1. What is the main characteristic that distinguishes laminar flow from turbulent flow?

a) Velocity profile
b) Reynolds number
c) Boundary layer thickness
d) Flow rate

Answer: b) Reynolds number

Explanation: The Reynolds number is a dimensionless parameter used to predict flow patterns in different fluid flow situations. Laminar flow occurs at low Reynolds numbers, where flow is smooth and orderly, while turbulent flow occurs at higher Reynolds numbers, characterized by chaotic, irregular movement.

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2. Which layer of fluid flow near a boundary experiences smooth, orderly flow in turbulent conditions?

a) Turbulent boundary layer
b) Laminar boundary layer
c) Laminar sublayer
d) Transitional layer

Answer: c) Laminar sublayer

Explanation: In turbulent flow, the laminar sublayer is the thin layer of fluid directly adjacent

to the boundary where the flow remains relatively orderly, exhibiting laminar-like behavior. Above the laminar sublayer is the turbulent boundary layer, characterized by chaotic movement.

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3. What effect does artificially roughening a pipe’s surface have on its resistance to flow?

a) Decreases resistance
b) Increases resistance
c) No effect
d) Makes flow laminar

Answer: b) Increases resistance

Explanation: Artificially roughening a pipe’s surface disrupts the flow, increasing the resistance to flow. This is often utilized to promote transition from turbulent to laminar flow in certain applications.

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4. Losses in pipe fittings and valves primarily contribute to:

a) Kinetic energy loss
b) Potential energy loss
c) Frictional energy loss

d) Pressure gain

Answer: c) Frictional energy loss

Explanation: Losses in pipe fittings and valves primarily occur due to friction between the fluid and the surface of the fittings or valves, resulting in a loss of energy.

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5. What method is commonly used to analyze pipe networks and determine flow distribution?

a) Newton’s method
b) Bernoulli’s equation
c) Hardy Cross Method
d) Euler’s method

Answer: c) Hardy Cross Method

Explanation: The Hardy Cross Method is a widely used technique for solving pipe network problems, where flow distribution and pressure drops are calculated iteratively to achieve equilibrium.

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6. Which phenomenon occurs when there’s a sudden closure of a valve in a pipe system?

a) Water surge
b) Water wave
c) Water hammer
d) Water backlash

Answer: c) Water hammer

Explanation: Water hammer is the surge of pressure or shock wave that occurs when a fluid in motion is forced to stop or change direction suddenly, typically due to the sudden closure of a valve.

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7. What concept represents the combined effect of frictional losses in various pipe components as an equivalent length of straight pipe?

a) Equivalent friction factor
b) Equivalent pipe diameter
c) Equivalent pipe length
d) Equivalent Reynolds number

Answer: c) Equivalent pipe length

Explanation: The concept of equivalent pipe length represents the total length of straight pipe that would produce the same frictional losses as the actual pipe configuration, including fittings and valves.

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8. When pipes are arranged in series, how does it affect the total head loss in the system?

a) Total head loss decreases
b) Total head loss increases
c) Total head loss remains constant
d) Total head loss fluctuates

Answer: b) Total head loss increases

Explanation: When pipes are arranged in series, the total head loss in the system increases as the flow passes through each successive pipe, experiencing frictional losses along the way.

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9. Which term describes the lines representing the hydraulic grade in a pipe system?

a) Hydraulic gradient lines
b) Energy gradient lines
c) Flow lines
d) Pressure lines

Answer: a) Hydraulic gradient lines

Explanation: Hydraulic gradient lines represent the variation of total head along the length of a pipe, indicating the direction of flow and changes in pressure.

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10. What phenomenon describes the transmission of pressure waves in a fluid-filled pipe caused by sudden changes in flow velocity?

a) Pressure wave propagation
b) Fluid shock
c) Water surge
d) Water hammer

Answer: d) Water hammer

Explanation: Water hammer refers to the pressure surge or shock wave that occurs in a fluid-filled pipe system due to sudden changes in flow velocity, such as rapid valve closure or pump start/stop.

