1. Please give the definitions of Reynolds number and vorticity. (20%)

2. A velocity field is

   $V = (x^2 + y^2 + x)i - (2xy + y)j$.

   Does this velocity field represent a possible irrotational flow? (20%)

3. Please write down the Navier-Stokes Equation in Cartesian Coordinates (x, y, z) and explain the physical mean of each term. (20%)

4. The velocity potential of steady flow is given as

   $\phi = x^2 + y^3 - 5z$

   The temperature field is given as

   $T = x + 3xy^2 + z^2 + 5xyz$

   Estimate the time rate of change of temperature of a fluid element as it passes though the point (2, 0, -3). (20%)

5. What is the stream function? If the stream function can be expressed as

   $\psi = -Ay + Be^{-y}\cos x$

   Please write down its velocity field and vorticity. (20%)

試題隨卷繳回