1. Which of the following factors primarily determines the velocity distribution in open channel flow?

a) Channel width
b) Channel slope
c) Channel roughness
d) Channel depth

Answer: c) Channel roughness

Explanation: The roughness of the channel bed and banks significantly influences the velocity distribution in open channel flow. It affects the resistance to flow, which in turn affects the velocity profile within the channel.

2. What is the specific energy in open channel flow?

a) Total energy per unit weight of fluid
b) Energy per unit volume of fluid
c) Total energy per unit volume of fluid
d) Energy per unit weight of fluid

Answer: a) Total energy per unit weight of fluid

Explanation: Specific energy is the total energy per unit weight of the fluid in the channel, which includes both kinetic and potential energy components.

3. Which type of flow occurs when the Froude number is less than 1?

a) Supercritical flow
b) Subcritical flow
c) Critical flow
d) Uniform flow

Answer: b) Subcritical flow

Explanation: Subcritical flow occurs when the flow velocity is less than the wave velocity, resulting in a Froude number less than 1.

4. Critical flow in open channels is characterized by which of the following conditions?

a) Froude number equal to 1
b) Froude number less than 1
c) Froude number greater than 1
d) Reynolds number equal to 1

Answer: a) Froude number equal to 1

Explanation: Critical flow occurs when the Froude number is exactly 1, indicating the transition between subcritical and supercritical flow regimes.

5. Which formula is commonly used for calculating uniform flow in open channels based on empirical relationships?

a) Chezy’s formula
b) Manning’s formula
c) Darcy-Weisbach equation

d) Hazen-Williams equation

Answer: b) Manning’s formula

Explanation: Manning’s formula is widely used for calculating uniform flow in open channels, particularly in natural or irregular channels, based on empirical relationships between flow velocity, channel geometry, and channel roughness.

6. What does Chezy’s formula describe in open channel hydraulics?

a) Velocity distribution
b) Specific energy
c) Channel slope
d) Channel width

Answer: a) Velocity distribution

Explanation: Chezy’s formula relates the mean flow velocity in an open channel to the hydraulic radius, channel slope, and a roughness coefficient, providing a means to estimate velocity distribution in the channel.

7. How is the normal depth in open channel flow determined?

a) By solving the energy equation
b) By solving the momentum equation
c) By using trial and error methods
d) By using the Chezy equation

Answer: a) By solving the energy equation

Explanation: The normal depth in open channel flow is determined by solving the energy equation, where the sum of kinetic and potential energies is minimized to find the depth corresponding to critical flow conditions.

8. What is the significance of the Saint Venant equation in open channel flow analysis?

a) It describes the velocity distribution in channels
b) It predicts the specific energy at different flow depths
c) It models the unsteady flow of water in channels
d) It calculates the friction losses in channels

Answer: c) It models the unsteady flow of water in channels

Explanation: The Saint Venant equations are partial differential equations used to model the unsteady flow of water in channels, considering both momentum and continuity principles.

9. Which factor primarily determines the critical slope in open channel flow?

a) Channel width
b) Channel roughness
c) Channel slope
d) Channel depth

Answer: b) Channel roughness

Explanation: The critical slope in open channel flow is primarily determined by the roughness

of the channel bed and banks, which influences the resistance to flow and the critical flow conditions.

10. What type of flow occurs when the Froude number is greater than 1?

a) Supercritical flow
b) Subcritical flow
c) Critical flow
d) Uniform flow

Answer: a) Supercritical flow

Explanation: Supercritical flow occurs when the flow velocity is greater than the wave velocity, resulting in a Froude number greater than 1.

11. Which parameter is not considered in the determination of critical flow in open channels?

a) Channel width
b) Channel roughness
c) Channel slope
d) Channel depth

Answer: a) Channel width

Explanation: The critical flow in open channels is primarily determined by factors such as channel roughness, channel slope, and channel depth. Channel width does not directly influence critical flow conditions.

12. How is the Manning’s roughness coefficient commonly estimated for open channel flow calculations?

a) Through laboratory experiments
b) Using theoretical models
c) Based on empirical correlations
d) By measuring channel dimensions

Answer: c) Based on empirical correlations

Explanation: Manning’s roughness coefficient is commonly estimated for open channel flow calculations based on empirical correlations derived from observed flow data in various channels with different characteristics.

13. What is the primary purpose of determining the critical slope in open channel flow analysis?

a) To identify the maximum allowable slope for stable flow
b) To determine the slope at which uniform flow occurs
c) To calculate the specific energy at critical flow conditions
d) To estimate the channel roughness coefficient

Answer: a) To identify the maximum allowable slope for stable flow

Explanation: Determining the critical slope helps in identifying the maximum slope at which stable flow conditions can be maintained without transitioning into supercritical flow or experiencing flow instability.

14. In open channel flow, what condition indicates a transition from subcritical to supercritical flow?

a) Froude number less than 1
b) Froude number greater than 1
c) Froude number equal to 1
d) Froude number approaching infinity

Answer: b) Froude number greater than 1

Explanation: When the Froude number exceeds 1, it indicates that the flow velocity is greater than the wave velocity, marking the transition from subcritical to supercritical flow.

15. Which equation describes the relationship between flow rate, channel slope, hydraulic radius, and roughness coefficient in open channel flow?

a) Darcy-Weisbach equation
b) Chezy’s equation
c) Manning’s equation
d) Hazen-Williams equation

Answer: c) Manning’s equation

Explanation: Manning’s equation expresses the relationship between flow rate, channel slope, hydraulic radius, and roughness coefficient, providing a means to calculate flow velocity or discharge in open channels.