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11. In pipe networks, what method is commonly used to balance flows and determine unknown flow rates?

a) Gauss-Seidel method
b) Gauss-Jordan elimination

c) Newton-Raphson method
d) Hardy Cross Method

Answer: d) Hardy Cross Method

Explanation: The Hardy Cross Method is a numerical technique used to solve pipe network problems by iteratively balancing flows and determining unknown flow rates until equilibrium is reached.

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12. What term describes the phenomenon of pipes bursting or failing due to pressure fluctuations in a fluid system?

a) Hydraulic shock
b) Water surge
c) Pipe rupture
d) Water hammer

Answer: c) Pipe rupture

Explanation: Pipe rupture occurs when the pressure within a pipe system exceeds its structural limits, leading to failure or bursting of the pipe, often as a result of pressure fluctuations such as water hammer.

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13. How does the branching of pipes in a network affect flow distribution?

a) Increases flow rate
b) Decreases flow rate
c) Maintains flow rate
d) Diverts flow

Answer: b) Decreases flow rate

Explanation: Branching of pipes in a network typically decreases flow rate in each branch as the total flow is divided among multiple paths, leading to increased resistance and pressure drops.

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14. What type of pipe flow is characterized by smooth, orderly movement of fluid particles in parallel layers?

a) Turbulent flow
b) Laminar flow
c) Transitional flow
d) Viscous flow

Answer: b) Laminar flow

Explanation: Laminar flow is characterized by smooth, orderly movement of fluid particles in parallel layers, with minimal mixing between layers.

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15. What property of a fluid determines whether its flow will be laminar or turbulent in a pipe?

a) Viscosity
b) Density
c) Velocity
d) Reynolds number

Answer: d) Reynolds number

Explanation: The Reynolds number, which is the ratio of inertial forces to viscous forces, determines whether flow in a pipe will be laminar or turbulent based on the fluid velocity, density, viscosity, and pipe diameter.

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16. Which type of boundary layer is characterized by irregular, chaotic movement of fluid particles near a surface?

a) Laminar boundary layer
b) Turbulent boundary layer

c) Transitional boundary layer
d) Kinetic boundary layer

Answer: b) Turbulent boundary layer

Explanation: Turbulent boundary layer is characterized by irregular, chaotic movement of fluid particles near a surface, resulting in enhanced mixing and higher frictional losses compared to laminar flow.

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17. How does the presence of roughness on a pipe’s inner surface affect the flow of fluid within the pipe?

a) Increases turbulence
b) Decreases friction
c) Promotes laminar flow
d) Increases friction

Answer: d) Increases friction

Explanation: Roughness on a pipe’s inner surface disrupts the flow of fluid, increasing the frictional resistance to flow and often promoting transition from laminar to turbulent flow.

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18. What term describes the phenomenon of pressure fluctuations caused by sudden changes in fluid velocity in a pipe system?

a) Fluid surge
b) Water backlash
c) Hydraulic jump
d) Water hammer

Answer: d) Water hammer

Explanation: Water hammer refers to the pressure surge or shock wave that occurs in a fluid-filled pipe system due to sudden changes in fluid velocity, such as rapid valve closure or pump start/stop.

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19. How does the equivalent length concept simplify the analysis of pipe systems with various components?

a) It reduces the number of pipe components
b) It converts all components to equivalent fittings
c) It combines frictional losses into a single length
d) It eliminates the need for flow calculations

Answer: c) It combines frictional losses into a single length

Explanation: The equivalent length concept simplifies the analysis of pipe systems by representing the combined frictional losses of various components (such as fittings and valves) as an equivalent length of straight pipe, facilitating calculations of pressure drops and flow distribution.

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20. What phenomenon occurs when fluid flows through a pipe network and experiences pressure fluctuations due to changes in flow velocity and direction?

a) Water surge
b) Water hammer
c) Fluid oscillation
d) Hydraulic jump

Answer: a) Water surge

Explanation: Water surge is the fluctuation in pressure or flow rate that occurs in a pipe network when fluid experiences changes in velocity or direction, often leading to pressure spikes or surges in the system.