

※ 注意：請於試卷內之「非選擇題作答區」標明題號依序作答。

1. (25%)

(a) Given steady velocity in a certain flow field as $\underline{v} = 2x\underline{i} - 2y\underline{j} + 0\underline{k}$,

- (i) derive the **acceleration** \underline{a} of this flow field,
- (ii) find the **vorticity** of this flow field. Is the flow irrotational?
- (iii) Find the **volumetric dilatation rate**.
- (iv) Determine the **streamline** which passes $(x_0, y_0) = (1, 1)$.

(b) If we only know the steady velocity components in x,y directions as $u=2x, v=-2y$, find all the possible **velocity component** w in z-direction such that the field is an **incompressible flow**.

2. (25%)

Give water depth h , radius of curved section r , specific weight of water γ , a tank wall has the shape shown in Fig. P2. Determine (a) the horizontal and (b) vertical components of the **force magnitude and direction** of water on the b -width curved section AB , and (c) the **magnitude, direction and acting point** of the resultant force on section AB .

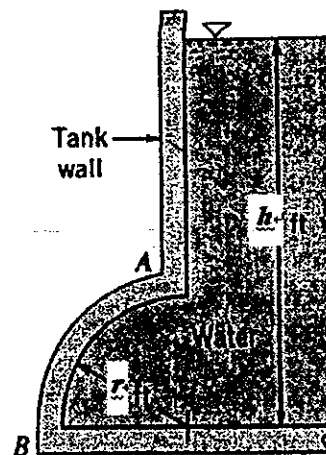


Fig. P2

3. (25%)

A steady discharge Q of a thin liquid drops vertically into a short horizontal rectangular channel of width B , as shown in Fig. P3. The depth at the outlet is Y_2 . Assume hydrostatic pressure distribution at all sections. Find the depth Y_1 at the upstream end in terms of Y_2, Q, B and the gravitational acceleration g . Hint: **control volume approach**.

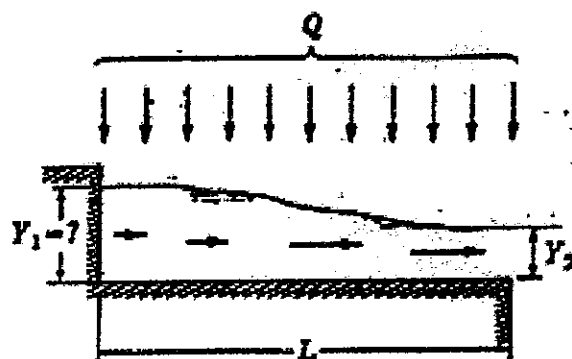


Fig. P3

4. (25%)

The flow rate over the spillway of a dam is $3125 \text{ m}^3/\text{min}$. Determine the required flow rate for a length scale 1 : 25 model. Hint: spillway flow simulation is controlled by **Froude number**.

試題隨卷繳回