

Enrollment No.....



Faculty of Engineering
End Sem (Odd) Examination Dec-2018
CE3CO08 Fluid Mechanics

Programme: B.Tech.

Branch/Specialisation: CE

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1
- i. The specific volume of a liquid is the reciprocal of 1
(a) Weight density (b) Mass density
(c) Specific weight (d) Specific volume
 - ii. Two fluids 1 and 2 have mass densities of ρ_1 and ρ_2 respectively. 1
If $\rho_1 > \rho_2$, which one of the following expressions will represent the relation between their specific volumes v_1 and v_2 ?
(a) $v_1 > v_2$
(b) $v_1 < v_2$
(c) $v_1 = v_2$
(d) Cannot be determined due to insufficient information
 - iii. What is the principal cause of action of buoyant force on a body 1
submerged partially or fully in fluid?
(a) Displacement of fluid due to submerged body
(b) Development of force due to dynamic action
(c) Internal shear forces mitigating external forces
(d) None of the mentioned
 - iv. As a balloon rises in the air its volume increases, at the end it 1
acquires a stable height and cannot rise any further.
(a) True (b) False
 - v. The rate of increase of velocity with respect to change in the 1
position of fluid particle in a flow field is called as
(a) Local acceleration (b) Temporal acceleration
(c) Convective acceleration (d) All of these

[2]

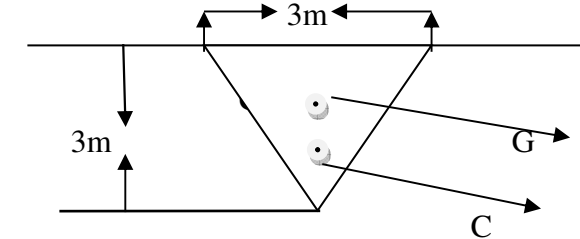
- vi. If stream function (Ψ) satisfies the Laplace equation, it is a possible case of **1**
 (a) A circular flow (b) A rotational flow
 (c) An irrotational flow (d) None of these
- vii. Which of the following devices does not use Bernoulli's equation as its working principle? **1**
 (a) Venturimeter (b) Orifice-meter
 (c) Pitot tube (d) None of these
- viii. What is the correct formula for Euler's equation of motion? **1**
 Where,
 ρ = density of the fluid
 p = pressure force
 g = acceleration due to gravity
 v = velocity of the fluid
 (a) $(\partial p / \rho) + (\partial g / \rho) + (\partial v / \rho) = 0$
 (b) $(\partial p / \rho) + (\partial g / \rho) + (v dv) = 0$
 (c) $(\partial p / \rho) + (g dz) + (v dv) = 0$
 (d) $(p dp) + (g dz) + (v dv) = 0$
- ix. What is the correct formula for loss at the exit of a pipe? **1**
 (a) $h_L = 0.5 (V^2 / 2g)$ (b) $h_L = (V^2 / 2g)$
 (c) $h_L = (2 V^2 / g)$ (d) $h_L = (4 V^2 / g)$
- x. Minor losses do not make any serious effect in **1**
 (a) Short pipes
 (b) Long pipes
 (c) Both the short as well as long pipes
 (d) Cannot say

Q.2

- Attempt any two:
- i. Write short note on: - **5**
 (a) Density (b) Specific weight
 (c) Specific gravity (d) Compressibility
 (e) Elasticity
- ii. What is PASCAL's law? Derive the expression for it. **5**
- iii. Discuss Newton's law of viscosity. Write the classification of Fluid. Write the expression between Kinematic and dynamic viscosity? **5**

[3]

- Q.3 i. Explain metacentre and metacentric height. **4**
 ii. An isosceles triangular plate of base 3 m and altitude 3 m is immersed vertically in an oil of specific gravity 0.8. The base of the plate coincides with the free surface of oil. Determine: **6**
 (a) Total pressure on the plate.
 (b) Centre of pressure.



