

CHAPTER 04

1. The representation of fluid parameters as a function of the spatial coordinates is termed a _____.

A. Velocity field

B. Field representation

C. Position vector

2. Name the two general approaches to analyzing fluid mechanics.

YOUR ANSWER: Eulerian and Lagrangian.

3. How many dimensions do most fluid flows have?

A. 2

B. 3

C. None. They are dimensionless

4. What is a streamline?

YOUR ANSWER: A line that is everywhere tangent to the velocity field.

5. What is a streakline?

A. Lines perpendicular to the velocity field.

B. All the particles in a flow that have previously passed through a common point.

C. A phenomena caused by unsteady flow.

6. What is a pathline?

A. A distance along a streakline.

B. The line traced out by a given particle over time.

C. Pathline is just another term for streakline.

Explanation: While in steady flow, a pathline is a distance along a streakline, in unsteady flow, this is not the case. So, while in steady flow, answer A) could be accepted, it is not true for all flows, and is therefore not an acceptable definition.

7. Which is the more commonly used method to describe fluid motion, Lagrangian or Eulerian?

YOUR ANSWER: Eulerian

8. An acceleration field is a function of ____ and ____ without actually following any particular particle.

YOUR ANSWER: **position, time.**

9. What is the material derivative used for?

A. To describe time rates of change for a given particle.

B. To describe the time rates of change for a given flow.

C. To give the velocity and acceleration of the flow.

10. If a flow is unsteady, its ____ may change with time at a given location.

A. Velocity

B. Temperature

C. Density

D. All of the above

11. If the flow is steady, there can be changes in velocity at different locations in the flow field, True or False.

A. True

B. False

12. Streamline coordinates consist of what two components in 2-D form?

YOUR ANSWER: Along the streamline, s , and perpendicular to the streamline, n .

13. Define a control volume.

YOUR ANSWER: A control volume is a volume in space, independent of mass, through which fluid may flow.

14. Define a system.

YOUR ANSWER: A system is a collection of matter of fixed identity, which may move, flow and interact with its surroundings.

15. An example of a deforming control volume is

A. A jet engine

B. solid pipe

C. balloon

16. The Reynolds transport theorem provides the relationship between

A. The time rate of change of an extensive property of the system and the control volume.

B. The time rate of change of the fluid mass and the control volume.

C. The time rate of change of the shape of the fluid and the control volume.

17. The time derivative associated with a system is always the same as the derivative associated with a control volume. True or False

A. True

B. False

18. The standard unit normal vector

A. is tangent to the control surface.

B. is normal to the surface pointing outwards.

C. is normal to the surface pointing inwards.

19. What is the relationship between the Reynolds transport theorem and the material derivative?

A. The Reynolds transport theorem is the integral equivalent of the material derivative.

B. The Reynolds transport theorem is the material derivative equivalent for unsteady flow.

C. There is no relationship.

20. What type of velocity must be considered when using a moving control volume?

YOUR ANSWER: Relative velocity.