國立成功大學
110學年度碩士班招生考試試題

編　號：155

系　所：生物醫學工程學系

科　目：流體力學

日　期：0202

節　次：第 2 節

備　註：可使用計算機

編號： 155　　國立成功大學 110 學年度碩士班招生考試試題

系　　所：生物醫學工程學系

考試科目：流體力學　　考試日期：0202，節次：2

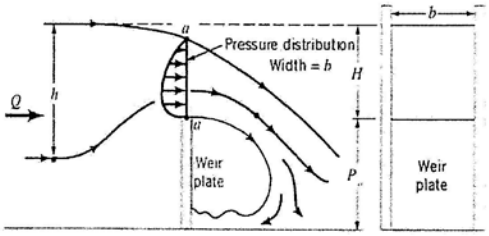
※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Explain the following terms: (15%)
   (a) d'Alembert's Paradox
   (b) Streamlines, streaklines, and pathlines
   (c) Newtonian and non-Newtonian fluids

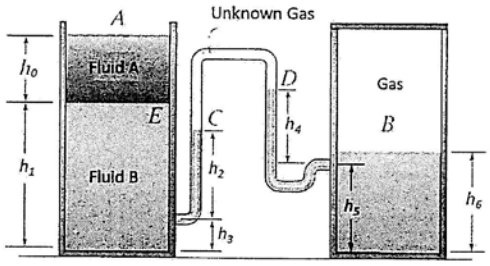
2. The flowrate over a weir plate can be estimated by an equation expressed as follows:

$$Q = Cb\sqrt{2g}H^{2/3}$$

where C is a constant and g is the gravitational acceleration. Assume no viscosity, **show** the above flowrate by the Bernoulli equation. (Hint: $H<<P_W$) (20%)



3. Two tanks A and B as shown below are connected using a manometer. If waste oil is poured into tank A to a depth of h_0, determine the pressure of the entrapped gas in tank B in terms of h_0, h_1, h_2, h_3, h_4, h_5, h_6, γ_A and γ_B. Assume liquid specific weight for Fluid A and Fluid B are γ_A and γ_B, respectively. (17%)



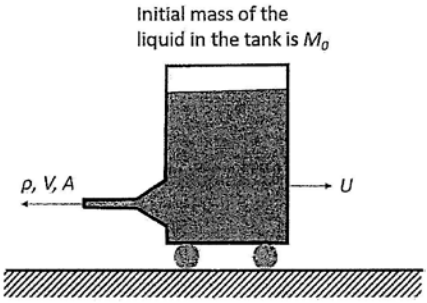
國立成功大學 110 學年度碩士班招生考試試題

系　　所：生物醫學工程學系

考試科目：流體力學

考試日期：0202，節次：2

4. A cart is propelled by a liquid jet issuing horizontally from a tank (liquid density: ρ; cross-sectional area of the jet: A) as shown below. The track is horizontal and friction is negligible. The tank is pressurized so that the jet speed, V, may be considered constant. Obtain a general expression for the speed of the cart (U) as it accelerates from rest. (Notice: **Control Volume** must be defined on the figure) (21%)



5. If oil ($\nu = 4 \times 10^5\ m^2/s$; SG=0.9) flows from the upper to the lower reservoir at a rate of 0.028 m³/s in the D=15 cm smooth pipe, **(a)** what is the elevation of the oil surface in the upper reservoir? (20%) **(b)** Explain what causes major and minor head losses? (7%) (Hint: $h_{L(major\ loss)} = f\frac{L}{D}\frac{V^2}{2g}$; $h_{L(minor\ loss)} = K\frac{V^2}{2g}$; K_{inlet}=0.5; K_{turn}=0.19; K_{outlet}=1; f=0.036 for turbulent flow and f=64/Re for laminar flow)