



**SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR**  
Siddharth Nagar, Narayanavanam Road – 517583

**QUESTION BANK (DESCRIPTIVE)**

**Subject with Code : FM(15A01305)**

**Course & Branch: B.Tech - CE**

**Year & Sem: II-B.Tech & I-Sem**

**Regulation: R15**

**UNIT – II**

**Buoyancy and Kinematics of Fluid Motion**

1. a) Distinguish between stream line, streak line and path line. 5M  
b) Write a brief note on continuity equation. 5M
2. Obtain an expression for continuity equation for a three - dimensional flow. 10M
3. a) The velocity potential function is given by  $\phi = 5(x^2 - y^2)$ . Calculate the velocity components at the point (4,5). 5M  
b) A stream function is given by  $\psi = 5x - 6y$ . Calculate the velocity components and also magnitude and direction of the resultant velocity at any point. 5M
4. If for a two – dimensional potential flow, the velocity potential is given by  $\phi = x(2y - 1)$ . Determine the velocity at the point p (4,5). Determine also the value of stream function  $\psi$  at the point p. 10M
5. Derive an expression for the meta-centre height of a floating body. 10M
6. A wooden log of 0.6 m diameter and 5 m length is floating in river water. Find the depth of the wooden log in water when the sp. gravity of the log is 0.7. 10M
7. Water flows through a pipe AB 1.2 m at 3 m/sec and then passes through a pipe BC 1.5 m diameter. At C, the pipe is branched. Branch CD is 0.8 m in diameter and carries one-third of the flow in AB. The flow velocity in branch CE is 2.5 m/sec. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE. 10M
8. a) What is the relation between stream function and velocity potential function?  
b) Define
  - i) Equipotential line
  - ii) Line of constant stream function
  - iii) Flow net5M
9. a) Distinguish between stream line, streak line and path line. 5M  
b) Write a brief note on continuity equation. 5M

10. a) Define buoyancy and centre of buoyancy. 2M  
 b) Define the term meta-centre and meta-centre height. 2M  
 c) Define uniform and non uniform flow. 2M  
 d) Distinguish between rotational and irrotational flow. 2M  
 e) Differentiate between forced vortex and free vortex flow. 2M

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**QUESTION BANK (OBJECTIVE)**

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**UNIT – II**

**Buoyancy and Kinematics of Fluid Motion**

1. For a floating body, the buoyant force passes through the [     ]  
 A) Centre of gravity of body                      B) Centre of gravity of the submerged part of the body  
 C) Meta centre of the body                        D) Centroid of the liquid displaced by the body
2. The condition for stable equilibrium for the floating body is [     ]  
 A) The meta centre coincide with the centre of gravity  
 B) The meta centre below with the centre of gravity

- C) The meta centre above with the centre of gravity
  - D) The centre of buoyancy is above the centre of gravity
3. Shear stress develops on a fluid element, if the fluid [     ]
- A) is at rest
  - B) if the container is subjected to uniform linear acceleration
  - C) is viscous
  - D) is viscous and the flow is non-uniform
4. For a body completely submerged in a fluid, the centre of gravity (G) and the centre of buoyancy (B) are known. The body is considered to be in stable equilibrium if [     ]
- A) B does not coincide with the centre of mass of the displaced fluid
  - B) G coincides with the centre of mass of the displaced fluid
  - C) B lies below the G
  - D) B lies above the G
5. The metacentric height of a floating body is [     ]
- A) The distance between metacentre and centre of buoyancy
  - B) The distance between centre of buoyancy and centre of gravity
  - C) The distance between metacentre and centre of gravity
  - D) None of the above
6. The resultant hydrostatic force acts through a point known as [     ]
- A) Centre of gravity
  - B) Centre of buoyancy
  - C) Centre of pressure
  - D) None of the above
7. What is buoyant force [     ]
- A) Lateral force acting on a submerged body
  - B) Resultant force acting on a submerged body
  - C) Resultant force acting on a submerged body
  - D) Resultant hydrostatic force on a body due to fluid surrounding it
8. Resultant pressure of the liquid in case of an immersed body acts through which one of the following [     ]
- A) Centre of gravity
  - B) Centre of pressure
  - C) Metacenter
  - D) Centre of buoyancy
9. If B is the centre of buoyancy, G is the centre of gravity and M is the Metacentre of a floating body, the body will be in stable equilibrium if [     ]
- A)  $MG = 0$
  - B) M is below G
  - C)  $BG = 0$
  - D) M is above G
10. The distance from the centre of buoyancy to the meta-centre is given by  $I/V_d$  where  $V_d$  is the volume of fluid displaced. What does I represent [     ]

