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MA/MSCMT-07

December - Examination 2018

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. Write answers as per given instructions.

Section - A $8 \times 2 = 16$

(Very Short Answer Questions)

Note: Answer **all** questions. As per the nature of the question delimit your answer in one word, one sentence or maximum upto 30 words. Each question carries 2 marks.

1) (i) Define body forces and surface forces.

(ii) State Kelvin Circulation theorem.

(iii) Explain dynamical similarity of fluid motions.

(iv) Define torque.

(v) Define stagnation point.

(vi) What do you mean by starting flow?

(vii) Write Stoke's equation for slow motion.

(viii) What do you mean by boundary layer thickness?

Section - B $4 \times 8 = 32$

(Short Answer Questions)

Note: Answer **any four** questions. Each answer should not exceed 200 words. Each question carries 8 marks.

2) What type of the motion do the following velocity components constitute?

$u = a + by - cz$, $v = d - bx + ez$, $w = f + cx - ey$ where a, b, c, d, e, f are arbitrary constants.

3) Obtain equation of continuity in Cartesian coordinate system.

4) Derive equations for Karman flow (Flow due to rotating disc).

5) Explain Stoke's first problem.

6) Describe flow between two parallel porous plates.

7) Explain boundary layers and it's applications.

8) Explain Blasius-Topfer solution to steady boundary layer flow on a flat plat.

9) Derive two dimensional thermal boundary layer equation for the viscous in compressible fluid flow past a thin plate.

Section - C $2 \times 16 = 32$

(Long Answer Questions)

Note: Answer **any two** questions. You have to delimit your each answer maximum upto 500 words. Each question carries 16 marks.

10) Explain:

(i) Mach Number

(ii) Eckert Number

(iii) Pe'clet Number

(iv) Lift and Drag Coefficients

11) Describe flow between two concentric rotating cylinders.

12) Describe temperature distribution in a pipe when walls of pipe are at uniform temperature gradient.

13) Describe Oseen's flow past a sphere.