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MA/MSCMT-07

June - Examination 2016

M.A./M.Sc. (Final) Mathematics Examination

Viscous Fluid Dynamics

Paper - MA/MSCMT-07

Time : 3 Hours] **[Max. Marks :- 80**

Note: The question paper is divided into three sections A, B and C. Use of non-programable calculator is allowed in this paper.

Section - A $8 \times 2 = 16$

(Very Short Answer Questions)

Note: Section 'A' contains 8 very short answer type questions. Examinees have to attempt **all** questions. Each question is of 2 marks and maximum word limit is 30 (thirty) words.

1) (i) Define viscosity.

(ii) What do you understand by dynamical similarity?

(iii) Define Brinkmann number.

(iv) Explain dissipation of Energy.

(v) Define stagnation point flow.

(vi) Define the concept of equation of continuity.

(vii) Define plane poiseulle flow.

(viii) Define boundary layer.

Section - B

$4 \times 8 = 32$

(Short Answer Questions)

Note: Section 'B' contains 8 short answer type questions. Examinees will have to answer any 4 (four) questions. Each question is of 8 marks. Examinees have to delimit each answer in maximum 200 words.

2) Discuss stress in a fluid:

   (i) When the fluid is in rest

   (ii) When the fluid is in motion

3) Derive equation of continuity for the moving viscous fluid.

4) Obtain non-dimensional parameters using π-theorem for viscous compressible fluid motion.

5) Obtain temperature distribution for the plane Couette flow and show that it depends on the product of Eckert and Prandtl numbers.

6) Discuss the flow due to an oscillating plane wall.

7) Write short note plane Couette flow with Porous wall.

8) Derive momentum thickness in boundary layer flow.

9) Discuss Hiemenz flow.

Section - C

$2 \times 16 = 32$

(Long Answer Questions)

Note: Section 'C' contains 4 long answer type questions. Examinees will have to answer 2 (two) questions. Each questions is of 16 marks. Examinees have to delimit each answer in maximum 500 words.

10) Derive equation of energy for the motion of viscous compressible fluid.

11) Define following with their significance:

    (i) Critical Reynolds number

    (ii) Mach number

    (iii) Prandtl number

    (iv) Grashoff number

12) Discuss starting flow in a pipe.

13) Obtain Blasius-Topfer solution for the boundary layer flow on a flat plate.