



**KERALA AGRICULTURAL UNIVERSITY**  
**B.Tech. (Food Technology) 2022 Admission**  
**II Semester Final Examination - September 2023**

Pafe.1207

**Fluid Mechanics (2+1)**

**Marks: 50**  
**Time: 2 hours**

**I Fill in the blanks (10x1=10)**

1. The dimension of kinematic viscosity is \_\_\_\_\_.
2. Attraction between the molecules of a liquid and the molecules of a solid boundary surface in contact with the liquid is known as \_\_\_\_\_.
3. The product of coefficient of contraction and coefficient of velocity of an orifice gives the value of \_\_\_\_\_.
4. For best hydraulic cross-section of a rectangular channel, the base width is \_\_\_\_\_ times the depth of flow.

**Choose the correct answer**

5. If both the horizontal and vertical axes of a fluid particle rotate by the same amount but in the opposite direction, it is said to have undergone.  
a) Rotation  
b) linear deformation  
c) angular deformation  
d) none of these
6. An imaginary curve drawn through a flowing fluid in such a way that the tangent to it at any point gives the direction of the velocity of flow at that point is a/an  
a) streamline  
b) equipotential line  
c) streak line  
d) path line
7. When flow velocity changes from place to place in a flowing fluid at any instant, the flow is said to be:  
a) steady flow  
b) uniform flow  
c) non-uniform flow  
d) unsteady flow
8. Piezometric head is the sum of  
a) pressure and velocity head  
b) velocity and potential head  
c) pressure and potential head  
d) none of these
9. The flow of fluid in circular pipe is turbulent, if the Reynolds number is  
a) up to 2000  
b) 2000-4000  
c) > 4000  
d)  $\leq 1$
10. The ratio between inertia force and gravity force is known as  
a) Mach number  
b) Weber number  
c) Froude number  
d) Euler number

**II Write short notes on ANY FIVE of the following (5x2=10)**

1. Calculate the specific weight and specific gravity of a liquid having a volume of  $4.5 \text{ m}^3$  and weighing 30 kN.
2. Differentiate between ideal fluid and real fluid.
3. Water is flowing through a pipe of 100 cm diameter and 15 km length at the rate of 1000 Lps. Find the head loss due to friction, if the friction factor is 0.02.
4. Define pressure. Express 10 m of water column in  $\text{kN/m}^2$ .
5. Differentiate between linear and angular deformation of a fluid particle.
6. Write short note on positive displacement pump.
7. Differentiate between velocity potential and stream function

**III Answer ANY FIVE of the following. (5x4=20)**

1. Find the depth of a point below water surface in sea where pressure intensity is  $1006 \text{ kN/m}^2$ . Specific gravity of sea water is 1.025.
2. Describe the operating characteristics of a centrifugal pump.
3. A vertical gate closes a horizontal tunnel 5 m high and 3 m wide running full of water. The pressure at the gate is  $196.2 \text{ kN/m}^2$ . Determine the total pressure on the gate.
4. Explain the principle of operation of a Pitot tube for measuring flow velocity in open channels.
5. A Venturimeter is to be fitted in a pipe 25 cm diameter where the pressure head is 7.6 m of flowing liquid and the maximum flow  $486 \text{ m}^3/\text{h}$ . Find the least diameter of the throat to ensure that the pressure head does not become negative. Take the coefficient of discharge of the Venturimeter as 0.96.
6. Define velocity potential. Derive Laplace equation in three dimension using the equation of continuity for steady flow of an incompressible fluid.
7. A wooden block of rectangular section 1.25 m wide, 2 m deep and 4 m long floats horizontally in sea water. If the specific gravity of wood is 0.64 and that of water is 1.025, find the volume of water displaced and the position of the centre of buoyancy.

**IV Write an essay on ANY ONE of the following (1x10=10)**

1. Using the principle of conservation of mass, derive the three dimensional continuity equation in cartesian coordinate for steady flow of an incompressible fluid.
2. What reciprocating pumps are called positive displacement pumps? Describe the working principle of reciprocating pumps. Differentiate between single acting and double acting reciprocating pumps.

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