國立交通大學 97 學年度碩士班考試入學試題

科目：流體力學(3082)　　考試日期:97 年 3 月 8 日 第 2 節

系所班別：土木工程學系　　組別：土木系丙組一般生　　第 1 頁,共 1 頁

【可使用計算機】＊作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符！！

1. (20%) Two fixed, horizontal, parallel plates are spaced 0.2 in apart. A viscous liquid ($\mu = 8*10^{-3}$ lb*s/ft^2, SG = 0.9) flows between the plates with a mean velocity of 0.9 ft/s. Determine the pressure drop per unit length in the direction of flow. What is the maximum velocity in the channel?

2. (15%) A velocity field is given by $\mathbf{V} = x\mathbf{i} + x(x\text{-}1)(y+1)\mathbf{j}$, where u and v are in m/s and x and y are in meter. Plot the streamline that passes through $x = 2$ and $y = 1.718$. What is the pathline passes through $x = 2$ and $y = 1.718$?

3. (15%) Water flows steadily through the variable area horizontal pipe shown as follows (Fig 3). The centerline velocity is given by $\mathbf{V} = 10(1+x)\mathbf{i}$ ft/s, where x is in feet. Viscous effects are neglected. (a) Determine the pressure gradient, $\partial p / \partial x$, needed to produce this flow. (b) If the pressure at section (1) is 50 psi, determine the pressure at section (2) by integration of the pressure gradient obtained in (a).

4. (25%) An inviscid incompressible fluid flows steadily through the contraction shows in Fig. 4. Derive an expression for the fluid velocity at section (2) in terms D_1, D_2, ρ, ρ_m, and h.

5. (25%) It is proposed that a two dimensional incompressible flow field be described by the velocity components $u = x^2 - y$; $v = y^2 - x$. Determine, if possible (a) the corresponding stream function (b) Is it an irrotational flow? Why?

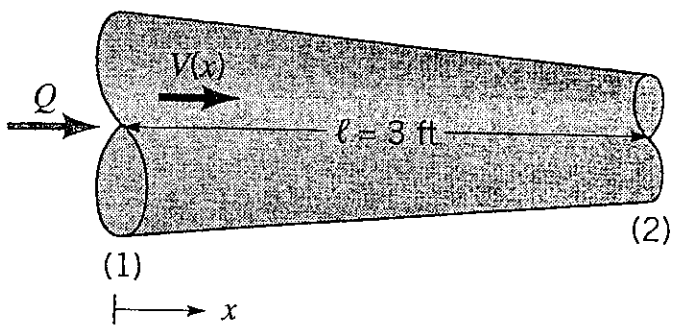

Fig. 3

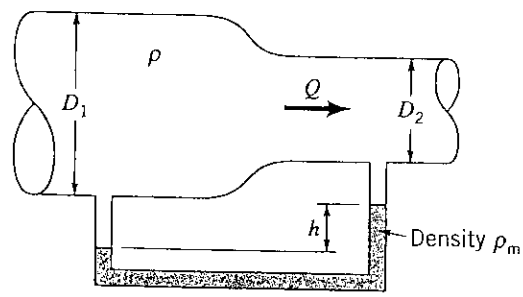

Fig. 4