1. Which theorem is commonly used in dimensional analysis to reduce the number of variables in a problem?
a) Newton’s Second Law
b) Euler’s Equation
c) Buckingham-π Theorem
d) Pythagoras’ Theorem

Answer: c) Buckingham-π Theorem
Explanation: The Buckingham-π Theorem allows for the reduction of variables in a problem through dimensionless groups, simplifying complex equations and analyses.

2. Which hypothesis is often used to model turbulent flow in fluid mechanics?
a) Bernoulli’s Principle
b) Newton’s Third Law
c) Prandtl Mixing Length Hypothesis
d) Hooke’s Law

Answer: c) Prandtl Mixing Length Hypothesis
Explanation: The Prandtl Mixing Length Hypothesis provides a method for estimating the eddy viscosity in turbulent flow, a crucial aspect of turbulence modeling.

3. In fluid mechanics, what equation describes the resistance to flow in a pipe due to friction?
a) Euler’s Equation
b) Bernoulli’s Equation
c) Darcy–Weisbach Resistance Equation
d) Navier-Stokes Equation

Answer: c) Darcy–Weisbach Resistance Equation
Explanation: The Darcy–Weisbach Resistance Equation relates the frictional head loss in a pipe to the velocity, diameter, length, and friction factor.

4. What does Moody’s diagram primarily depict in fluid mechanics?
a) Pressure distribution in pipes
b) Friction factor variation with Reynolds number
c) Turbulent flow patterns
d) Smooth and rough surface comparison

Answer: b) Friction factor variation with Reynolds number
Explanation: Moody’s diagram provides a graphical representation of the relationship between the friction factor and Reynolds number for different flow conditions.

5. Which surface condition typically results in higher frictional losses in fluid flow?
a) Smooth surface
b) Rough surface
c) Porous surface
d) Lubricated surface

Answer: b) Rough surface
Explanation: Rough surfaces disrupt the flow more, leading to higher frictional losses compared to smooth surfaces.

6. What parameter does the friction factor depend on in the Darcy–Weisbach Resistance Equation?
a) Density of the fluid

b) Velocity of the fluid

c) Roughness of the pipe

d) All of the above

Answer: d) All of the above

Explanation: The friction factor in the Darcy–Weisbach Resistance Equation depends on the density of the fluid, velocity of the fluid, and the roughness of the pipe.

7. Which concept is utilized to understand the variation of friction factor with Reynolds number?

a) Hagen-Poiseuille equation

b) Poiseuille’s Law

c) Ergun Equation

d) Moody’s diagram

Answer: d) Moody’s diagram

Explanation: Moody’s diagram provides a comprehensive overview of the variation of the friction factor with Reynolds number under different flow conditions.

8. What does the Darcy–Weisbach Resistance Equation primarily describe?

a) Flow rate through a pipe

b) Pressure drop in a pipe

c) Velocity distribution in a pipe

d) Heat transfer in a pipe

Answer: b) Pressure drop in a pipe

Explanation: The Darcy–Weisbach Resistance Equation relates the pressure drop in a pipe to various factors including flow velocity, pipe diameter, and friction factor.

9. Which hypothesis is used to estimate the eddy viscosity in turbulent flow?
a) Navier-Stokes hypothesis
b) Reynolds-Averaged Navier-Stokes hypothesis
c) Prandtl Mixing Length Hypothesis
d) Kolmogorov hypothesis

Answer: c) Prandtl Mixing Length Hypothesis
Explanation: The Prandtl Mixing Length Hypothesis provides a simple model for estimating the eddy viscosity, which is essential for turbulent flow analysis.

10. What does the Moody's diagram help engineers determine in pipe flow problems?
a) Friction factor at various Reynolds numbers
b) Velocity distribution in pipes
c) Pressure distribution in pipes
d) Temperature distribution in pipes

Answer: a) Friction factor at various Reynolds numbers
Explanation: Moody's diagram serves as a reference tool for engineers to determine the friction factor at different Reynolds numbers, aiding in pipe flow calculations and analyses.

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