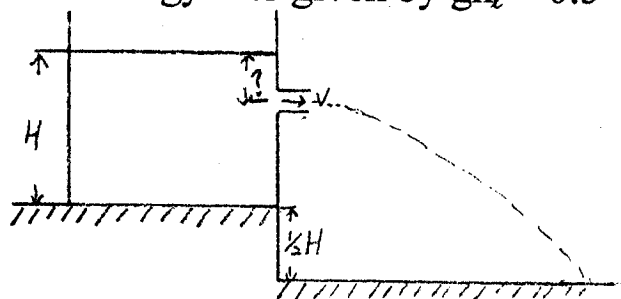


科目名稱：流體力學(0143) 考試日期：94 年 4 月 17 日 第 2 節

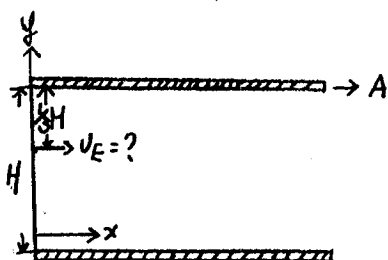
系所班別：環境工程研究所 組別：甲組 第 / 頁, 共 2 頁

\* 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. Find the height of the nozzle in the figure shown below such that the water will travel the longest horizontal distance. The nozzle has energy loss given by  $gh_L = 0.5 V^2$ . (20 分)



2. A rectangular channel has a flow rate  $= 1 \text{ m}^3/(\text{s} \cdot \text{m})$ . (a) What is the critical depth? (7 分) (b) What type of flow (supercritical or subcritical) exists if the actual depth is 0.42 m? Why? (3 分)
3. For steady, incompressible, fully developed flow between parallel plates with one plate moving at a velocity  $A$  and the pressure drops linearly,  $p = -Bx + C$ . Please find the fluid velocity for  $u_E$ . (20 分)



國立交通大學 94 學年度碩士班入學考試試題

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4. For the 2-D flow field with tangential motion in cylindrical coordinates,  
 $V_r=0$ ,  $V_\theta = f(r)$ ,  
(i) find rotation, vorticity and circulation for solid body motion.  
(ii) find rotation, vorticity and circulation for irrotational flow  
(12 分)
5. Considering a fluid flow in the xy plane and derive Euler's equations in streamline coordinates. The equations must cover streamwise direction, s, and the direction normal to the streamlines, n. First obtain the equations assuming the flow is unsteady and body forces exist. Then obtain the equations for steady flow with body forces neglected. (15 分)
6. Air flows steadily through a horizontal round nozzle, discharging to the atmosphere at standard conditions. The diameter of the nozzle inlet is 10 cm. At the nozzle exit, the diameter is 4 cm. (i) Assuming frictional effects are negligible, determine the gauge pressure (in kPa) required at the nozzle inlet to produce an outlet speed of 40 m/sec. (ii) What is this gauge pressure in mm H<sub>2</sub>O? (iii) What is the volumetric flow rate in L/min?  
(Note: The air density at standard conditions is 1.23 kg/m<sup>3</sup>) (15 分)
7. (i) The velocity profile for fully developed turbulent flow through a smooth pipe is determined from experimental data. In the region very close to the wall, what is the name of the region? And what is the mean velocity profile in this region (define all variables)?  
(ii) For fully developed turbulent channel flow, what is expression for the total shear stress (define all variables)? (8 分)