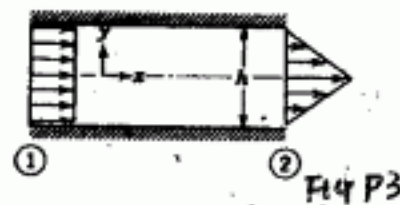
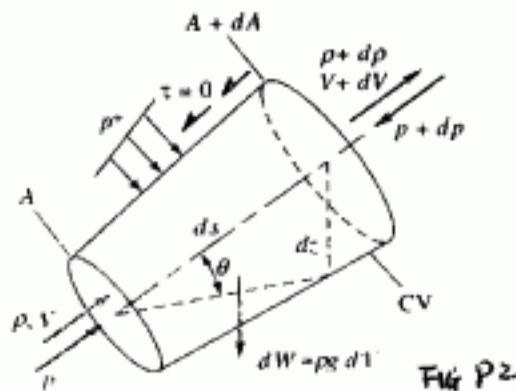


國立清華大學命題紙

九十三年學年度 工程與系統科學系(所) 乙 組碩士班入學考試

科目 流體力學 科號 3903 共 2 頁第 1 頁 *請在試卷【答案卷】內作答

- (15%) Define and explain the following terms
 - Normal stress
 - Shear stress
 - Strain
 - Capillary effect
 - Mach number
 - Moody curve
 - Darcy's friction factor
 - Reynold number
 - Streamline
 - Potential function
- (15%) Please derive Bernoulli Equation and list all assumptions



- (10%) Consider the steady flow of water between two parallel plates a distance h feet apart (Fig.P3). At station 1 the velocity is uniform across the width; the velocity distribution is assumed to be linear at station 2. The flow is identical in all planes parallel to the plane of the diagram. Calculate the ratio of the x direction momentum flux at station 2 to that at station 1 for the assumed velocity distribution..
- (15%) Experiments show that the pressure drop due to flow through a sudden contraction in a circular duct may be expressed as $\Delta P = p_1 - p_2 = f(\rho, \mu, V, d, D)$ where the geometric variables are defined in Fig.P4. Please organize the experimental data using dimensionless parameters, using ρ , V , and D as repeating variables. (圖在第二頁)
- (15%) A fluid flows steadily between two parallel plates. The distance between the plates is h . The flow is laminar and fully developed.
 - please derive an equation for the velocity profile as $\rightarrow u = -\frac{1}{2\mu} \frac{\partial p}{\partial x} \left[y^2 - \left(\frac{h}{2}\right)^2 \right]$
 - please derive an equation for the shear stress as a function of y . Plot this function
- (15%) Figure P6 plots the pressure distribution around a sphere for laminar and turbulent boundary flow, compared to inviscid flow. Please list all implications this figure tells you.
- (15%) Consider two-dimensional, laminar flow along a flat plate. The velocity profile in the boundary layer is assumed to be sinusoidal, that is, $u/U = \sin(\pi y/2\delta)$. Find an expression for (a) the rate of growth of δ as a function of x (b) the total friction force on a plate of length, L , and width, b .

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科目 流體力學 科號 3903 共 2 頁第 2 頁 *請在試卷【答案卷】內作答

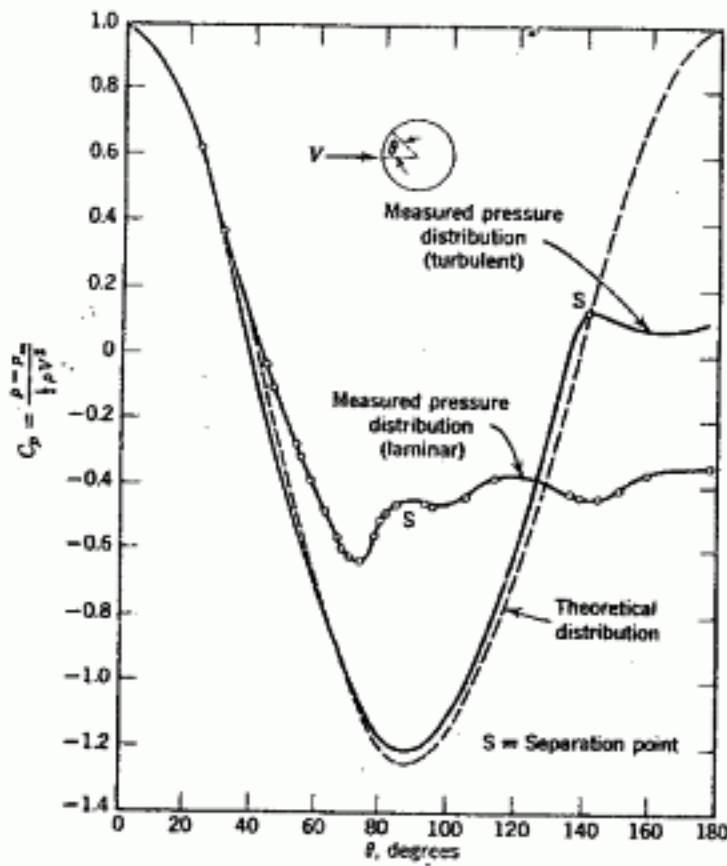


FIG P6

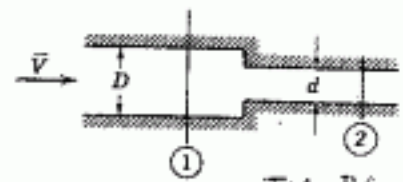


FIG P4