淡江大學九十一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　　90-1

准帶項目請打「○」否則打「×」	
計算機	字典
○	×

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本試題雙面印製

一、 解釋名詞及簡答題：

8% (1) 說明 Dimensional Analysis 之目的。

8% (2) 高爾夫球上凹孔之目的係讓球飛的更遠，試由流體力學之觀點說明其原理。

8% (3) What is Reynolds number? Why Reynolds number 愈大，流場愈傾向於 turbulent flow?

8% (4) What is boundary layer? Laminar and turbulent boundary layer 內之 velocity profile 有何不同(可以圖示表示之)?What makes the difference?

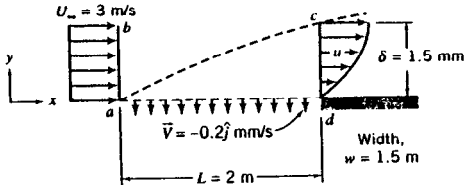
8% (5) 說明作縮小模型實驗時，需注意之事項。

二、 計算題(一)： 20%

Water flows steadily past a porous flat plate. Constant suction is applied along the porous section. The velocity profile at section *cd* is:

$$\frac{u}{U_\infty} = 3\left(\frac{y}{\delta}\right) - 2\left(\frac{y}{\delta}\right)^{1.5}$$

Evaluate the mass flow rate across section *bc*.



三、計算題(二)： 20%

A static thrust stand, as shown below, is to be designed for testing a jet engine. The following conditions are known for a typical test:

Intake air velocity = 200 *m/s*
Exhaust gas velocity = 500 *m/s*
Intake cross-sectional area = 1 m^2
Intake static pressure = -22.5 *Kpa* = 78.5 *Kpa* (abs)
Intake static temperature = 268 *K*

◀注意背面尚有試題▶

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90-2

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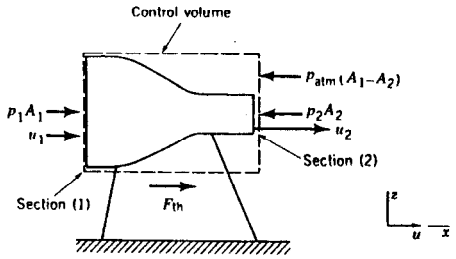
Exhaust static pressure = 0 *Kpa* = 101 *Kpa* (abs)

Estimate the nominal thrust for which to design.

(Note: the gas constant of air is 287 *J/Kg K*)



三、計算題(三)： 20%

Consider a smooth sphere, of diameter D, immersed in a fluid moving with speed V. The drag force on a 3 m diameter weather balloon in air moving at 1.5 m/s is to be calculated from the test data. The test is to be performed in water using a 50 mm diameter model. Under dynamically similar conditions, the model drag force is measured as 3.78 N. Evaluate the model test speed and the drag force expected on the full-scale balloon.

(Note: The kinematic viscosity of water and air is 1×10^{-6} m^2/s and 1.45×10^{-5} m^2/s, respectively. The density of water and air is 1000 kg/m^3 and 1.23 kg/m^3, respectively.)