系所組別 環境工程學系乙組

考試科目 流體力學 考試日期：0307，節次：2

※ 考生請注意：本試題 ☑可 ☐不可 使用計算機

1. A flow rate of 69 m^3/s water exists at a depth of 3 m in a rectangular channel 5 m wide. Find the critical depth, specific energy, Froude number, conjugate depth and draw the F+M curve by the unit width. (20%)
2. (1). A velocity potential in two-dimensional flow is $\phi = 5x+5y+6x^2-7y^2$, Find the stream function for this flow. (10%)

   (2). The two-dimensional stream function for a flow is $\psi = 11 + 13x - 7y + 8xy$. Find the velocity potential. (10%)
3. A flow in a pipe is related to the parameters of head loss per unit length h_f/L, average velocity V, pipe inner diameter D, gravity g, viscosity μ, mass density ρ, roughness size ε, roughness gap ε', and shape factor *m*. Please derive the Darcy-Weisbach Equation by using the Demensional Analysis. (20%)
4. The vertical reducing section shown in Fig.4 contains oil, sp gr 0.86, flowing upward at the rate of 2 m^3/s. the pressure at the larger section is 230 kPa. Neglecting losses but including gravity, determine the force on the contraction. (20%)

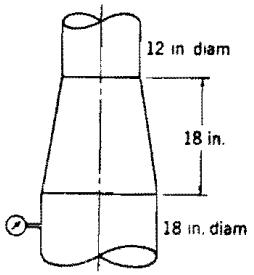

Fig. 4

5. (1). The cube of Fig. 5 is filled with liquid, sp gr 2.4. When it is accelerated to the right 3 m/s^2, draw the imaginary free surface and determine the pressure at A. (10%)

   (2). Locate the vertical axis of rotation and the speed of rotation of the U tube of Fig. 5 so that the pressure of liquid at the mispoind of the U tube and at A are both zero. (10%)

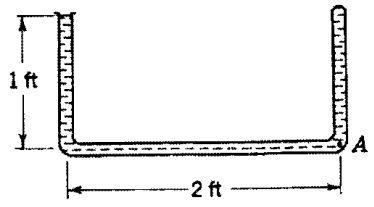

Fig. 5