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MT–607

M.A./M.Sc. MATHEMATICS (MAMT/MSCMT)

(Viscous Fluid Dynamics-II)

4th Semester Examination, Session December 2024

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. Discuss the temperature distribution in the plane Couette flow when the moving plate is at a higher temperature than the stationary plate.

2. Discuss the flow of an incompressible viscous fluid between two rotating concentric cylinders.

3. Derive Stokes equation for very slow motion and discuss Stokes flow past a sphere.

4. Derive Oseen's equation for very slow motion and discuss Oseen's flow past a sphere.

5. Discuss the temperature distribution in pipe :

   (a) When the wall of the pipe is kept at a constant temperature ?

   (b) When the wall of the pipe is kept at a uniform temperature gradient.

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. (a) Obtain velocity profile for plane Couette flow.

   (b) Discuss the steady flow a viscous incompressible fluid between parallel plates.

2. Discuss the temperature distribution between two concentric rotating cylinders.

3. Write a note on boundary layer theory.

4. Discuss the temperature distribution of plane-Couette flow with transpiration cooling.

5. Discuss the boundary layer flow over a flat plate.

6. Derive temperature distribution of steady incompressible fluid in a circular pipe when :

   (i) Wall is at constant temperature

   (ii) Wall is uniform temperature gradient

7. Discuss the flow of an incompressible viscous fluid between two rotating concentric cylinder.

8. Derive the expressions of the velocity components and drag coefficient for steady flow of an incompressible viscous fluid past a sphere.

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