臺灣綜合大學系統114學年度學士班轉學生聯合招生考試試題

科目名稱	流體力學	類組代碼	D36
		科目碼	D3692

※本項考試依簡章規定所有考科均「不可」使用計算機。　　本科試題共計 5 頁

The following are 25 multiple-choice questions (4 points each). Choose the best answer.

1. The total head remains constant:

A) In any fluid flow

B) Along any line in the fluid

C) Along a streamline in inviscid flow

D) In turbulent pipe flow

2. The Reynolds Transport Theorem is used to relate:

A) Local and global velocity

B) Lagrangian and Eulerian formulations

C) Density and pressure

D) Energy and entropy

3. The no-slip condition at a wall implies:

A) Fluid velocity equals wall velocity

B) Zero pressure

C) Zero density

D) Uniform velocity

4. Flow separation is characterized by:

A) Increase in velocity

B) Positive pressure gradient

C) Reversal of flow near wall

D) Constant pressure

5. In turbulent flow, time-averaged Navier-Stokes equations include:

A) Viscous stresses only

B) Reynolds stresses

C) Compressibility terms

D) Buoyancy

6. Which term in the Navier-Stokes equation is nonlinear?

A) $\rho \mathbf{u} \cdot \nabla \mathbf{u}$

B) $-\nabla p$

C) $\mu \nabla^2 \mathbf{u}$

D) $\partial \mathbf{u} / \partial t$

7. For potential flow, the velocity potential satisfies:

A) Navier-Stokes equation

B) Laplace equation

C) Bernoulli equation

D) Reynolds transport theorem

8. A vortex line is defined as a line:

A) Tangent to velocity

B) Tangent to vorticity

C) Normal to pressure

D) Normal to velocity

9. Kinematic viscosity has the units of:

A) m^2/s

B) $N \cdot s/m^2$

C) Pa

D) kg/m^3

10. The Reynolds number is a ratio of:

A) Pressure forces to gravitational forces

B) Inertial forces to viscous forces

C) Viscous forces to surface tension forces

D) Inertial forces to pressure forces

11. The unit of vorticity in SI is:

A) 1/s

B) m/s

C) $m^2 s$

D) rad/s

12. Circulation is the line integral of:

A) Pressure

B) Velocity

C) Acceleration

D) Vorticity

13.Which flow has zero divergence and non-zero vorticity?

A) Uniform flow

B) Irrotational flow

C) Incompressible rotational flow

D) Source flow

14. In a control volume with uniform flow in and out, net momentum change equals:

A) 0

B) Net force on fluid

C) Static pressure

D) Shear stress

15. For incompressible flow, which of the following is correct:

A) $\nabla \times \mathbf{u} = \mathbf{0}$

B) $d\mathbf{u}/dt = \mathbf{0}$

C) $\nabla \cdot \mathbf{u} \neq 0$

D) $d\rho/dt = 0$

16. In the boundary layer, the viscous effects are:

A) Negligible

B) Dominant near the wall

C) Uniform

D) Absent

17. The Buckingham π-theorem is used for:

A) Solving Navier-Stokes

B) Obtaining dimensionless groups

C) Calculating vorticity

D) Solving energy equation

18. Creeping flow corresponds to:

A) $Re \approx 2000$

B) $Re \ll 1$

C) $Re > 4000$

D) Mach > 1

19. Surface tension acts:

A) Perpendicular to the surface

B) Downward due to gravity

C) Along the surface of a liquid

D) Only at high temperatures

20. In a 2D incompressible irrotational flow, the stream function ψ satisfies:

A) Laplace's equation

B) Euler's equation

C) Navier-Stokes equation

D) Bernoulli's equation

21. Boundary layer thickness δ in laminar flow over flat plate is:

A) $\delta \sim \sqrt{x}$

B) $\delta \sim x^2$

C) $\delta \sim \log(x)$

D) $\delta \sim 1/x$

22. The shear stress in a Newtonian fluid is proportional to:

A) Square of velocity

B) Pressure

C) Rate of strain

D) Temperature

23. What is cavitation in fluid flow?

A) The formation of vapor bubbles in a liquid due to a reduction in pressure below the vapor pressure

B) The solidification of a fluid due to extreme cooling

C) The formation of gas bubbles due to heating of the fluid

D) The rapid increase in fluid velocity in a constricted area

24. What is the definition of the Froude number in open channel flow?

A) The ratio of inertial forces to gravitational forces

B) The ratio of pressure forces to inertial forces

C) The ratio of viscous forces to inertial forces

D) The ratio of surface tension forces to inertial forces

25. In open channel flow, a hydraulic jump represents a rapid transition from:

A) Laminar to turbulent flow

B) Supercritical to subcritical flow

C) Gradually varied flow to rapidly varied flow

D) Subcritical to supercritical flow