10. Write short notes on the following :

    (i) Mach Number

    (ii) Grashoff Number

    (iii) Nusselt Number

    (iv) Brinkman Number

11. Derive equation of energy for the motion of viscous compressible fluid.

12. Discuss Oseen's flow past a sphere.

13. Describe flow between two concentric rotating cylinders.

MAMT-07/MSCMT-07

December – Examination 2023

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

MATHEMATICS

(Viscous Fluid Dynamics)

Paper : MAMT-07/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) Define Shearing strain.

   (ii) What do you understand by dynamic similarity ?

   (iii) Define Prandtl number.

   (iv) What do you mean by incompressible fluid motion ?

   (v) Define Couette flow.

   (vi) Write down equation of energy of a viscous incompressible fluid in spherical polar coordinates.

   (vii) Define Plane Poiseuille flow.

   (viii) Define separation of boundary layer flow.

Section–B **4×8=32**

(Short Answer Type Questions)

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

2. Prove that the stress at a point is completely known if the nine components of stress tensor at that point are known.

3. State and prove Buckingham π-theorem.

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

5. Discuss flow between two parallel porous plates.

6. Show that velocity distribution is linear in flow between two parallel plates, when one plate is at rest and the other moving with a uniform velocity U in the own plane.

7. Discuss the temperature distribution in Hagen-Poiseuille flow in a circular pipe, when the wall of the pipe is kept at a constant temperature gradient.

8. Write a short note on Thermal Boundary layer.

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

Section–C **2×16=32**

(Long Answer Type Questions)

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