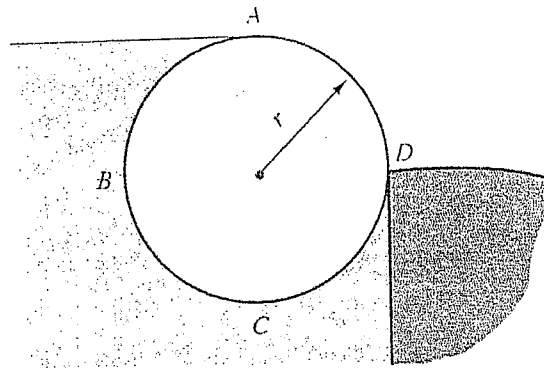
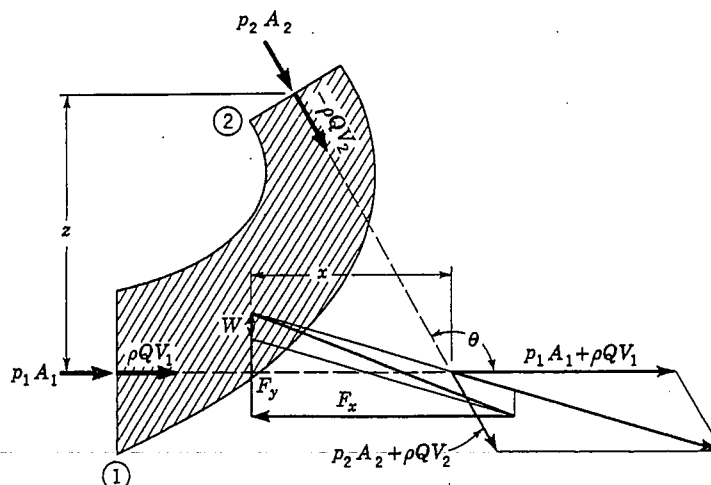


流體力學

1. A cylindrical barrier holds water. The contact between cylinder and wall is smooth. $r = 1$ m. Please determine
 - (a) its weight (10 points)
 - (b) the force exerted against the wall (5 points)



2. If $14 \text{ m}^3/\text{s}$ of water per meter of width flows down a slipway onto a horizontal floor and the velocity is 25 m/s . Please determine
 - (a) the downstream depth required to cause a hydraulic jump (10 points)
 - (b) the losses in power by the jump per meter of width (5 points)
3. The reducing bend of below Figure is in a vertical plane. Water is flowing, $D_1 = 6 \text{ ft}$, $D_2 = 3 \text{ ft}$, $Q = 350 \text{ cfs}$, $W = 18000 \text{ lb}$, $Z = 10 \text{ ft}$, $\theta = 120^\circ$, $p_1 = 40 \text{ psi}$, $x = 6 \text{ ft}$, and losses through the bend are $0.5 v_2^2/2g$ ft-lb/lb. $\beta_1 = \beta_2 = 1$. Please determine
 - (a) F_x (10 points)
 - (b) F_y (10 points)



國立中山大學100學年度碩士班招生考試試題

科目：流體力學【環工所碩士班甲組】

4. 下列是非或簡答題每題 4 分：(是非題，請以「是」或「非」回答)

(a) 於水管流中，若雷諾數(Reynolds number)愈大，則入口的長度(entrance length)愈短。

(b) 於邊界層(boundary layer)中，流線方向的摩擦力小於垂直方向的摩擦力。

(c) 不可壓縮流(incompressible fluid)的 $\nabla \times \vec{v} = 0$ ，其中 \vec{v} 為速度向量。

(d) 何謂牛頓流體(Newtonian fluid)? 簡述之。

(e) 常用以判斷是否為可壓縮流(compressible flow)的無因次參數為何?

5. A certain two-dimensional, incompressible, flow has the velocity component (u, v) in (x, y) coordinates as:

$$u = U \left(\frac{2y}{ax} - \frac{y^2}{a^2 x^2} \right)$$

where a and U are constants. Derive from continuity equation the velocity component $v(x, y)$, given that $v = 0$ at the wall, $y = 0$. (15 points)

6. The speed of sound, a , of a gas varies with pressure its P and density ρ . Find the proper functional form of $a = f(P, \rho)$ using dimensional analysis. (15 points)