

淡江大學 105 學年度碩士班招生考試試題

23-1

系別:

水資源及環境工程學系 A 組

科目: 流體力學

考試日期: 3 月 5 日(星期六) 第 2 節

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1. 寫出適用於不可壓縮、非穩態流場之 Navier-Stokes 方程之向量形式。並說明每一項所代表的物理意義。(20%)

2. 寫出雷諾應力 (Reynolds stress), 並說明其由來。(20%)

3. Sketch (繪) the streamlines for the 2D flow

$$u = ax, v = -ay$$

where u and v = velocity in the x and y directions, and a = a positive constant. Let the concentration (濃度) of some pollutant (污染物) in the fluid be

$$c(x, y, t) = bx^2ye^{-at}$$

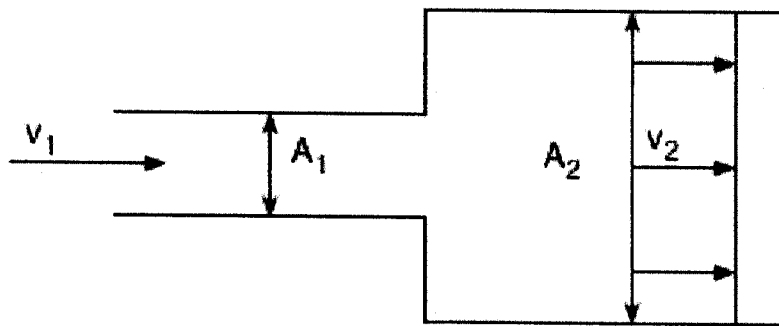
for $y > 0$, where t = time and b is a constant. Does the pollutant concentration for any particular fluid element change with time? (20%)

提示: a. 找出流函數。b. 使用物質微分。

4. 管流中若管徑面積由 A_1 突然增加為 A_2 , 試推導出損失係數 ($K_L = \frac{h_L}{v_1^2/2g}$) 與 A_1/A_2 的關係。 h_L

為水頭損失。(20%)

提示: 利用質量守恆、動量守恆、伯努利定律。



5. A fluid with density of ρ is siphoned (虹吸) from a large tank through a constant diameter hose (水管). Determine the maximum height, H , over which the water can be siphoned without cavitation (孔蝕) occurring. Assume vapor pressure (蒸氣壓) = p_v and atmospheric pressure (大氣壓) = p_a . (20%)

提示: 利用質量守恆、伯努利定律。

