國立嘉義大學九十六學年度

土木與水資源工程學系碩士班招生考試（乙組）試題

科目：流體力學

（ 如有條件不足之情形，請自行假設。 僅可使用學校提供之計算機 ）

1. Explain the following terms:（20%）
   (1) Darcy-Weisbach equation
   (2) Displacement thickness
   (3) Water hammer
   (4) Energy coefficient
   (5) Hydraulic grade line

2. The velocity potential of a steady flow is given by the equation:
   $$\phi = x^2 + y^2 - 2z^2$$
   (1) Show that this field represents a possible incompressible, irrotational flow.（10%）
   (2) Calculate the circulation about the square enclosed by x=±5 and y=±2.（5%）
   (3) The temperature of the field is described by the following expression:
   $$T = x + 3xy + z^2 + 5xyz$$
   Determine the time rate of change of the temperature of a fluid element as it passes through the point (1, -2, -1)（10%）
   (4) Calculate the pressure difference between points (3, -4, 1) and (8, -1, 2)（5%）

3. What are the free vortex and the forced vortex? Give examples to explain.（6%）
   Which one (or both) is a rotation flow?（4%）

4. What are streamlines, pathlines, and streaklines?（15%）
   Give examples to explain. In what situation, streamlines, pathlines, and streaklines are the same?（5%）

5. Determine the acceleration field for a three dimensional flow with velocity components u = - x , v = $4x^2y^2$, and w = x-y.（20%）