

國立臺北科技大學九十七學年度碩士班招生考試

系所組別：1432 能源與冷凍空調工程系碩士班丙組

第二節 流體力學 (選考) 試題

填准考證號碼

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第一頁 共二頁

注意事項：

1. 本試題共 5 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

3. A circular plate having a diameter of 300 mm is held vertically to an axisymmetric horizontal jet of air with a velocity of 40 m/s and a diameter of 80 mm as shown in Fig. 2. A hole at the center of the plate causes a discharge jet of air having a velocity of 40 m/s and a diameter of 20 mm. Solve the horizontal force required to hold the plate still. (20 分)

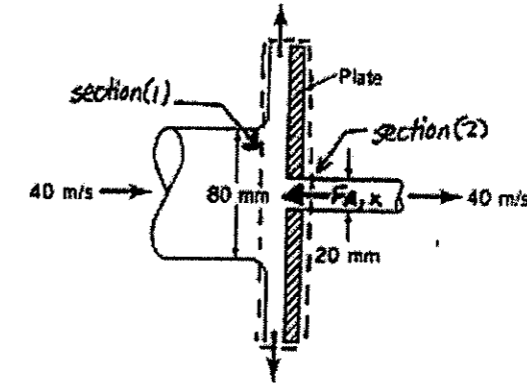


Figure 2

1. As shown in Fig. 1, water flows without viscous effect from the nozzle with $p_1 = 85 \text{ kPa}$ (gage). Determine the flowrate and the height h , to which the water can flow. (20 分)

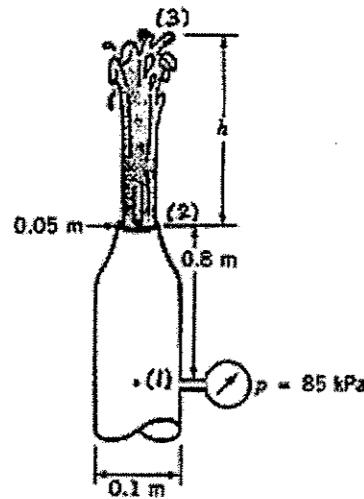


Figure 1

4. The viscous, incompressible, laminar flow between the parallel plates shown in Fig. 3 is caused by a pressure gradient $(\partial p / \partial x)$ and the motion of the bottom plate at a constant velocity of U . If the velocities can be expressed as $u = \frac{1}{2\mu}(\partial p / \partial x)y^2 + c_1y + c_2$; $v = 0$. Here c_1 and c_2 are two constants to be solved by the boundary conditions. Determine the relationship between U and $\partial p / \partial x$ so that the shearing stress acting on the fixed plate is zero. (20 分)

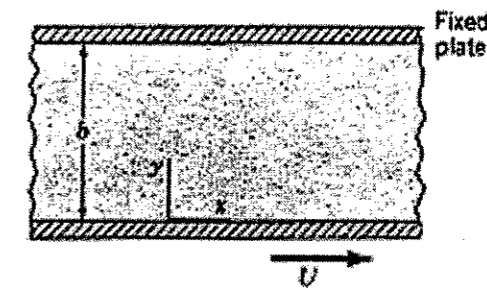


Figure 3

2. Considering as fully developed laminar flows, an oil with a viscosity of $\mu = 0.40 \text{ N}\cdot\text{s}/\text{m}^2$ and density $\rho = 900 \text{ kg}/\text{m}^3$ flows in a pipe of diameter $D = 0.02 \text{ m}$. If the pipe is horizontal with the traveling distance $l = 10 \text{ m}$, determine the pressure drop (Δp) needed to produce a flowrate of $Q = 2.0 \times 10^{-5} \text{ m}^3/\text{s}$. (20 分)

注意：背面尚有試題

5. The fluid velocity along the x axis shown in Fig. 4 varies from 12 m/s at point A to 36 m/s at point B . It is also known that the velocity is a linear function of distance along the streamline. Determine the acceleration at points A , B , and C . Assume steady flow. (20 分)

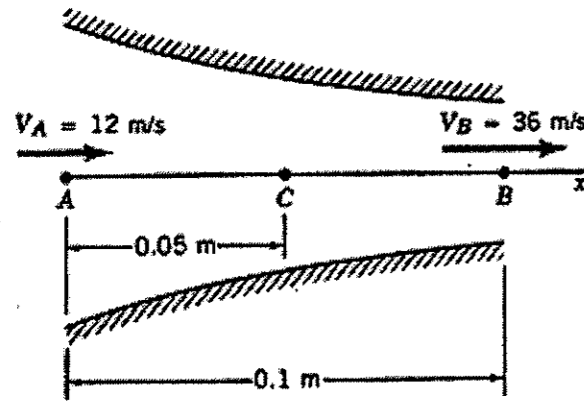


Figure 4