- A) Moment of inertia of a horizontal section of the body taken at the surface of the fluid  
B) Moment of inertia about its vertical centroidal axis  
C) Polar moment of inertia  
D) Moment of inertia about its horizontal centroidal axis
11. A large metacentric height in a vessel [     ]  
A) Improves stability and makes periodic time to oscillation longer  
B) Impairs stability and makes periodic time of oscillation shorter  
C) Has no effect on stability or the periodic time of oscillation  
D) Improves stability and makes the periodic time of oscillation shorter
12. What are the forces that influence the problem of fluid static [     ]  
A) Gravity and viscous forces                      B) Gravity and pressure forces  
C) Viscous and surface tension forces              D) Gravity and surface tension
13. For a fluid element in a two dimensional flow field (x-y plane), if it will undergo [     ]  
A) Translation only                                      B) Translation and rotation  
C) Translation and deformation                      D) Deformation only
14. In adiabatic flow with friction, the stagnation temperature along a streamline [     ]  
A) Increases    B) Decreases                      C) Remains constant                      D) None
15. Streamlines, path lines and streak lines are virtually identical for [     ]  
A) Uniform flow    B) Flow of ideal fluids                      C) Steady flow                      D) Non uniform flow
16. Existence of velocity potential implies that [     ]  
A) Fluid is in continuum    B) Fluid is irrotational                      C) Fluid is ideal    D) Fluid is compressible
17. In a flow field, the streamlines and equipotential lines [     ]  
A) Are Parallel                                      B) Are orthogonal everywhere in the flow field  
C) Cut at any angle                                      D) Cut orthogonally except at the stagnation points
18. The flow in pipe is laminar if [     ]  
A) Reynolds number is less than 2000                      B) Reynolds number is more than 2000  
C) Reynolds number is more than 4000 D) None of the above
19. A stream line is a line [     ]  
A) Which is along the path of particle                      B) Which is always parallel to the main flow  
C) Across which there is no flow                      D) None of these
20. Continuity equation can take the form [     ]

- A)  $A_1V_1=A_2V_2$       B)  $Q_1V_1=Q_2V_2$       C)  $A_1V_2=A_2V_1$       D)  $A_1A_2=V_1V_2$
21. Continuity equation deals with the law of conservation of [      ]  
 A) Mass      B) Momentum      C) Energy      D) None of the above
22. Which of the following functions represent the velocity potential of a function [      ]  
 A)  $\phi=X^2+Y^2$       B)  $\phi=X^2-Y^2$       C)  $\phi=2X^2+Y^2$       D)  $\phi=X^3+Y^3$
23. In an immersed body, centre of pressure is [      ]  
 A) At the centre of gravity      B) Above the centre of gravity  
 C) Below the centre of gravity      D) Could be above or below
24. A flow is called super-sonic if the [      ]  
 A) Velocity of flow is very high      B) Discharge is difficult to measure  
 C) Mach number is between 1 and 6      D) None of these
25. A one dimensional flow is one which [      ]  
 A) Is uniform flow      B) Is steady uniform flow  
 C) Takes place in straight lines      D) Involves zero transverse component of flow
26. The condition for unstable equilibrium of a floating and submerged body are [      ]  
 A) M is above the G      B) M is below the G      C) M and G are coincide      D) B is above the G
27. For incompressible flow the density of fluid is [      ]  
 A) Constant      B) Proportional      C) Not constant      D) Equal
28. The continuity equation in three dimensions is [      ]  
 A)  $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z}$       B)  $\frac{\partial V}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial w}{\partial z}$       C)  $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z}$       D)  $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial x}$
29. For steady flow in velocity potential, the velocity in x-direction is [      ]  
 A)  $u = - \frac{\partial \phi}{\partial y}$       B)  $u = - \frac{\partial \phi}{\partial x}$       C)  $u = - \frac{\partial \phi}{\partial z}$       D)  $u = \frac{\partial \phi}{\partial y}$
30. For steady flow in stream function, the velocity in x-direction is [      ]  
 A)  $u = - \frac{\partial \psi}{\partial y}$       B)  $u = - \frac{\partial \psi}{\partial x}$       C)  $u = - \frac{\partial \psi}{\partial z}$       D)  $u = \frac{\partial \psi}{\partial y}$
31. For steady flow in velocity potential, the velocity in y-direction is [      ]  
 A)  $u = - \frac{\partial \phi}{\partial y}$       B)  $u = - \frac{\partial \phi}{\partial x}$       C)  $u = - \frac{\partial \phi}{\partial z}$       D)  $v = - \frac{\partial \phi}{\partial y}$

32. For steady flow in stream function, the velocity in y-direction is [     ]  
A)  $v = -\frac{\partial \psi}{\partial y}$      B)  $v = \frac{\partial \psi}{\partial x}$      C)  $u = -\frac{\partial \psi}{\partial z}$      D)  $u = \frac{\partial \psi}{\partial y}$
33. For equipotential line, the velocity function is [     ]  
A) Constant     B) Same     C) Reciprocal     D) Proportional
34. A grid is obtained by drawing a series of equipotential line is called [     ]  
A) Stream function     B) Velocity potential     C) Flow net     D) Free vortex flow
35. The continuity equation in two dimensions is [     ]  
A)  $\frac{\partial u}{\partial x} + \frac{\partial w}{\partial z}$      B)  $\frac{\partial u}{\partial y} + \frac{\partial w}{\partial x}$      C)  $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z}$      D)  $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}$
36. The velocity of flow does not change with respect to space is [     ]  
A) Steady flow     B) Uniform flow     C) Unsteady flow     D) Laminar flow
37. The fluid particles are flow along stream lines and also rotates about its own axis is [     ]  
A) Rotational flow     B) Irrotational flow     C) Turbulent flow     D) Compressible flow
38. The fluid particles are flow along stream lines and not rotates about its own axis is [     ]  
A) Rotational flow     B) Irrotational flow     C) Turbulent flow     D) Compressible flow
39. For two dimensional flow, the velocity in z- direction is [     ]  
A) Constant     B) Unity     C) function of z     D) Zero
40. Irrotational flow means [     ]  
A) The fluid doesnot rotate while moving     B) The fluid particles moves in straight line  
C) The net rotation of fluid particles about their mass centre is zero     D) None of the above

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