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淡江大學96學年度碩士班招生考試試題

系別：航空太空工程學系　　科目：流　體　力　學

准帶項目請打「V」	
V	簡單型計算機

本試題共 1 頁

一、什麼是 laminar flow？什麼是 turbulent flow？哪一參數常用來判斷流場是 laminar or turbulent flow？此參數與流場之關聯爲何？(10%)

二、在探討 systems of dimensions，什麼是(MLtT)？(5%)

三、簡單說明皮托管(pitot-static tube)如何量測流場速度。(10%)

四、什麼是摩擦阻力(friction drag)？什麼是壓力阻力(pressure drag)？由摩擦阻力及壓力阻力觀點解釋高爾夫球表面製成凹面之原因。(10%)

五、什麼是 boundary layer thickness? 什麼是 displacement thickness? (10%)

六、Which of the following sets of equations represent possible two-dimensional incompressible flow cases? (註:利用 $\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}$ 是否爲零來判斷) (15%)

(a) $u=x+y$, $v=x-y$; (b) $u=x+2y$, $v=x^2-y^2$; (c) $u=4x+y$, $v=x-y^2$

七、Consider the flow field given by $\psi=ax^2-ay^2$ (ψ is the stream function), where $a=3\ s^{-1}$. Show that the flow is irrotational. Determine the velocity potential for this flow. (註一: If the flow is irrotational, then $2\omega_z=\frac{\partial v}{\partial x}-\frac{\partial u}{\partial y}=0$；註二: stream function 與速度之關係爲 $u=\frac{\partial \psi}{\partial y}$，$v=-\frac{\partial \psi}{\partial x}$；註三: velocity potential 與速度之關係爲 $u=-\frac{\partial \phi}{\partial x}$，$v=-\frac{\partial \phi}{\partial y}$) (20%)

八、The drag force, F, on a smooth sphere depends on the relative velocity, V, the sphere diameter, D, the fluid density, ρ, and the fluid viscosity, μ. Obtain a set of dimensionless groups that can be used to correlate experimental data. (註:利用 Dimensional analysis 得到 $\frac{F}{\rho V^2 D^2}=f(\frac{\mu}{\rho VD})$) (20%)