淡江大學 95 學年度轉學生招生考試試題

50

系別：航空太空工程學系三年級　　科目：流 體 力 學

50-1

准帶項目請打「V」	
V	簡單型計算機

本試題共 1 頁

解釋名詞及簡答題：

(1) What is "Fluid"? What is "fluid mechanics"? (6 分)

(2) 探討流體力學時，基本上需利用哪五個定律(law)? (5 分)

(3) 說明 Reynolds number 之物理意義。並敘述 Reynolds number 大小與流場之關聯？(6 分)

(4) 什麼是"no slip condition"? (5 分)

(5) 繪出一 incompressible, viscous flow 流經二維圓柱之流線示意圖，標出停滯點及分離點。並由流體力學觀點說明高爾夫球之凹洞? (10 分)

(6) 在流體力學中，什麼是 Dimensional Analysis？什麼是 Incomplete similarity？ (10 分)

計算題：

(7) For the velocity fields given below, determine: (The quantities a, b and c are constants) (18 分)

(a) whether the flow is one-, two-, or three-dimensional, and why.
(b) whether the flow is steady or unsteady, and why.

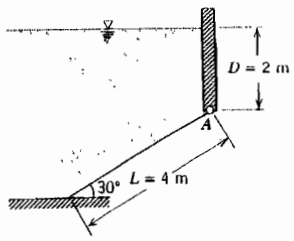
1. $\vec{V} = [ae^{-bz}]\vec{k}$　　2. $\vec{V} = az^2\vec{i} + bz\vec{k}$

3. $\vec{V} = ax\vec{i} + bx^2e^{-ct}\vec{j}$　　4. $\vec{V} = ax\vec{i} + by\vec{j} + cx^2\vec{k}$

5. $\vec{V} = ay^2\vec{i} + bx\vec{j} + cxy\vec{k}$　　6. $\vec{V} = ax\vec{i} + by^2\vec{j} + czt\vec{k}$

(8) The inclined surface shown below, hinged along edge A, is 5 m wide. Determine the resultant force, F_R, of the water and air on the inclined surface. (20 分)

Notes: $\rho_{water} = 999$ kg/m^3



(9) The drag of an airfoil at zero angle of attack is function of density, viscosity, velocity, and a length parameter. A 1/10 scale model of an airfoil was tested in a wind tunnel at a Reynolds number of 5.5×10^6, based on chord length. Test conditions in the wind tunnel air stream were 15°C and 10 atm absolute pressure. The prototype airfoil has a chord length of 2 m, and is to be flown in air at standard conditions. Determine the speed at which the wind tunnel model was tested, and the corresponding prototype speed. (20 分)

Notes: For air: R= 287 N-m/kg-K, $\mu = 1.74\times10^{-5}$ N-sec/m^2 at 15°C