1. What is the definition of Mach number in gas dynamics?

a) The speed of sound in a fluid
b) The ratio of the fluid velocity to the speed of light
c) The ratio of the fluid velocity to the speed of sound
d) The ratio of the fluid density to the speed of sound

Correct Answer: c) The ratio of the fluid velocity to the speed of sound

Explanation: Mach number is defined as the ratio of the fluid velocity to the speed of sound in that fluid. It is a dimensionless quantity used to describe the speed of an object moving through a fluid medium, such as air or water.

2. What is formed when an object moves through a fluid at a speed greater than the speed of sound?

a) Mach cone
b) Stagnation properties
c) Isentropic flow
d) Velocity coefficient

Correct Answer: a) Mach cone

Explanation: When an object moves through a fluid at a speed greater than the speed of sound, it creates a cone-shaped shock wave known as a Mach cone.

3. In a one-dimensional isentropic flow of ideal gases through a variable area duct, how does the area ratio change with Mach number?

a) Increases linearly
b) Decreases linearly
c) Remains constant
d) Varies exponentially

Correct Answer: d) Varies exponentially

Explanation: In a one-dimensional isentropic flow of ideal gases through a variable area duct, the area ratio (ratio of the cross-sectional area at any point to the initial cross-sectional area) changes exponentially with Mach number.

4. What is the critical pressure ratio in gas dynamics?

a) The pressure ratio at which the flow becomes sonic
b) The pressure ratio at which the flow becomes supersonic
c) The pressure ratio at which the flow becomes subsonic
d) The pressure ratio at which the flow becomes hypersonic

Correct Answer: a) The pressure ratio at which the flow becomes sonic

Explanation: The critical pressure ratio is the pressure ratio at which the flow in a converging-diverging nozzle becomes sonic (Mach number equals 1).

5. What is the effect of friction on the flow of gases in ducts?

a) Increases the flow velocity
b) Decreases the flow velocity
c) Has no effect on the flow velocity

d) Creates turbulence

Correct Answer: b) Decreases the flow velocity

Explanation: Friction between the gas and the walls of the duct tends to decrease the flow velocity by converting some of the kinetic energy of the gas into heat.

6. What does the coefficient of discharge represent in fluid dynamics?

a) Efficiency of a diffuser
b) Efficiency of a nozzle
c) Efficiency of a pump
d) Efficiency of an orifice

Correct Answer: d) Efficiency of an orifice

Explanation: The coefficient of discharge represents the efficiency of an orifice in terms of how much flow it allows relative to the theoretical maximum flow.

7. What is the function of a diffuser in a fluid flow system?

a) Increases pressure and decreases velocity
b) Decreases pressure and increases velocity
c) Increases pressure and velocity
d) Decreases pressure and velocity

Correct Answer: a) Increases pressure and decreases velocity

Explanation: A diffuser is a device used to slow down fluid flow and increase pressure.

8. What phenomenon occurs when a supersonic flow is abruptly slowed down to subsonic speed?

a) Mach cone
b) Stagnation properties
c) Isentropic flow
d) Normal shock

Correct Answer: d) Normal shock

Explanation: A normal shock is a sudden and strong change in the flow properties, such as pressure, temperature, and velocity, that occurs when a supersonic flow is abruptly slowed down to subsonic speed.

9. What property remains constant across a normal shock in an ideal gas?

a) Pressure
b) Velocity
c) Density
d) Temperature

Correct Answer: a) Pressure

Explanation: Across a normal shock in an ideal gas, the pressure remains constant while other properties such as density, velocity, and temperature change.

10. What is the velocity coefficient used for in fluid dynamics?

a) To calculate the speed of sound in a fluid
b) To correct for friction losses in flow measurement
c) To determine the efficiency of a diffuser
d) To adjust the area ratio in variable area ducts

Correct Answer: b) To correct for friction losses in flow measurement

Explanation: The velocity coefficient is used to correct for friction losses in flow measurement devices like pitot tubes or venturi meters, allowing for more accurate determination of flow velocity.

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