

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