

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MSc DEGREE EXAMINATION MAY 2024
(Fourth Semester)

Branch – MATHEMATICS

FLUID DYNAMICS

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(5 x 1 = 5)

- 1 The method which describes the motion of each particle of fixed identity for all time is called _____.
(i) Eulerian method (ii) Lagrangian method
(iii) Navier method (iv) Bernoulli method
- 2 If stress is less than strain then the deformation _____ when the force is removed.
(i) increases (ii) decreases
(iii) disappears (iv) none of these
- 3 The time dependent flow is called as _____.
(i) steady flow (ii) viscous flow
(iii) unsteady flow (iv) non viscous flow
- 4 The ratio of dynamic pressure to the shearing stress is known as _____.
(i) Prandtl number (ii) Froude number
(iii) Reynolds number (iv) Mach number
- 5 Von Karman integral Pohlhausen method is based on the _____.
(i) Integral theorem (ii) momentum theorem
(iii) cauchy theorem (iv) Poiseuille theorem

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks

(5 x 3 = 15)

- 6 a Obtain the differential equation of stream lines.
OR
b Obtain the relation between vorticity vector and average angular velocity vector.
- 7 a Verify the following invariant for two dimensional stress components:
 $(\sigma_{xixi} - \sigma_{yiyi})^2 + 4\sigma_{xixi}^2 = (\sigma_{xx} - \sigma_{yy})^2 + 4\sigma_{xy}^2$.
OR
b Derive the equation of continuity for an incompressible fluid.
- 8 a Derive one dimensional equation of continuity.
OR
b Derive Euler's equation of motion and hence deduce Bernoulli equation.
- 9 a Obtain the expressions for velocity distribution and shearing stress for couette flow.
OR
b Discuss the flow between the two concentric rotating cylinders.
- 10 a Derive the Von Karmen integral relation.
OR
b Discuss momentum thickness, displacement thickness and boundary layer thickness.

Cont...

SECTION -C (30 Marks)Answer **ALL** questions**ALL** questions carry **EQUAL** Marks

(5 x 6 = 30)

- 11 a Explain the methods of describing the fluid motion and give its merits and demerits.
- OR
- b Prove that in general the movement of fluid element may consists of a translation, rotation and a rate of deformation.
- 12 a Obtain the relation between rate of strain and stress in two dimensional case.
- OR
- b Derive the Navier - Stokes equation of motion for a viscous incompressible fluid.
- 13 a State and prove three dimensional momentum theorem.
- OR
- b State and prove Stokes theorem.
- 14 a Discuss Hagen Poiseuille flow.
- OR
- b Discuss the flow between two coaxial cylinders.
- 15 a Derive Prandtl boundary layer equation in two dimensional flow.
- OR
- b Derive Blasius solution.

Z-Z-Z

END