A–0692

Total Pages : 3 **Roll No. .....**

MAT-604

M.Sc. Math (MSCMT)

(Fluid Mechanics)

Examination, June 2025

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

(Long Answer Type Questions) 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Show that the surface :

$$\frac{x^2}{a^2k^2t^4}+kt^2\left(\frac{y^2}{b^2}+\frac{z^2}{c^2}\right)=1$$

is a possible form of boundary surface of a liquid at time *t*.

2. Derive the expression of flux for the Poiseuille flow.

3. State and prove D'Alembert's paradox.

4. Show that the image with regard to a sphere of a doublet whose axis passes through the centre is a doublet at the inverse point.

5. Define coefficient of viscosity and Laminar flow.

Section–B

(Short Answer Type Questions) 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Determine the equation of stream lines passing through (1, 2, 1) for the velocity vector :

$$v=x\hat{i}-2y\hat{j}+2z\hat{k}$$

2. If the velocity distribution is :

$$q = iAx^2y + jBy^2zt + kCzt^2$$

where A, B, C, are constants, then find the the acceleration and velocity components.

3. State and prove Pascal's law.

4. Write a short note on immiscible fluids.

5. The velocity distribution for the flow of an incompressible fluid is given by $u = 3 - 2x$, and $v = 4 + 2y$. Show that this satisfies the requirements of the continuity equation.

6. The function for a two-dimensional flow is $\phi = x(2y - 1)$. At a point P(4, 5) determine the value of stream function.

7. Define the Complex Potential ?

8. Determine image of a line doublet parallel to the axis of a right circular cylinder.

****