國立成功大學

114學年度碩士班招生考試試題

編　號：109

系　所：環境工程學系

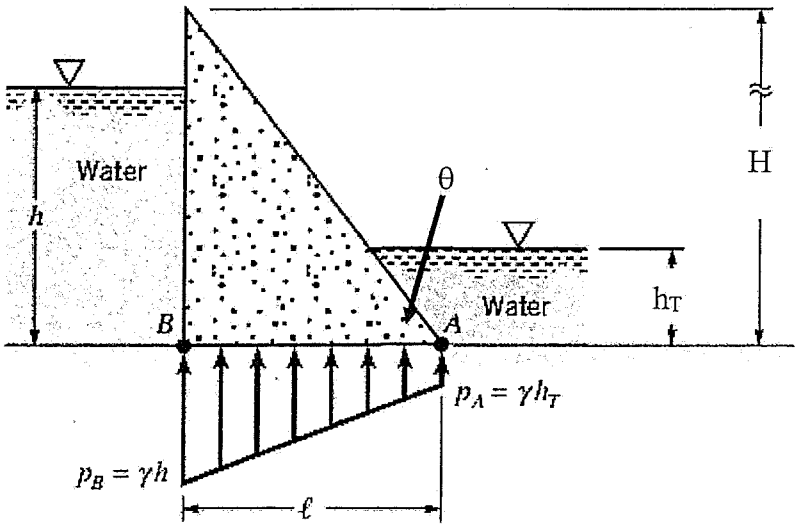
科　目：流體力學

日　期：0210

節　次：第 2 節

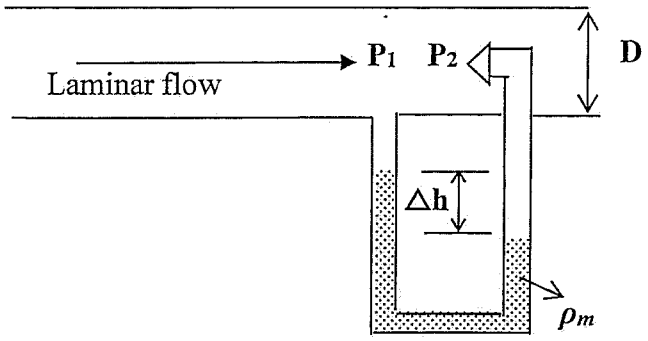
注　意：1.不可使用計算機
2.請於答案卷(卡)作答，於試題上作答，不予計分。

1. Water (specific weight of water = γ (kN/m^3)) backs up behind a concrete dam as shown below. Leakage under the foundation gives a pressure distribution under the dam as indicated. If the dimension given, derive the relationship between the maximum water depth (h) and width of the dam (ℓ). Base your analysis on a unit length of the dam. The specific weight of the concrete is γ_c kN/m^3. (20%)



2. The power (**P**) required to run a stirred tank varies with turbine diameter (**D**), rotational speed (**n**), fluid density (**ρ**), viscosity (**μ**), acceleration of gravity (**g**) and unit conversion factor ($\mathbf{g_c}$). Please generate a set of appropriate dimensionless groups by dimensional analysis. (20%)

3. Please describe how to measure the **volume flowrate** ($\dot{V}$) of laminar flow by using a pitot-static tube? where $P_1 = P_o$ = static pressure, $P_2 = P_s$ = stagnation pressure, ρ = fluid density, ρ_m= Hg density, D = diameter. (20%)



4. While workers spray paint onto the ceiling of a room (Height = H), numerous small paint aerosols are dispersed into the air. Eventually theses particles will settle out and fall to the floor surfaces. Consider a small spherical paint particle of diameter (D_p) and specific gravity (SG). The specific weight of water and air are γ_{H2O} and γ_{air}, respectively. The viscosity of air is μ_{air}. Determine the time it would take this particle to fall from ceiling to the floor. Assume that the air within the room is motionless and the flow will be creeping flow (Re < 1). (20%)

5. Calculate the **inlet pressure** to a pump 3 m above the level of a sump. The pipe is 8.9 cm in diameter, 0.89 m long and made of cast iron. The flow rate through the pump is 2.04 m^3/min. The kinematic viscosity of water is 1.22×10^{-5} m^2/s. The assumption of the flow is fully developed. Please use the following diagrams to find the e/D and f_f. Note that 1 in = 2.54 cm. (20%)