

國立嘉義大學 100 學年度

土木與水資源工程學系碩士班(乙組)招生考試試題

科目：流體力學

說明：1. 如有條件不足，請自行假設。
2. 僅可使用試務單位提供之計算機。

1. The components of a velocity fields are given by $u = x+y$, $v = xy^3 + 16$, and $w = 0$, determine the location of any stagnation point ($v=0$) in the flow fields. (20%)
2. A hydraulic jump is in place downstream from a spillway as indicated in Fig. 1. Upstream of the jump, the depth of the stream is 0.2 m and the average stream velocity is 5.0 m/s. Just downstream of the jump, the average stream velocity is 1 m/s. Calculate the depth of the stream, h , just at the downstream of the jump. (20%)

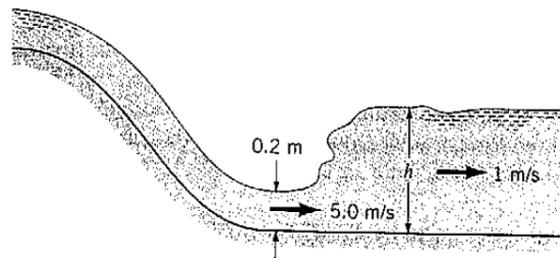


Fig. 1

3. A sluice gate across a channel of width b is shown at the closed and the open positions respectively in Fig. 2(a) and 2(b). What is the anchoring force required to hold the gate in place? And which position, closed or open, requires a larger force? (20%)

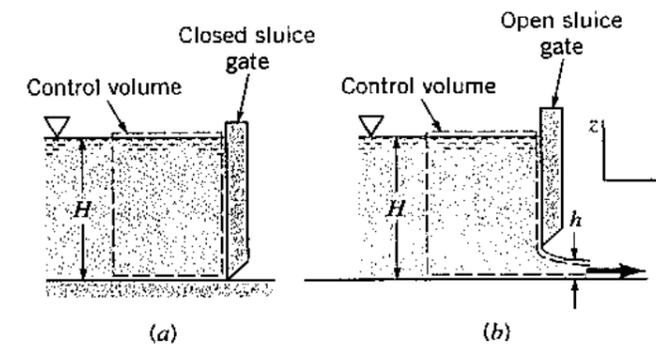


Fig. 2

4. A 10-cm diameter jet of water is issued from a 1-m diameter tank. Assume that the velocity in the jet is $\sqrt{2gh}$ m/s. z is the difference in elevation between the water surface and the jet. g is gravitational acceleration. How long will it take for the water surface in tank to drop from $h_c = 2\text{m}$ to $h_f = 0.5\text{m}$? (20%)
5. (a) The pressure rise, Δp , across a pump can be expressed as

$$\Delta p = f D Q (\dots) \rho \omega$$

where D is the impeller diameter, ρ the fluid density, ω the rotational speed, and Q the flowrate. Determine a suitable set of dimensionless parameters. (10%)

- (b) The flowrate over the spillway of a dam is 27,000 ft³/min. Determine the require flowrate for a 1:25 scale model that is operated in accordance with Froude number similarity. (10%)