**Question #1**

Give the definition of fluid. List the laws of fluid flow. Explain system and control volume. Explain the difference between differential and integral approach to solve problems. List the methods of description of fluid flow.

**Question #2**

Explain the continuum assumption. Describe the velocity field. Explain the difference between 1, 2 and 3 dimensional flows. Explain the difference between path lines and streamlines.

**Question #3**

Explain the difference between the volume forces and surface forces. Explain the normal stress and shear stress.

**Question #4**

Explain the viscosity. Explain the difference between Newtonian and Non-Newtonian fluids. Explain the surface tension.

**Question #5**

Classify fluid motions. Explain the difference between viscous and inviscid flows. Explain the boundary layer. Explain the difference between laminar and turbulent flows. Explain the difference between compressible and incompressible flows.

**Question #6**

Derive the basic equations of fluid statics. Explain the difference between absolute and gauge pressures. Describe the working principle of manometers. Derive the expression for the pressure of a gas.

**Question #7**

Derive the expression for hydrostatic force on a plane submerged surface.

**Question #8**

Derive the expression for hydrostatic force on a curved submerged surface.

**Question #9**

Explain buoyancy and stability. Derive the expression of the hydrostatic force for fluids in rigid-body motion.

**Question #10**

List basic laws of fluid flows. Derive the relation of system derivatives to the control volume formulation.

**Question #11**

Derive the expression for mass conservation in integral form.

**Question #12**

Derive the momentum equation for inertial control volume in integral form.

**Question #13**

Derive the Bernoulli equation.

**Question #14**

Derive the momentum equation for control volume moving with constant velocity in integral form. Derive the momentum equation for control volume with rectilinear acceleration in integral form.

**Question #15**

Derive the momentum equation for control volume with arbitrary acceleration in integral form.

**Question #16**

Derive the angular-momentum equation for fixed control volume in integral form. Derive the angular-momentum equation for rotating control volume in integral form.

**Question #17**

Derive the expressions of the first and second laws of thermodynamics in integral form.

**Question #18**

Derive the expression of mass conservation in differential form.

**Question #19**

Derive the expression of stream function for two-dimensional incompressible flow.

**Question #20**

Derive the expression of the acceleration of a fluid particle in a velocity field for fluid translation.

**Question #21**

Derive the expression of the vorticity of a fluid particle in a velocity field for fluid rotation.

**Question #22**

Write the expressions of the rate of angular deformation and volume dilation rate.

**Question #23**

Derive the momentum equation in differential form. Write the Navier-Stokes equation for incompressible flow.

**Question #24**

Derive the Euler’s equation for inviscid flow. Derive the Bernoulli equation by integration of Euler's equation along a streamline for steady flow.

**Question #25**

Interpret the Bernoulli equation as an energy equation. Derive the unsteady Bernoulli equation.

**Question #26**

Nondimensionalize the Navier Stokes equation. Explain why this equation depends only on the Reynolds number.

**Question #27**

Explain Buckingham Pi Theorem.

**Question #28**

List significant dimensionless groups in fluid mechanics.

**Question #29**

Explain flow similarity and model studies.

**Question #30**

Explain scaling with multiple dependent parameters.