

MA/MSCMT-07

December - Examination 2015

M.A./M.Sc. (Maths) Final 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 calculator is allowed in this paper.

Section - A

8 x 2 = 16

Note: Section 'A' contain 08 Very Short Answer Type Questions.
Examinees have to attempt all questions. Each question is of
02 marks and maximum word limit is 30 (thirty) words.

- 1) (i) Give the expression for the velocity distribution for the flow in plane coquette flow with porous boundaries.
- (ii) Define unsteady motion.
- (iii) What do you mean by incompressible fluid motion.
- (iv) Write the vector form of equation of continuity.
- (v) Write down the equation of state for the incompressible viscous fluid.
- (vi) Write down equation of energy of a viscous incompressible fluid in spherical polar coordinates.

(vii) What do you mean by critical Reynolds number?

(viii) What is the Eckert number for gases in high speed flow.

Section - B

4 x 8 = 32

Note: Section 'B' contain 08 Short Answer Type Questions. Examinees will have to answer any four (04) questions. Each question is of 08 marks. Examinees have to delimit each answer in maximum 200 words.

- 2) Discuss the inspection analysis.
- 3) Explain a back flow in case of generalized coquette flow.
- 4) Discuss coefficient of skin friction when flow is in a circular pipe.
- 5) Discuss flow between two parallel porous plates.
- 6) Write a short note on the theory of very slow motion with reference to stoke's flow past a sphere.
- 7) Discuss about the concept of unsteady flow.
- 8) Write about plane coquette flow with porous wall.
- 9) Explain steady laminar flow of viscous incompressible fluid between two infinite stationary parallel plates.

Note: Section 'C' contain 04 Long Answer Type Questions. Examinees will have to answer any two (02) questions. Each question is of 16 marks. Examinees have to delimit each answer in maximum 500 words.

10) Write short note on following:

- (i) Eckert Number
- (ii) Grashoff Number
- (iii) Pe'clet Number
- (iv) Brinkman Number

11) (i) Show that the volume rate of flow is given by $Q = \frac{27Pa^4}{20\sqrt{3}\mu}$ in the steady flow of a various incompressible fluid through a tube with uniform equilateral triangular cross section.

(ii) State and prove Buckingham π -theorem.

12) Discuss stagnation point flow of a incompressible viscous fluid (Hiemang flow).

13) Discuss Oseen's flow past a sphere.
