

國立臺北科技大學 100 學年度碩士班招生考試

系所組別：1432 能源與冷凍空調工程系碩士班丙組

第二節 流體力學 試題 (選考)

第一頁 共二頁

注意事項：

1. 本試題共 5 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. The rotating cylinder of figure 1 is 30 cm in diameter and 42 cm high. It is filled to a depth of 35 cm with liquid. Determine the angular velocity required to spill liquid over the top. (20%)

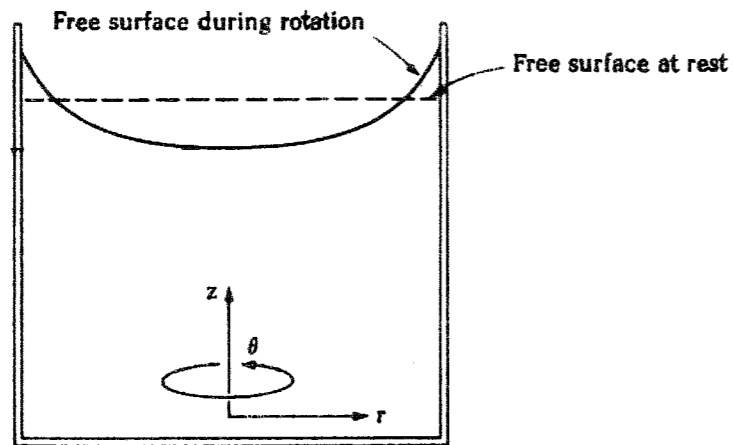


Figure 1.

2. A water jet of velocity 3 m/s and a cross-sectional area of 1 m² strikes a curved vane as shown in figure 2. The vane is moving at a velocity of 1 m/s in the positive x direction, and it deflects the jet through an angle of 60°. Assuming no frictional losses between the jet and the surface, determine the reaction forces F_x and F_y. (20%)

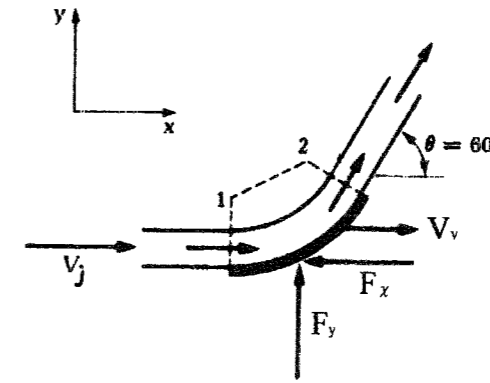


Figure 2

3. Water flows through a pipe reducer as is shown in figure 3. The static pressures at (1) and (2) are measured by the inverted U-tube manometer containing oil of specific gravity, SG, less than one. Determine the manometer reading, h, which is a function of Q, A₁, A₂ and SG. Assume the flow is steady, inviscid and incompressible. (20%)

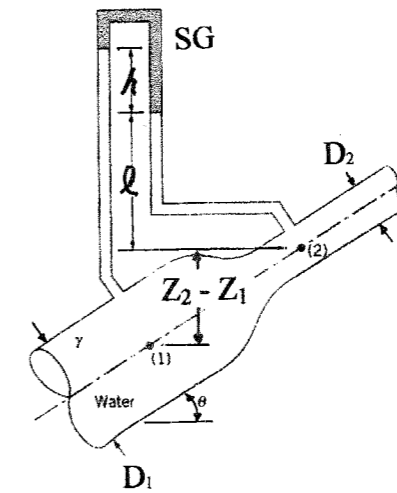


Figure 3

4. Water enters a rotating lawn sprinkler through its base at the steady rate of 1000 ml/s as sketched in figure 4. The exit area of each of the two nozzles is 30 mm², and the flow leaving each nozzle is in the tangential direction. The radius from the axis of rotation to the centerline of each nozzle is 200 mm. (20%)
 - (a) Determine the resisting torque required to hold the sprinkler head stationary. (10%)

注意：背面尚有試題

- (b) Determine the speed of the sprinkler if no resisting torque is applied. (10%)

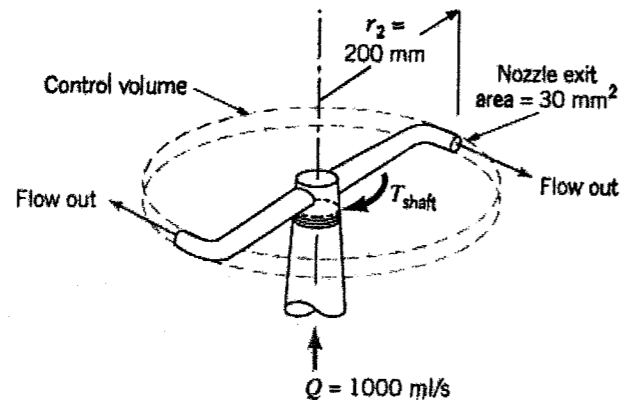


Figure 4

5. Consider the laminar flow of an incompressible fluid past a flat plate at $y=0$. the boundary layer velocity profile is approximated as $u = Uy/\delta$ for $0 \leq y \leq \delta$ and $u = U$ for $y > \delta$, as is shown in figure 5. Determine the shear stress by using the momentum integral equation. (20%)

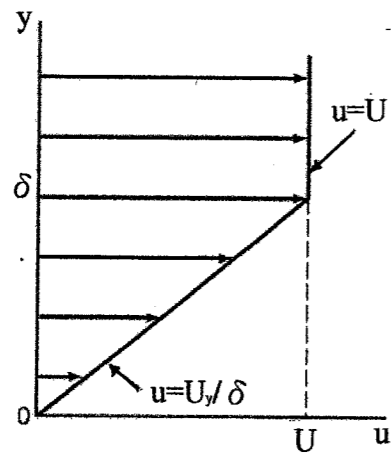


Figure 5