淡江大學九十一學年度日間部轉學生招生考試試題

系別：航太工程學系三年級　　科目：流 體 力 學

准帶項目請打「○」否則打「×」
計 算 機

一、 What is uniform flow ? What is steady flow ? Given an example of non-uniform flow. (10%)

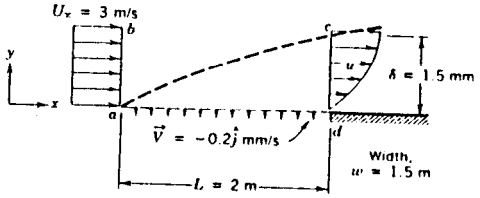
二、 What is laminar flow ? What is turbulent flow ? Why the Reynolds number can be used to tell the flow is laminar or turbulent. (10%)

三、 What is inviscid flow ? Are the flows naturally inviscid ? (5%)

四、 What is the difference between the Bernoulli equation and the Navier-Stokes Equations ? (10%)

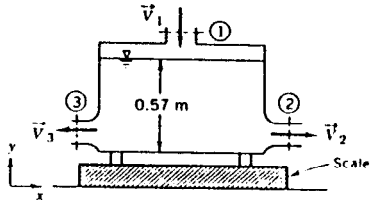
五、 Water flows steadily past a porous flat plate. Constant suction is applied along the porous section. The velocity profile at section *cd* is shown below. Evaluate the mass flow rate across section *bc*. (20%)

$$\frac{u}{U_e} = 3\left[\frac{y}{\delta}\right] - 2\left[\frac{y}{\delta}\right]^{1.5}$$



六、 An airship is to operate at 20 *m/s* in air at standard conditions (the pressure is 101 *kpa*). A model is constructed to 1/20 scale and tested in a wind tunnel at the same air temperature to determine the drag. What criterion should be considered to obtain dynamically similarity ? If the model is tested at 75 *m/s*, what pressure should be used in the wind tunnel ? If the model drag force is 250 *N*, what will be the drag of the prototype ? (25%)

七、 A metal container 0.6 *m* high, with an inside cross-sectional area of 0.09 m^2, has a mass of 2.5 *kg* when empty. The container is placed on a scale and water flows in through an opening in the top and out through the two equal area openings in the sides, as shown in the diagram. Under steady conditions, the height of the water in the tank is 0.57 *m*. Determine the reading on the scale. The density of water is 1000 kg/m^3. (20%)



$A_1 = 0.009\ m^2$

$\vec{V}_1 = -1.5\hat{j}\ m/s$

$A_2 = A_3 = 0.009\ m^2$