NOVEMBER/DECEMBER 2019

MMA35C — FLUID DYNAMICS

Time : Three hours Maximum : 75 marks

SECTION A — (5 × 6 = 30 marks)

Answer ALL questions.

1. (a) Derive the equation of continuity.

Or

(b) Discuss the stream lines and path lines.

2. (a) Derive the Bernoulli's equation.

Or

(b) Describe pressure at a point in a fluid at rest

3. (a) Derive the doublet in uniform stream.

Or

(b) Obtain the images in a rigid infinite plane.

4. (a) Discuss the flow due to a uniform line doublet at 0 of strength μ per unit length, its axes being along $\overline{OX}$.

Or

(b) Describe the uniform flow past a fixed infinite circular cylinder.

5. (a) Derive the Co-efficient of Viscosity and Laminar flow.

Or

(b) Obtain the translational motion of fluid element.

SECTION B — ($3 \times 15 = 45$ marks)

Answer any THREE questions.

6. For an incompressible, fluid, $q = [-\omega y, \omega x, 0]$ (ω = constant). Discuss the nature of the flow.

7. Define pressure at a point in a moving fluid and prove that the pressure p is the same in all directions.

8. Derive the Stoke's Stream functions.

9. A two-dimensional doublet of strength μi is at the point z=ia in a stream of Velocity –Vi in a semi-infinite liquid of constant density occupying the half plane y>0 and having y=0 as a rigid boundary (i is the unit vector in the positive x-axis). Show that the complex potential of the motion is $\omega = Vz + 2\mu z(z^2 + a^2)$. Show that for $0 < \mu < 4a^2V$, there are no stagnation points on this boundary and that the pressure on it is a minimum at the origin and a maximum at the points $Z = \pm a\sqrt{3}$.

10. Obtain the relations between stress and rate of strain.