

# CHAPTER 06

1.Name the four types of motion that a fluid element can experience.

**YOUR ANSWER: Translation, linear deformation, rotation, angular deformation.**

2.How is the acceleration of a particle described?

A. Through Newtonian equations.

**B.By using the material derivative.**

C.Through the mass flow rate and the surface integral.

3.What is the simplest type of motion a fluid particle can undergo?

**YOUR ANSWER: Translation**

4.The rate of change of the volume per unit volume is called the \_\_\_\_\_.

**A.Volumetric dilatation rate.**

B.Volumetric flow rate.

C.Mass flow rate

5.How does vorticity relate to the rotation vector?

A.They are the same.

**B.Vorticity is twice the rotation vector.**

C.Vorticity is perpendicular to the rotation vector

6.For irrotational flow, the vorticity is zero. True or False.

**A.True**

B.False

7.Which type of expansion series is used in the development of the mass flow rate equation?

**A.Taylor**

B.Fourier

C.Maclaurin

8.What term of the continuity equation, when held constant, allows the continuity equation to reduce to a relationship involving only velocity gradients for incompressible fluids?

**YOUR ANSWER: Density**

9. For some problems it is more convenient to express the various differential relationships in cylindrical coordinates rather than in Cartesian coordinates. True or False.

**A. True**

**B. False**

10. Lines along which the stream function is constant are \_\_\_\_\_.

**YOUR ANSWER: Streamlines**

11. Flow can cross a streamline. True or False

**A. True**

**B. False**

12. A change in the value of the stream function is related to the rate of flow.

**YOUR ANSWER: volume**

13. According to the momentum equation, the time rate of change of linear momentum is equal to:

**A. acceleration**

**B. mass**

**C. resultant force**

14. The surface forces acting on a fluid element can be described in terms of \_\_\_\_\_ and \_\_\_\_\_ stresses.

**YOUR ANSWER: normal, shearing**

15. What does it mean when a flow is said to be inviscid?

**A. The flow is moving at negligible velocity.**

**B. No acceleration is occurring.**

**C. The shearing stresses are negligible.**

16. Name three terms for flows where the shearing stresses are negligible?

**YOUR ANSWER: Inviscid, nonviscous, and frictionless.**

17. The equations of motion describing an inviscid flow are commonly called \_\_\_\_\_ equations of motion.?

**YOUR ANSWER: Euler's**

18. What law, when directly applied to a fluid particle moving along a streamline, led to the Bernoulli equation?

A. Newton's First Law

**B. Newton's Second Law**

C. The Euler principle

19. The Bernoulli equation applies along a \_\_\_\_\_ for \_\_\_\_\_ fluids.

**YOUR ANSWER: Streamline, inviscid.**

20. What is the value of the vorticity in irrotational flow fields?

A. Infinity

B. It is proportional to the velocity of the flow

**C. Zero**

21. The pressure or force of gravity can cause a fluid flow element to rotate. True or False

A. True

**B. False**

22. Laplace's equation governs what type of flow?

A. Irrotational flow

B. Inviscid flow

**C. Potential flow**

23. The \_\_\_\_\_ potential is a consequence of the irrotationality of the flow field, while the stream function is a consequence of the conservation of \_\_\_\_\_ .

**YOUR ANSWER: velocity, mass**

24. Lines where the velocity potential is constant are called \_\_\_\_\_ lines.

**YOUR ANSWER: Equipotential**

25. The velocity potential and the stream function are related. True or False.

**A. True**

B. False

26. Flow radiating towards a single point is called a

**A. Sink**

B. Source

C. Radial flow

27. If the streamlines form radial lines, what configuration do the equipotential lines assume?

A. They are also radial.

**B. Concentric circles.**

C. They form a grid pattern.

28. \_\_\_\_ represents a flow in which the streamlines form concentric circles.

A. A sink

B. A source

**C. A vortex**

29. A potential flow vortex is rotational. True or False

A. True

**B. False**

30. A hurricane is an example of a \_\_\_\_.

**A. Free vortex**

B. Sink

C. Source

31. When a source and a sink are combined, what results?

**YOUR ANSWER: A Doublet**

32. How is flow around a half body obtained?

A. By adding a sink to a uniform flow

**B. By adding a source to a uniform flow**

C. By adding a vortex to a uniform flow

33. If a source and a sink are placed a short distance apart, but not on top of each other, what type of body is formed?

A. A cylinder

**B.A Rankine oval**

C.A half body

34.A doublet, placed in a uniform flow, is used to represent flow around a \_\_\_\_\_.

**YOUR ANSWER: Cylinder**

35.Does the theoretical solution of flow behind a cylinder accurately predict the actual flow?

**YOUR ANSWER: No.**

36.Potential theory predicts that drag on a cylinder in a uniform flow is zero, a prediction that is not actually true. This discrepancy is called

A.Euler's prediction.

**B.D'Alembert's paradox.**

C.The Carthaginian conundrum.

37.If a cylinder is rotated in a uniform flow, what happens to the stagnation point?

A.It never moves.

B.It moves along the surface of the cylinder.

**C.It moves along the surface of the cylinder, and can even move off of the surface of the cylinder.**

38.Potential flow theory provides a reasonable approximation when dealing with what type of flow?

**YOUR ANSWER: Low viscosity, high velocity flows, in regions where the flow is accelerating.**

39.Why are potential flow solutions always approximate solutions?

A.Because of inherent inaccuracies in the solutions.

**B.Because the fluid is assumed to be frictionless.**

C.Because exact solutions are impossible to find.

40.How are stresses related to the rate of deformation of incompressible Newtonian fluids?

**A.Linearly**

B.Exponentially

C.They are not related

41.The \_\_\_\_ equations are the basic differential equations describing the flow of Newtonian fluids.

**YOUR ANSWER: Navier-Stokes**

42.Which term of the Navier-Stokes equation results in the equations non-linearity?

A.Force

**B.Acceleration**

C.Rotation

43.Give an example of a type of flow for which the Navier-Stokes equation gives an exact solution?

**YOUR ANSWER: Fixed plates in steady, laminar flow.**

44.Steady laminar flow between fixed plates is \_\_\_\_ to the pressure gradient and is \_\_\_\_ to the viscosity.

**YOUR ANSWER: Proportional, inversely proportional.**

45.Parallel plate flow where one plate moves with constant velocity is called \_\_\_\_ flow.

**A.Couette**

B.Eulerian

C.Viscous

46.Where does the maximum velocity occur in a flow through a circular tube?

A.At the edges

**B.In the center of the tube**

C.The flow is uniform

47.What shape is the velocity distribution for steady, laminar flow in circular tubes?

**YOUR ANSWER: Parabolic.**

48.If the viscosity is set to zero, the Navier-Stokes equations reduce to \_\_\_\_ equations.

**YOUR ANSWER: Euler's.**

49.High speed \_\_\_\_ have allowed numerical solutions to be found for many problems using Navier-Stokes equations.

**YOUR ANSWER: Computers**