A–898

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MAMT–07

VISCOUS FLUID DYNAMICS

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

2nd Year Examination, 2024 (June)

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Define the stress at a point in a fluid and show that it is symmetric second order tensor.

2. Define the circulation. Show that the time rate of change of circulation in a closed circuit.

3. Find the velocity distribution for the steady flow of viscous incompressible fluid in the annular region between two concentric cylinders.

4. Discuss stagnation point flow of an incompressible, viscous fluid(Helmholtz flow).

5. Discuss the starting flow in plane Couette Motion.

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Show that the rate of strain tensor is symmetric tensor.

2. Explain equation of continuity in vector form.

3. Write a short notes on the theory slow motion with reference to stoke's flow past a sphere.

4. Write a note on boundary layer theory.

5. Obtain Croccos's first integral for $P_r = 1$.

6. Explain the principal of dynamic similarity.

7. Define the following :

   (a) Reynold's Number

   (b) Froude Number

   (c) Mach Number

   (d) Prandtl Number

8. What is the difference between plane Couttee flow and plane Poiseuille flow ?

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