Assignment 6

The due date for submitting this assignment has passed.

Due on 2020-10-20, 23:59 IST

1. At a particular point in a steady, incompressible flow, the velocity at point A is 1 m/s in the x-direction and 2 m/s in the y-direction. The pressure at point A is 100 kPa. At point B, the velocity is 2 m/s in the x-direction and 3 m/s in the y-direction. The pressure at point B is 90 kPa. Determine the pressure gradient along the streamline connecting points A and B.

2. In a turbulent flow through a cylindrical pipe, the ratio of the average velocity ($\bar{v}$) to the maximum velocity ($\bar{v}_{max}$) is equal to 0.8. What is the value of $\bar{v}_{max}$ if the average velocity $\bar{v}$ is 10 m/s?

3. The pressure drop ($\Delta P$) across the cylinder with a blade in turbulent flow is given by

$$\Delta P = \frac{Q^2}{2\rho}$$

where $Q$ is the flow rate and $\rho$ is the fluid density.

4. Which of the following is true for a turbulent flow in a cylindrical pipe?

- $\bar{v} = \frac{Q}{A}$
- $\frac{\bar{v}}{\bar{v}_{max}} = 0.8$
- $\Delta P = \frac{Q^2}{2\rho}$

5. Define density of fluid.

6. Describe the characteristics of a streamline.

7. A stream tube is used in the subplot phase for a mesophotography experiment. In the process, water flows through an empty cylinder of inner diameter 20 cm and length 30 cm. The flow rate is maintained at 1.5 m/s. The process is repeated at 10°C. The steady and dynamic viscosity of the liquid at the temperature is 0.02 kg/m/s and 0.03 kg/m/s, respectively. Calculate the Reynolds number for the flow.

8. Calculate the friction factor for the flow of water in the mentioned tube.

9. Calculate the Reynolds number for the mentioned flow.

10. Calculate the friction factor for the flow of water in the mentioned tube.