RAN-2303080303040002

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M.Sc. (Sem.-III) Examination October - 2025

Mathematics : Fluid Dynamics (PGMTH Paper-3041)

Time: 3 Hours] **[Total Marks: 70**

સૂચના : / Instructions

(1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book

(2) All questions carry equal marks

(3) Figure to the right indicates full marks of the questions

Seat No.:

Student's Signature

Q.1. **Attempt any two** **14**

A. Prove that pressure at a point is same in all directions for the static fluid.

B. Define fluid static and show that for any fluid under gravitational force, pressure decreases with increasing height z in the upward direction.

C. Define pressure, density and surface tension.

Q.2. **Attempt any two** **14**

A. Define Euler and Lagrange method to describe the fluid flow and derive the Lagrange represent that describe the fluid flow.

B. Define steady uniform, steady non - uniform, unsteady uniform and unsteady non - uniform flow of fluid.

C. Describe the method to Convert the fluid flow properties in Euler's system to Lagrange's system.

Q.3. **Attempt any Two** **14**

A. Derive the Local, Convective and Material rate of change of fluid properties.

B. Derive the expression for acceleration of fluid particle.

C. Show that the general form of equation of continuity is $\frac{d\rho}{dt} + \nabla(\rho \vec{q}) = 0$.

Q.4. **Attempt any Two** **14**

A. Derive the equation of Continuity in Cartesian form.

B. Show that the equation of continuity together with velocity potential is satisfies the Laplace equation.

C. Show that for incompressible fluid the given flow is possible flow if it satisfies the equation of Continuity $\nabla \vec{q} = 0$.

Q.5. **Attempt any Two** **14**

A. Derive the Euler Equation of motion along a stream line

B. Derive the General equation of Motion for an ideal fluid.

C. Derive the integration of Euler's Equation.