Question 1

❑ The mathematical representation for irrotational flow is :

a. $\nabla . v = 0$
b. $\nabla \times v = 0$
c. $\nabla^2 v = 0$
d. $\nabla v = 0$
e. None of these

Question 2

- Dimensions of kinematic viscosity $\nu = \frac{\mu}{\rho}$ are :

a. $ML^{-1}T^{-2}$

b. $ML^{2}T^{-2}$

c. $L^{2}T^{-1}$

d. MLT^{-2}

e. LT^{-1}

Question 3

- Potential flow is characterized by the:

a. Shear stress and velocity
b. Velocity gradient and pressure intensity
c. Shear stress rate of angular deformation in a fluid
d. Pressure gradient and rate of angular deformation.
e. None of these

Question 4

- Utilizing the order of magnitude analysis, which of the following dimensionless numbers relate to the boundary layer thickness. Use the following information.

$$\frac{{v_\infty}^2}{l_o} = O\left(\frac{\mu\, v_\infty}{\rho\, {\delta_0}^2}\right)$$

a. Froude Number : $\frac{v_\infty}{\sqrt{g_0 l_0}}$

b. Mach Number : $\frac{v_\infty}{c}$

c. Reynolds Number : $\frac{\rho\, v_\infty l_0}{\mu}$

d. Weber Number : $\frac{\rho\, v_\infty^2 l_0}{\sigma}$

e. Dean Number : $\frac{\rho v_\infty l_0}{\mu} \left(\frac{l_0}{2R}\right)^{1/2}$

Question 5

- The law of dimensional homogeneity is used to

a. Neglect variables in equation of motion.

b. Check consistency of physical laws.

c. Identify dimensionless numbers

d. Design model experiments

e. None of these

Question 6

- It is observed that the velocity 'v' of a liquid leaving a nozzle depends upon the pressure drop 'P' and the density 'ρ' . The relationship between the variables can be given by

a. $v = C\ \left(\frac{P}{\rho}\right)^{1/2}$

b. $v = C\ \left(\frac{P}{\rho}\right)^{-\,1/2}$

c. $v = C\ (P\rho)^{-\,1/2}$

d. $v = C\ (P\rho)^{\,1/2}$

e. None of these

Question 7

- The Laplace equation for potential flow is automatically satisfied due to which assumption

a. Irrotational and incompressible.
b. Irrotational
c. Laminar, Irrotational
d. *Steady State* and Irrotational
e. None of these

Question 8

- The main use of Equation of motion for Potential flow is to

a. Get shear stress on solid object

b. Get pressure distribution for a velocity profile

c. Obtain velocity gradients far from solid object

d. Obtain relationship between free stream velocity and boundary layer velocity

e. None of these

Question 9

- The dimensions of Torque is :

a. ML^2T^{-3}
b. MLT^{-2}
c. ML^2T^{-2}
d. $ML^{-1}T^2$
e. MLT

Question 10

- Given the following relation assumed for velocity profile in boundary layer, which of the required conditions are not met. $\frac{V_x}{V_\infty} = \frac{y}{\delta}$

a. Incompressible flow

b. Velocity gradient with y on outer edge of boundary layer is 0.

c. No slip condition.

d. Steady flow.

e. Dependence on y.

Question 11

❑ Bernoulli's equation for steady, frictionless, continuous flow states that the ____________ at all sections is same.

a. Total pressure
b. Total energy
c. Velocity gradients
d. forces
e. None of these

Question 12

- Streamlines do not cross each other because :

a. Flow is irrotational
b. Incompressible fluid
c. Velocity is tangential and n.v = 0
d. Viscosity effects are negligible
e. None of these

Question 13

- Mass flow rate is related to stream function as :

a. Gradient of ψ
b. Difference of ψ
c. Laplace of ψ
d. Addition of ψ
e. Integral of ψ for correct dimension

Question 14

❑ The velocity components for a flow given by $\psi = axy$ is

a. $v_x = ax^2;\ v_y = ay^2$

b. $v_x = ax\ \ ;\ v_y = -ay$

c. $v_x = axy;\ v_y = -axy$

d. $v_x = a\frac{x}{y};\ v_y = -a\frac{x}{y}$

e. $v_x = 0\ ;\ v_y = -axy$

Question 15

- Which of the following velocity fields are irrotational, assume b to be a constant (Hint : remember the mathematical formulation for irrotational flow)

a. $v_x = by\ ;\ v_y = 0;\ v_z = 0$

b. $v_x = bx\ ;\ v_y = 0;\ v_z = 0$

c. $v_x = by\ ;\ v_y = bx;\ v_z = 0$

d. $v_x = -by\ ;\ v_y = bx;\ v_z = 0$