Assignment 7
The due date for submitting this assignment has passed.

1. A sample of motor oil is placed in a parallel plate shearing device with the following results: Streaming flow from one unit area is 0.5 Pa, the plate separation 1 mm, the top plate velocity is 40 cm/s, determine the viscosity of the fluid.

   - Dynamic viscosity
   - Kinematic viscosity

2. The Navier-Stokes equations are a relation between:
   - Components of strain tensor and strain rate tensor
   - Components of stress tensor and strain rate tensor
   - Components of stress tensor and strain rate tensor
   - Components of strain tensor and shear stress tensor

   No, the answer is incorrect. 2 points

3. Choose the correct vector form of the Navier-Stokes equation.

   - $\tau = \rho \frac{\partial \mathbf{u}}{\partial t} + \rho \mathbf{u} \cdot \nabla \mathbf{u} + \mathbf{f}
   - $\tau = \rho \frac{\partial \mathbf{u}}{\partial t} - \rho \mathbf{u} \cdot \nabla \mathbf{u} + \mathbf{f}
   - $\tau = \rho \frac{\partial \mathbf{u}}{\partial t} + \rho \mathbf{u} \cdot \nabla \mathbf{u} - \mathbf{f}
   - $\tau = \rho \frac{\partial \mathbf{u}}{\partial t} - \rho \mathbf{u} \cdot \nabla \mathbf{u} - \mathbf{f}

   Yes, the answer is correct. 1 point

4. Consider two fluids: water and carbon tetrachloride (CCl4). A cross-section of tube shown in Figure 1. Calculate the pressure difference if the specific gravity of CCl4 is 1.56 and the height difference between the level of CCl4 in the tube 3 ft = 9 in.

   - 0.5 Pa
   - 2.5 Pa
   - 0.1 Pa
   - 1 Pa

   No, the answer is incorrect. 2 points

5. Choose the conditions that are applicable for inviscid flow.

   - $\tau = 0$
   - $\rho \frac{\partial \mathbf{u}}{\partial t} + \rho \mathbf{u} \cdot \nabla \mathbf{u} = \mathbf{f}$
   - $\nabla \cdot \mathbf{u} = 0$
   - $\nabla \cdot \mathbf{u} = w$

   Yes, the answer is correct. 1 point

6. An aircraft is traveling at a constant speed on a level flight and is subjected to a horizontal wind. Choose the correct option.

   - The aircraft will experience a constant horizontal velocity.
   - The aircraft will experience a constant vertical velocity.
   - The aircraft will experience a horizontal velocity that is the sum of the wind velocity.
   - The aircraft will experience a horizontal velocity that is the difference of the wind velocity.

   No, the answer is incorrect. 2 points

7. The Euler's equation is obtained from the linear momentum balance by

   - Neglecting the body forces term
   - Neglecting the pressure gradient term
   - Neglecting the viscous stress term
   - Neglecting the convective term

   No, the answer is incorrect. 2 points

8. Air flows steadily at a flow rate through a horizontal nozzle shown in Figure 2, discharging into atmosphere. The area of the nozzle is 0.02 m². Assume the nozzle exit to be 0.04 m. Determine the gauge pressure required at the nozzle inlet to produce an outlet speed of 30 m/s. The density of air is 1.2 kg/m³.

   - No, the answer is incorrect. 2 points

   - $15$ Pa
   - $30$ Pa
   - $115$ Pa
   - $950$ Pa

   No, the answer is incorrect. 2 points

   Accepted Answer: $115$ Pa