淡江大學九十四學年度轉學生招生考試試題

系別： 航空太空工程學系三年級科目：流　體　力　學

准帶項目請打「V」	
	簡單型計算機

節次： 7 月 13 日第三節

本試題共 / 頁

1. 簡答題
(10%) (a)什麼是 inviscid fluid? 什麼是 streamline?
(10%) (b)在什麼條件下兩個流場可視為 dynamically similar?
(10%) (c)請寫出雷諾數(Reynolds number)的表示式及其物理意義
(10%) (d)請問在一水平黏滯流場(viscous flow)中，若 $\partial p/\partial x < 0$，則其對流場分離點有何影響？是提前、延後、還是不變？

2. (20%) Determine which of the following pairs of velocity components u and v satisfy the equation of continuity for a two-dimensional planar flow of an incompressible fluid.
(a) $u = Ax$, $v = -Ay$, (b) $u = Ax/(x^2 + y^2)$, $v = Ay/(x^2 + y^2)$, (c) $u = A\sin(xy)$, $v = -A\sin(xy)$
(d) $u = -Ax/y$, $v = A\ln(xy)$

3. (20%) A two-dimensional flow of an incompressible fluid has the following velocity field:

$$V = (\frac{y^2}{3} + 2x - x^2 y)i + (xy^2 - 2y - \frac{x^3}{3})j$$

Does this velocity field represent a possible case of an irrotational flow?

4. (20%) For a two-dimensional steady flow between two fixed parallel flat plates separated by a distance b. If the flow is in the x-direction, and the x-direction is taken as normal to the direction of the gravity. Please find the velocity profile expressed in μ, y, and $\partial p/\partial x$.
Note: Equation of motion in x-component is $\rho\partial u/\partial t = -\partial p/\partial x + \mu(\partial^2 u/\partial y^2 + \partial^2 u/\partial z^2)$
本題推導過程中，上式任一項的省略都必須解釋清楚為何可以刪除或忽略.