KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Engg.) 2017 Admission
III Semester Final Examination-Janauary-2019

Cien. 2103 **Fluid Mechanics (2+1)** **Marks: 50**
Time: 2 hours

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

1 The unit of coefficient of viscosity in SI unit is .....
2 The specific gravity of oil, having specific weight of 7.848 kN/m^3, is .....
3 Current meter is a device used to measure .....
4 The laminar flow between parallel flat plates, when one plate is moving at uniform velocity and the other one is at rest is known as ..... flow.
5 The side slope (H:V) of Cipoletti weir is .....

Choose the Correct answer

6 The dimension of pressure is:
a $M^1L^1T^{-1}$ b $M^1L^{-1}T^{-1}$ c $M^1L^{-1}T^{-2}$ d $M^1L^{-2}T^{-1}$
7 Inter-molecular attraction between the molecules of the same liquid is known as:
a surface tension b cohesion c adhesion d capillarity
8 Whenever a body, floating in a liquid, is given a small angular displacement, it starts oscillating about some point, which is known as:
a centre of buoyancy b metacentre c centre of pressure d centre of gravity
9 The two dimensional equation of an equipotential line is given by:
a $vdy + udx = 0$ b $udy-vdx = 0$ c $udy + vdx = 0$ d $vdy-udx = 0$
10 The square root of Cauchy number is known as:
a Newton number b Weber number c Mach number d Euler number

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

1 Differentiate between ideal fluid and real fluid.
2 A rectangular tank 5 m long, 2 m wide contains water up to a depth of 2.5 m. Calculate the total pressure on the base of the tank.
3 Buoyancy and floatation.
4 A differential manometer connected at two points at the same level in a pipe containing oil of specific gravity 0.8 shows a difference in mercury level as 100 mm. Determine the difference in pressure between the two points.
5 Differentiate between Lagrangian method and Eulerian method
6 Show that the two dimensional flow represented by velocity components $u = 8xy$ and $v = 4x^2-4y^2$, satisfies the equation of continuity.
7 Differentiate between linear and angular deformation of a fluid particle.

P.T.O

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

1 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 sea water weighs 10.05 kN/m^3, find the volume of water displaced and the position of the centre of buoyancy.

2 Define streamline. Prove that at any point of intersection it is orthogonal to an equipotential line.

3 The diameter of a pipe changes from 200 mm at a section 5 m above datum to 50 mm at a section 3 m above datum. The pressure of water at the first section is 500 kN/m^2. If the velocity of flow at the first section is 1 m/s, determine the intensity of pressure at the second section.

4 Derive Darcy-Weisbach equation for flow through a long pipeline running full of water.

5 Define vortex motion. Classify and discuss about various types of vortex motions.

6 Water flows at the rate of 0.147 m^3/s through a 15 cm diameter orifice inserted in a 30 cm diameter pipe. If the pressure gauge fitted upstream and downstream of the orifice plate have shown readings of 176.58 kN/m^2 and 88.29 kN/m^2, respectively, find the coefficient of discharge of the orifice meter.

7 With neat sketch derive the expression for total pressure acting on a vertical plane surface submerged in water.

IV **Answer ANY ONE of the following** **(1x10=10)**

1 Rayleigh method to establish the expression for coefficient of discharge of an orifice of diameter d. Consider that water is flowing at a rate of Q through the orifice under a constant head of H. Take ρ as the mass density and μ as the dynamic viscosity of water.

2 Principle of conservation of mass to derive the three dimensional continuity equations in cartesian co-ordinates for steady flow of an incompressible fluid.

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