Assignment 2

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment.

Due on 2021-02-07, 23:59 IST.

1) Consider a fluid in a horizontal tube. Let the fluid pressure at position $x = 0$ be $P_1$ and at position $x = R$ be $P_2$, with $P_2 > P_1$. Which of the following statements are true?
- [ ] If the fluid is perfectly inviscid (i.e., zero viscosity), the fluid will accelerate in the positive x-direction
- [ ] If the fluid is perfectly inviscid (i.e., zero viscosity), the fluid will accelerate in the negative x-direction
- [ ] If the fluid is quite viscous (e.g., honey) the fluid will flow at a constant velocity in the negative x-direction
- [ ] If the fluid is quite viscous (e.g., honey) the fluid will flow at a constant velocity in the positive x-direction

No, the answer is incorrect.
Score: 0
Accepted Answers:
If the fluid is perfectly inviscid (i.e., zero viscosity), the fluid will accelerate in the negative x-direction
If the fluid is quite viscous (e.g., honey) the fluid will flow at a constant velocity in the negative x-direction

2) Pick the statements that are true
- [ ] Potential flows are irrotational
- [ ] Viscous flows can be described using a scalar velocity potential
- [ ] A smooth sphere moving through a perfectly inviscid fluid will feel no drag

No, the answer is incorrect.
Score: 0
Accepted Answers:
Potential flows are irrotational
A smooth sphere moving through a perfectly inviscid fluid will feel no drag

3) A horizontal jet of water with diameter 8 cm and speed 25 m/s impinges normally on a large stationary flat plate. The plate dimensions are considerably larger that the diameter of the water jet. The density of water is 1000 kg m$^{-3}$ and you can assume the water to be perfectly cold. Pick the correct statements
- [ ] The force needed to hold the plate stationary is 1570 N
- [ ] The force needed to hold the plate stationary is 3000 N
- [ ] The force needed to hold the plate stationary is $312500$ N m$^{-2}$
- [ ] The pressure on the plate is 62500 N m$^{-2}$

Score: 0
Accepted Answers:
The force needed to hold the plate stationary is 1570 N
The pressure on the plate is $312500$ N m$^{-2}$

4) A city water tower is 50 metres high. What is the maximum speed of water that is sprayed from a hose that is situated 1 metre above the ground? The density of water is 1000 kg m$^{-1}$, Atmospheric pressure = 101 k Pa=101 k N m$^{-2}$, You can take $g=10$ m s$^{-2}$.
- [ ] 10 m/s
- [ ] 40 cm/s
- [ ] 31 m/s
- [ ] 20 m/s

Score: 0
Accepted Answers:
31 m/s

5) Pick the correct statements
- [ ] The circulation of the velocity vector is conserved only for a perfectly inviscid fluid
- [ ] A ball spinning in a perfectly inviscid fluid will experience a lift by virtue of the Magnus effect
- [ ] Consider a smooth sphere immersed in a perfectly inviscid fluid flowing past it at constant velocity. The tangential velocity at the surface of the sphere is zero
- [ ] For a perfectly inviscid fluid, only the diagonal terms of the pressure tensor are non-zero

Score: 0
Accepted Answers:
The circulation of the velocity vector is conserved only for a perfectly inviscid fluid
For a perfectly inviscid fluid, only the diagonal terms of the pressure tensor are non-zero