

10. Derive equation of continuity in Cartesian co-ordinate system.
11. Prove that the stress tensor is symmetric.
12. Discuss the flow between two concentric rotating cylinders. Also find the torque to turn the outer cylinder.
13. Derive Boundary layer equations in two dimension form.

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MA/MSCMT-07

June – Examination 2020

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

MATHEMATICS

(Viscous Fluid Dynamics)

Paper : MA/MSCMT-07

Time : 3 Hours]

[Maximum Marks : 80

Note :- The question paper is divided into three Sections A, B and C. Write answers as per the given instructions.

Section-A

8×2=16

(Very Short Answer Type Questions)

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

1. (i) Write Newton's Law of viscosity.

- (ii) What is equation of state for incompressible fluid ?
- (iii) Define Dynamical similarity.
- (iv) Define Karman flow.
- (v) What is a Stagnation Point ?
- (vi) “Oseen’s equation for slow motion are valid at any distance from body.” This statement is true or false :
- (vii) Who formulated Boundary Layer Theory ?
- (viii) Define Boundary Layer Thickness ‘ δ ’.

Section–B **4×8=32**

(Short Answer Type Questions)

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

- 2. Write a short note on strain analysis in fluid.
- 3. Deduce Kelvin’s Circulation theorem.

- 4. Discuss the physical importance of non-dimensional parameters, specially in view of Reynolds number and Prandtl number.
- 5. Explain the Back Flow in case of generalised couette flow.
- 6. Formulate Karman’s flow along with the equation of motion and boundary conditions.
- 7. Discuss the temperature distribution in Plane Poiseuille Flow.
- 8. Write a short note on characteristic parameters of Boundary Layer Theory.
- 9. Obtain Crocco’s first integral for $Ps = 1$.

Section–C **2×16=32**

(Long Answer Type Questions)

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