- OR iii. What is buoyancy? Develop the relation between centre of pressure and centre of gravity of the body for inclined plain surface inside the fluid. **6**

- Q.4 i. What is convective and local acceleration? **3**
 ii. Write note on streamline function and velocity potential function. **7**
 Write about types of fluid flow (any 3 in detail)

- OR iii. A 2D-steady incompressible flow is given $\vec{V} = 3xi - 3yj$. Find the equation of streamline passes from (3,2). Also, check if flow is possible or not. **7**

- Q.5 i. What do you understand from Reynolds transport theorem. **2**
 ii. What do you understand by flow measuring devices, give the name of measuring device. Derive an expression for Discharge of fluid flowing through an orifice meter. **8**

- OR iii. Derive an expression for Euler's equation. Also derive Bernoulli's equation from Euler's equation. **8**

- Q.6 Attempt any two: **5**
 i. Derive Darcy-weisbach equation with diagram. **5**
 ii. Write down the type of minor losses. Derive any one. **5**
 iii. What do you know H.G.L. and T.E.L. in detail with diagram? **5**

Marking Scheme
CE3CO08 Fluid Mechanics

- Q.1 i. The specific volume of a liquid is the reciprocal of (b) Mass density **1**
- ii. Two fluids 1 and 2 have mass densities of ρ_1 and ρ_2 respectively. If $\rho_1 > \rho_2$, which one of the following expressions will represent the relation between their specific volumes v_1 and v_2 ? (b) $v_1 < v_2$ **1**
- iii. What is the principal cause of action of buoyant force on a body submerged partially or fully in fluid? (a) Displacement of fluid due to submerged body **1**
- iv. As a balloon rises in the air its volume increases, at the end it acquires a stable height and cannot rise any further. (a) True **1**
- v. The rate of increase of velocity with respect to change in the position of fluid particle in a flow field is called as (c) Convective acceleration **1**
- vi. If stream function (Ψ) satisfies the Laplace equation, it is a possible case of (c) An irrotational flow **1**
- vii. Which of the following devices does not use Bernoulli's equation as its working principle? (d) None of these **1**
- viii. What is the correct formula for Euler's equation of motion? Where,
 ρ = density of the fluid
 p = pressure force
 g = acceleration due to gravity
 v = velocity of the fluid
(c) $(\partial p / \rho) + (g dz) + (v dv) = 0$ **1**
- ix. What is the correct formula for loss at the exit of a pipe? (b) $h_L = (V^2 / 2g)$ **1**
- x. Minor losses do not make any serious effect in (b) Long pipes **1**

Q.2 Attempt any two:

- i. Write short note on: - 1 mark for each (1 mark *5) **5**
(a) Density (b) Specific weight
(c) Specific gravity (d) Compressibility
(e) Elasticity
- ii. What is PASCAL's law 1 mark **5**
Expression for it. 4 marks
- iii. Newton's law of viscosity 2 marks **5**
Classification of Fluid 2 marks
Expression b/w Kinematic and dynamic viscosity 1 mark
- Q.3 i. Definition of metacentre 1 mark **4**
Metacentric height. 1 mark
- ii. Total pressure on the plate 2.5 marks **6**
Correct answer 0.5 mark
Centre of pressure 2.5 marks
Correct answer 0.5 mark
- OR iii. What is buoyancy 2 marks **6**
Develop the relation between centre of pressure and centre of gravity of the body for inclined plain surface inside the fluid. 4 marks
- Q.4 i. Convective 1.5 marks **3**
Local acceleration 1.5 marks
- ii. Streamline function 2 marks **7**
Velocity potential function 2 marks
Types of fluid flow (any 3 in detail)
1 mark for each (1 mark * 3) 3 marks
- OR iii. Find the equation of streamline passes from (3,2) 4 marks **7**
Check if flow is possible or not 2 marks
Correct answer 1 mark
- Q.5 i. Reynolds transport theorem. **2**
- ii. What do you understand by measuring devices 1 mark **8**
Name of measuring devices 1 mark
Expression for Discharge of fluid flowing through an orifice meter 6 marks

