

Question Bank for PG Course

অঙ্ক (Mathematics)

দশম (ক ২) পত্র (Paper - XA(ii))

Fluid Mechanics : PGMT-XA(ii)

1. Find the equation of streamline of a two-dimensional liquid motion, $(u, v, 0)$ is the velocity vector at a point
2. Find relations between velocity potential and stream function in a two-dimensional irrotational motion
3. Find the velocity potential of a fluid motion generated by a uniform stream U in the negative direction of x-axis past a fixed rigid cylinder with radius a .
4. Find the complex potential of a two-dimensional liquid motion due to circulation with cyclic constant K about a fixed cylinder with radius a where $z = re^{i\theta}$
5. Find the equation of a stream line due to an irrotational flow generated by a uniform moving sphere with velocity U and radius ' a ' in (r, θ, φ) coordinate
6. Find the equation of continuity for an axisymmetric liquid motion with velocity $(u, v, 0)$ in $(z, \tilde{\omega}, \varphi)$ coordinate system.
7. Find the velocity potential of an irrotational motion by a sink of strength $-m$ placed at $(a, 0, 0)$ in front of a rigid wall at $x = 0$
8. Why a vortex tube cannot be originated or terminated within the fluid, $\vec{\Omega}$ being the vorticity vector in a fluid motion ?
9. Find the velocity of a vortex at $z = 0$ in a row of infinite vortices of equal strength ' k ' placed at $z = 0, z = \pm a$ in a fluid medium
10. What is the relation between phase velocity c and the group velocity c_g for a group of progressive waves $\eta = a \sin(mx - nt)$ moving as a group with nearly same velocity?
11. Find the stream function for a pair of vortices with strength ' k ' at $ae^{i\alpha}$ and $-k$ at $-ae^{i\alpha}$ where $a \rightarrow 0, k \rightarrow \infty, 2ak = \mu$ and $z = re^{i\theta}$
12. Find the total energy per wave length λ at any time for a stationary wave $\eta = a \sin mx \cos nt$, ρ, g being density and gravity respectively
13. A simple harmonic progressive wave $\eta = a \sin(mx - nt)$ is propagating along a surface of a finite depth liquid of height ' h '. Find the difference between phase velocity of wave and wave length ' λ '.
14. Write vorticity transport equation for a liquid motion of viscous incompressible fluid with vorticity vector $\vec{\Omega} = \text{curl } \vec{v}$ and γ is the viscosity coefficient.

15. Find the differential equation satisfied by the velocity component ω along the axis of a viscous fluid flow through a pipe of uniform cross-section where P is the velocity gradient decreasing along the flow and μ is viscous coefficient of the fluid.