Water flows through a converging-diverging duct. At the throat of the duct the velocity attained by water is close to the local sound speed in water. Then

- The flow is incompressible as the fluid is water which is incompressible
- The flow is compressible
- The flow is incompressible as for water, the flow should attain more than double the sound speed to be compressible
- More information is required to assess if the flow is compressible

No, the answer is incorrect.
Score: 0
Accepted Answers:
The flow is compressible

Which of the following equations can be used to analyze boundary layer flow?

- Euler equation
- Bernoulli equation
- Both a & b
- None

No, the answer is incorrect.
Score: 0
Accepted Answers:
None

A flow velocity field is given by \( \mathbf{V}(x, y, t) = x^2 t \mathbf{i} + (y^2 + t) \mathbf{j} \). The value of local acceleration along y direction \( \mathbf{a}_y \) is given by \( \mathbf{a}_y = \frac{d^2 \mathbf{V}}{dt^2} \). The value of local acceleration along y direction \( \mathbf{a}_y \) and the magnitude of total acceleration.
4) Fill in the blank ______(2)

No, the answer is incorrect.

Score: 0

Accepted Answers:
(Type: Numeric) 1

5) If stream function is given by \( \psi = xy \) then, potential function \( (\phi) = \)

\( (x^2 + y^2)/2 \)
\( (x^2 - y^2)/2 \)
\( (x^3 + y^3)/2 \)
\( (x^3 - y^3)/2 \)

No, the answer is incorrect.

Score: 0

Accepted Answers:
(Type: Range) 5,7,5,9

6) If potential function \( (\phi) \) can be defined for a flow then, which of the following is/are true

i) The flow is inviscid
ii) \( \frac{\partial \phi}{\partial x^2} + \frac{\partial \phi}{\partial y^2} = 0 \)
iii) The flow is irrotational

No, the answer is incorrect.

Score: 0

Accepted Answers:
i, ii, iii

7) Bernoulli equation can be applied to

- Any two points in a flow
- Any two points on a streamline in an inviscid flow
- Any two points on a potential line in an inviscid flow
- None

No, the answer is incorrect.

Score: 0
8) A stream function ($\psi$) automatically satisfies
- Laplace equation for any flow
- Continuity equation for steady, incompressible flow
- Continuity equation for any flow
- Laplace equation for steady, incompressible flow

No, the answer is incorrect.
Score: 0

9) An idealized incompressible flow has the proposed three-dimensional velocity distribution $\vec{V}(x, y, z) = 4xyz^3 \hat{i} + f(y) \hat{j} - zy^2 \hat{k}$ in arbitrary units. If $\vec{V}(0, 0, 0) = 0$ then the velocity magnitude at $(1, 1, 1)$ is

No, the answer is incorrect.
Score: 0

10) An open tank is completely filled with water (to a height ($h_0$) of 5 m) and has a nozzle (initially closed) at the bottom as shown in the figure. If the nozzle is opened and the height $h_0$ is maintained constant by appropriately filling the tank through a float valve, find the velocity $V$ (in m/s at section 2) if the tank cross-sectional area is 0.5 $m^2$, and the nozzle cross-sectional area is 0.1 $m^2$. Neglect friction, pressure losses due to sudden expansion near the nozzle and take $g = 9.81 \, m/s^2$.

No, the answer is incorrect.
Score: 0

11) If $\vec{V}(x, y) = (3x^3 + y^2) \hat{i} - 5xy \hat{j}$, then $\frac{\partial p}{\partial y}$ (in Pa/m) at $(1, 1)$ is (take $\rho = 1000 \, kg/m^3$ and neglect gravity)

Score: 0
No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) -5000