

MAMT-07

Viscous Fluid Dynamics

MA/M.Sc. Mathematics (MAMT/MSCMT-19)

2nd Year Examination, 2021 (Winter)

Time : 2 Hours]

Max. Marks : 80

Note : This paper is of Eighty (80) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION–A

(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Twenty (20) marks each. Learners are required to answer any Two (02) questions only.

(2×20=40)

1. Obtain Navier-Stokes Equations of motion of a fluid in Cartesian Coordinates.

2. Discuss the plane Poiseuille flow between two parallel plates.
3. Prove that the temperature distribution between two concentric rotating cylinders.
4. Define Oseen Equations. Prove that Oseens flow past a sphere.
5. Define the following :
 - (a) Lift and drag coefficient.
 - (b) Boundary Layer.
 - (c) Vorticity.
 - (d) Thermal conductivity.
 - (e) Viscosity.

SECTION-B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Ten (10) marks each. Learners are required to answer any Four (04) questions only. $(4 \times 10 = 40)$

1. Velocity field at point given by $1 + 2y - 3z$, $4 - 2x + 5z$, $6 + 3x - 5y$. Show that it represents a rigid body motion.
2. Find the Equation of Continuity in vector form.

3. State Kelvin Circulation theorem.
 4. An oil of specific gravity 0.85 is flowing through a pipe of 5 cm. diameter at the rate of 3 liter/sec. Find the type of flow, if the viscosity for the oil is 3.8 Poise.
 5. Explain the principal of dynamic similarity.
 6. Discuss stagnation point flow of an incompressible, viscous fluid (Hiemanz flow).
 7. Discuss the temperature distribution in Generalized Couette flow.
 8. Discuss the stokes stream function.
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