

國立交通大學八十九學年度碩士班入學考試試題

科目名稱：流體力學(103)

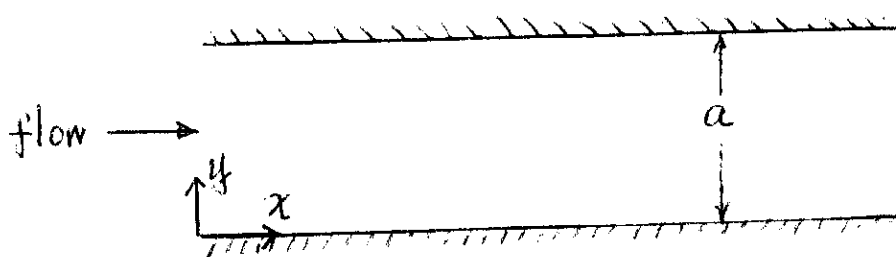
考試日期：89 年 4 月 22 日 第 3 節

系所班別：機械工程學系 組別：乙組

第 1 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. The relationship between the shearing stress τ and pressure drop (dp/dx) in a fully developed laminar flow which is between infinite parallel fixed plates can be expressed as the following equation, $d\tau_{yx}/dy = \partial p/\partial x = \text{const}$. The fluid is Newtonian fluid of which the viscosity is μ . The distance between the plates is a . Calculate the velocity distribution of the flow, and the location and value of the maximum velocity. (20%)

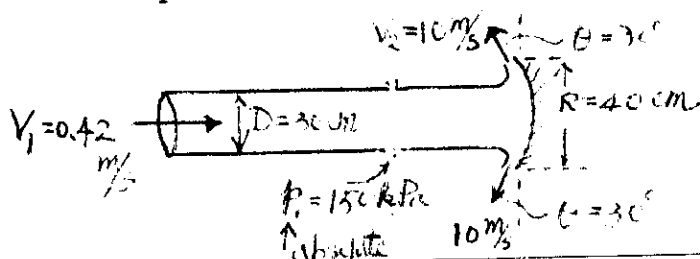


2. (a) Explain the physical meanings of the streamlined and blunt bodies, and sketch them qualitatively. (5%)

- (b) Which one experiences the larger flow resistance when the surface area of the two bodies is same.

Explain the reason of your answer in detail. (10%)

3. Consider water discharged from a conical spray head, as shown in the following sketch. Use control volume analysis to estimate (a) the thickness of spray sheet and (b) the axial force exerted on the supply pipe. (Be sure to make the appropriate assumptions and define the control volume clearly). (16%)



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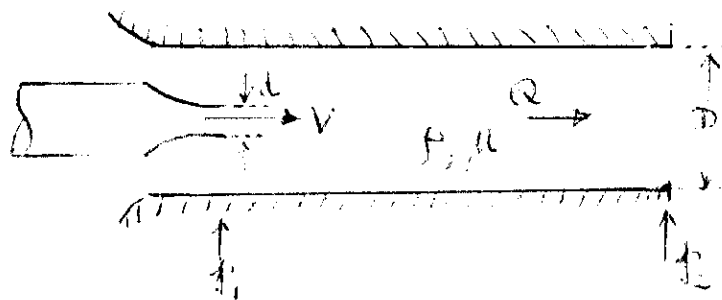
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4. We are interested in the pressure drop caused by a jet pump shown schematically in the following. Use dimensional analysis to find the relevant dimensionless groups. In the analysis ρ , V and d are chosen as the repeating parameters. (15%)



5. (a) What is the physical mechanism of heat conduction in a solid, a liquid and a gas? (3%)
(b) What is thermal contact resistance? Explain how it can be minimized. (4%)
(c) State the physical definitions and also significance of the following dimensionless numbers: Biot number, Reynolds number, Grashof number and Radiant exchange view factor. (12%)
(d) Consider laminar flow of air across a hot circular cylinder and describe the variation of heat transfer along the circumference of the cylinder. Also describe the variation of heat transfer for turbulent flow over a hot circular cylinder. (8%)
(e) Because of the large number of devices in today's PC chips, fan-finned heat sinks (as shown in figure) are often used to maintain the chip at an acceptable operating temperature. As a mechanical engineer, what do you think the considerations should be in determining the specification of fins (such as fin length, pitch, numbers and base thickness) attached to a surface? (7%)

