Assignment 2

The due date for submitting this assignment has passed. Due on 2021-02-07, 23:59 IST.

As per our records you have not submitted this assignment.

Common data for Q. 1 to Q. 3
A velocity field is given by

\[ \mathbf{v} = (x + y, y + x) \]

Where, all the coordinates are in meter (m) units.

1. Find the equation of the pathlines of a fluid particle moving in the aforementioned velocity field that was at the point (2, 4) at t = 0 s. 1 point

2. Time required for the fluid particle in Q. 1 to move from x = 4 to x = 0 m is 1 point

3. At time t = 0 s, find the equation of the streamline that passes through the point (4, 2). 1 point

4. The velocity distribution in a viscous liquid (dynamic viscosity \( \mu = 0.08 \text{ Pa·s} \)) flowing over a rigid plate is given by \( \mathbf{v} = 0.75y - x^2 \) (y is velocity, 1 point) in m/s and \( y = \text{distance from the plate in m} \). What are the stresses \( (\text{in Pa}) \) on the plate surface at \( y = 0.39 \text{ m} \)?

5. Calculate the Nusselt number value for air flowing in a 150 micron channel. The mean free path of air molecules is 64 nm 1 point

6. In the below graph, what types of fluid are represented by the lines 2 and 4 respectively? 1 point

7. Water enters a circular pipe of diameter 10 cm with a velocity of 5.5 m/s and a temperature of 45 degrees Celsius. The dynamic viscosity is 0.001 Pa·s, water density is 1000 kg/m³. Find out the flow Reynolds number. 1 point

8. Mach number is defined as the ratio of the local flow velocity to the sonic velocity in the fluid. For what value of Mach number does the gas flow become incompressible? 1 point