

國立中央大學102學年度碩士班考試入學試題卷

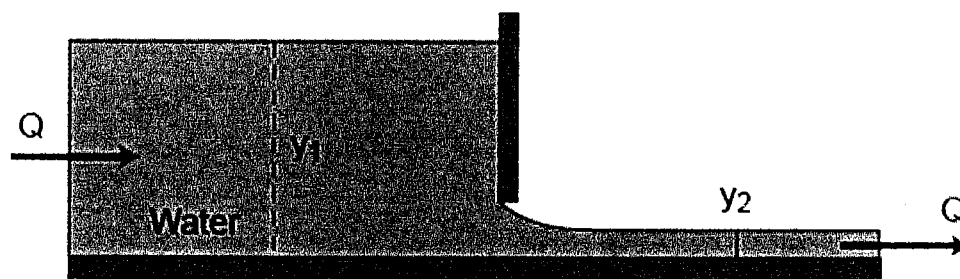
所別：水文與海洋科學研究所碩士班 不分組(一般生) 科目：流體力學 共 / 頁 第 / 頁
水文與海洋科學研究所碩士班 不分組(在職生)

本科考試禁用計算器

*請在試卷答案卷(卡)內作答

參考用

- There is a tank of gasoline with $\rho_{\text{Gasoline}} = 800 \text{ kg/m}^3$, and $p_{\text{atmosphere}} = 100 \text{ kN/m}^2$.
 Please calculate:
 - (15%) The absolute pressure (in kPa) of gasoline at depth 5m below the surface
 - (10%) Gauge pressure (in kPa) of gasoline at depth 10m below the surface
- The velocity field of a flow is given by $u = 3x^2t + y$, $v = xyt - t^2$, $w = 0$, in which distances are in meters, time in seconds, and velocities in meters/second. Please answer the following questions:
 - (10%) What is the acceleration measured by a stationary observer at $x = 3\text{m}$, $y = 5\text{m}$, and $t = 3\text{s}$?
 - (15%) What is the acceleration experienced by a fluid particle located at the same time and place as in (a)?
- (25%) For flow under a sluice gate as shown in the figure, there is no significant head loss. If $y_1 = 1\text{m}$ and $y_2 = 0.2\text{m}$, what are the velocity V_1 and V_2 at locations y_1 and y_2 , respectively? In this case, you may assume gravity $g = 10 \text{ m/sec}^2$ and a channel width of 1m).



- Water can be approximated as incompressible fluid.
 - (10%) Show that the flow field given by

$$\vec{V} = x^3y\vec{i} - (3\sin(x) + 2x^2y^2)\vec{j} + 2x^2y\vec{k}$$
 does not describe a valid flow field for water. (Note: \vec{i} , \vec{j} , and \vec{k} are unit vectors in the x-, y-, and z-directions).
 - (15%) How might you change the z-component of the flow field given above so that the resulting flow field is incompressible?

