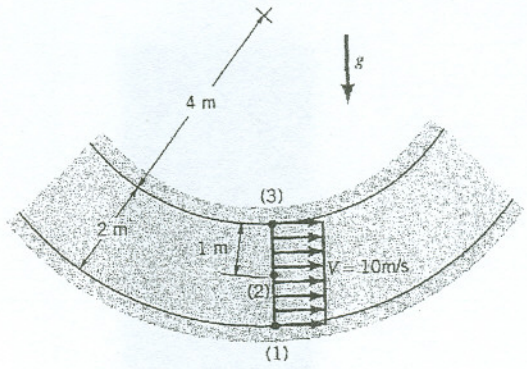
國立交通大學 93 學年度碩士班入學考試試題

科目名稱：流體力學(232)　考試日期：93 年 4 月 17 日　第 2 節

系所班別：土木工程學系　　組別：丙組　　第 1 頁，共 2 頁

＊作答前，請先核對試題、答案卷（試卷）與准考證上之所組別與考試科目是否相符!!

1. Water flows around the vertical two-dimensional bend with circular streamlines and constant velocity as shown in the following figure. If the pressure is 30 kPa at point (1), determine the pressure at points (2) and (3). Assume that the velocity profile is uniform as indicated. (25 %)



2. A certain spillway for a dam is 30 m wide and is designed to carry 150 cms at flood stage. A 1:15 model is constructed to study the flow characteristics through the spillway. Determine the required model width and flowrate. What operating time for the model corresponds to a 48 hours period in the prototype? The effects of surface tension and viscosity are to be neglected. (25%)

3. A tank wall has the shape shown in Fig 3. Determine the horizontal and vertical components of the force of water on a 1 m width of the curved section AB. (25%)

4. The viscous, incompressible flow between the parallel plates shown in Fig 4 is caused by both the motion of the bottom plate and a pressure gradient, $\partial p/\partial x$. Determine the relationship between U and $\partial p/\partial x$ so that the shearing stress acting on the fixed plate is zero. If $P = -\left(b^2/2\mu U\right)\left(\partial p/\partial x\right) = 3$. Where does the maximum velocity occur? (25%)

Hint: The N-S equation in the x direction is

$$\rho\left(\frac{\partial u}{\partial t}+u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}+w\frac{\partial u}{\partial z}\right)=-\frac{\partial p}{\partial x}+\rho g_x+\mu\left(\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}\right)$$

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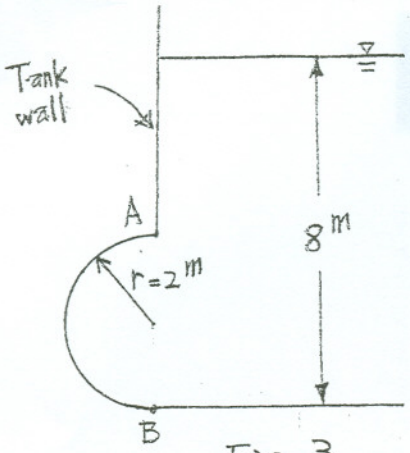

Fig 3

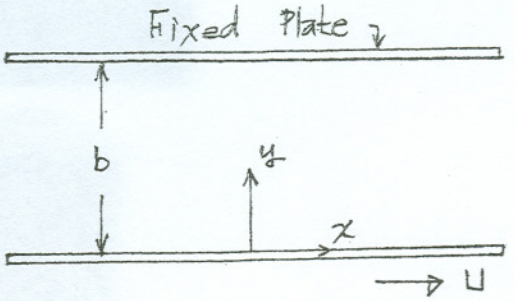

Fig 4