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Courses » Fluid dynamics and turbomachines

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Week #3. DIFFERENTIAL ANALYSIS

Assignment 3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2018-09-05, 23:59 IST.

1) 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 *1 point*

- 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

2) Which of the following equations can be used to analyze boundary layer flow? *1 point*

- 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 $\vec{V}(x,y,t) = x^2 t\,\vec{i} + (y^2+t)\,\vec{j}$. The value of local acceleration along y direction ____________(1) and the magnitude of total acceleration

Score: 0

Accepted Answers:
(Type: Numeric) 1

1 point

4) Fill in the blank _________(2)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 5.7,5.9

1 point

5) If stream function is given by $\psi = xy$ then, potential function (ϕ) = *1 point*

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
$(x^2 - y^2)/2$

6) If potential function (ϕ) can be defined for a flow then, which of the following is/are true *1 point*

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

- i
- i, ii
- i, iii
- i, ii, iii

No, the answer is incorrect.
Score: 0

Accepted Answers:
i, ii, iii

7) Bernoulli equation can be applied to *1 point*

- 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

Accepted Answers:
Any two points on a streamline in an inviscid flow

8) A stream function (ψ) automatically satisfies **1 point**

- 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

Accepted Answers:
continuity equation for steady, incompressible flow

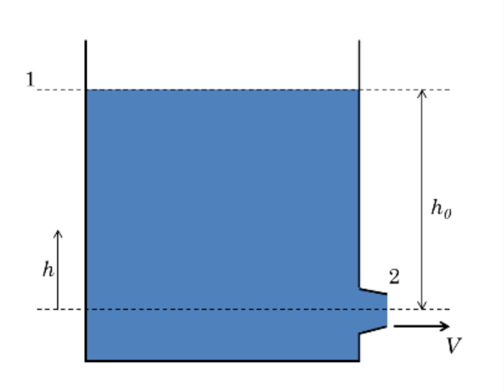
9) An idealized incompressible flow has the proposed three-dimensional velocity distribution $\vec{V}(x, y, z) = 4xy^3\ \vec{i} + f(y)\ \vec{j} - zy^2\ \vec{k}$ in arbitrary units. If $\vec{V}$ (0, 0, 0) =0 then the velocity magnitude at (1, 1, 1) is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 4.1,4.2

2 points

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

Accepted Answers:
(Type: Range) 10,10.2

2 points

11) If $\vec{V}(x, y) = (3x^3 + y2)\ \vec{i}\ - 5xy\ \vec{j}$, then $\frac{\partial p}{\partial y}$ (in Pa/m) at (1, 1) is (take ρ = 1000 kg/m^3 and neglect gravity)

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) -5000

2 points

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