淡江大學九十學年度碩士班招生考試試題

系別：機械工程學系　　　　　　科目：流　體　力　學

| 准帶項目請打「〇」否則打「×」	
計算機	字典
〇	×

本試題共 **2** 頁

1. 選擇題每題答對得 4 分，答錯、空白得 0 分不倒扣

(1) For a flow in the xy plane , the y component of velocity field is given by
$v = y^2 - 2x + 2y$. Determine a possible x component for steady, incompressible flow.
　(a) $u = 2yx + 2x + f(y)$　　(b) $u = -2yx - 2x + f(y)$
　(c) $u = 2yx + 2x + f(x)$　　(d) $u = -2yx - 2x + f(x)$

(2) Which of the following statement about stream function ψ is <u>not</u> true ?
　(a) ψ is a constant along a streamline
　(b) the differential of ψ is exact
　(c) $\psi_2 - \psi_1$, depends only on the end points of integration
　(d) ψ is a path function

(3) Liquid flow down an inclined plane surface as show, after fully developed flow assumption is applied , which is true ?
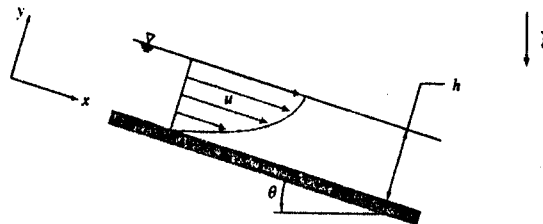
　(a) $\dfrac{\partial u}{\partial t} = 0$　　(b) $\dfrac{\partial u}{\partial x} = 0$　　(c) $\dfrac{\partial u}{\partial y} = 0$　　(d) $\dfrac{\partial u}{\partial z} = 0$

(4) Which is not the restriction for Bernoulli equation
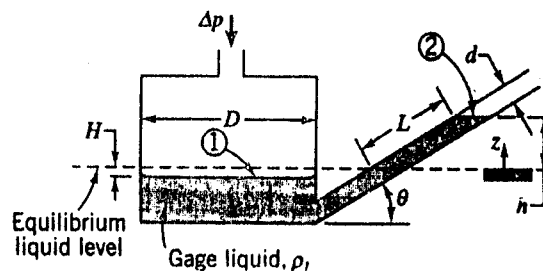　(a) steady flow　(b) uniform flow　　(c) frictionless flow　　(d) incompressible flow

(5) Which is not the Reynolds number for a pipe?
　(a) $\dfrac{\rho \bar{V} D}{\mu}$　(b) $\dfrac{4Q}{\pi \nu D}$　(c) $\dfrac{\bar{V} D}{\nu}$　(d) $\dfrac{4\dot{m}}{\pi \mu D}$

2. An inclined-tube reservoir manometer is constructed as shown. Analyze the manometer to obtain a general expression for the liquid deflection, L, in the inclined tube, in terms of the applied pressure difference, Δp .
Also obtain a general expression for the manometer sensitivity ($h/\Delta h_e$).
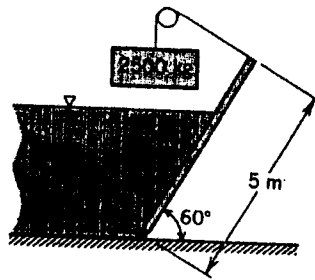(20%) hint: $p_1 - p_2 = \rho_{H2O} g \Delta h_e$

Equilibrium liquid level　Gage liquid, ρ_l

◀注意背面尚有試題▶
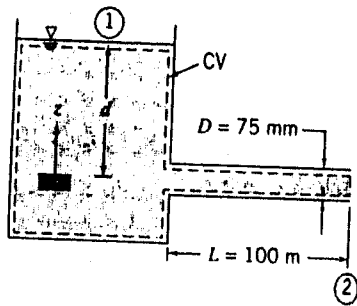
3. The gate shown is 3 m wide and for analysis can be considered mass less. For what depth of water will this rectangular gate be in equilibrium as shown ? (20%)

5 m

60°

4. Water flow at 0.01 m³/s, through the smooth pipe as shown, assume $P_1 = P_2 = P_{atm}$, $V_1 \cong 0$, $\bar{V}_2 = \bar{V}$, $\alpha_2 = 1$, $\rho = 999$ kg/m³, $\mu = 1 \times 10^{-3}$ kg/(m · s),

loss coefficient K = 0.5, $f = \dfrac{0.316}{Re^{0.25}}$,

① CV

d

D = 75 mm

L = 100 m

②

(a) Please find the friction factor f of the pipe (10%)

(b) Please find the resevoir depth , d to maintain the flow (10%)

5. A steady jet of water is used to propel a small cart along a horizontal track. Total resistance to motion of the cart assembly is given by $F_D = kU^2$, where k = 0.92 N · s²/m². Evaluate the acceleration of the cart at the instant when its speed is $U = 10$ m/s. (20%)

$\theta = 30°$

D = 25.0 mm

V = 30.0 m/s

U = 10.0 m/s

M = 15.0 kg