arks : 70



Reg. No.				
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III Semester M.Sc. Degree Examination, April/May - 2022

MATHEMATICS

Fluid Mechanics

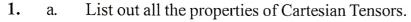
Paper: M-302 T

(CBCS Scheme Y2k17 (Repeaters))

Time: 3 Hours

Instructions to Candidates:

- i. Answer any **five** questions.
- ii. All questions carry equal marks.



b. Show that every tensor A can be represented as a sum of spherical and deviatoric parts.

(7+7)

- **2.** a. Establish the description of motion of a continuum. Also, discuss the Lagrangian and Eulerian description of motion of a continuum.
 - b. State and prove Reynolds transport formula.

(7+7)

- 3. a. Derive the continuity equation for a compressible fluid in its usual notations. Also show that $\frac{D}{Dt} \int_{V} \rho \phi dV = \int_{V} \rho \frac{D\phi}{Dt} dV$ from the continuity equation.
 - b. Derive the energy equation in its usual notations. (7+7)
- 4. a. For certain flow of non-viscous fluids with a constant density under earth's gravitational field, the velocity is $\vec{q} = \Delta \phi$ where $\phi = x^3 3xy^2$, find the pressure distribution.
 - b. State and prove the Helmholtz vorticity equation.

(7+7)

- 5. a. Derive the energy equation for an incompressibel viscous fluid.
 - b. State and prove the Stoke's first problem.

(7+7)

6. Determine the velocity distribution, average velocity, maximum velocity and shearing stress on the wall for the plane Couette flow. (14)

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- 7. a. Establish the diffusion of vorticity.
 - b. Show that $W = -uz m \ln(z) + m \ln(z z_0)$ represents a system with a uniform flow, a source at z = 0 and a sink at $z = z_0$. (5+9)
- 8. a. Find the complex potential of a flow system that has a source of strength M at $z = \pm a$ and hence find the potential and stream functions.

b. State and prove the Blasius theorem.

(7+7)

