Cat. No: Iden 2104

Title: Fluid Mechanics and Open Channel Hydraulics (2+1)

Marks: 50.00

Time: 2 hours

I Choose the correct answer

(10 x 1=10)

1. Dynamic viscosity of liquids

   a) Increases with an increase in temperature

   b) decreases with an increase in temperature

   c) does not depend on temperature

   d) does not depend on pressure

2. Uniform flow occurs when

   a) the fluid particles move in an orderly manner

   b) the velocity does not change from place to place

   c) the velocity at a given point does not change with time

   d) all the above

3. The line joining the piezometric heads at different points in a pipe line is called

   a) Total energy line

   b) Datum line

   c) Hydraulic gradient line

4. When Reynolds number is less than 2000, the flow is

   a) Critical

   b) Super critical

   c) Laminar

   d) Turbulent

5. Vacuum pressure is equal to

   a) Absolute pressure + atmospheric pressure

   b) Absolute pressure – atmospheric Pressure

   c) Atmospheric pressure – Absolute pressure

   d) None of the above

6. The centre of pressure on an immersed surface

   a) Always below centre of gravity

   b) Always above centre of gravity

   c) Can coincide with centre of gravity

   d) Cannot coincide with centre of gravity

7. Most efficient open channel section is defined as

   a) The section that has maximum area for a given discharge

   b) The section that has minimum roughness coefficient

   c) The section that has maximum wetted perimeter

   d) The section that has maximum discharge for a given cross sectional area

8. Reynold's number is the ratio of

   a) Inertia force and gravity force

   b) Inertia force and pressure force

   c) Inertia force and surface tensive force

   d) Inertia force and viscous force

9. Locus of positions of particles issuing from a point at any instant is called

   a) Streak line

   b) Path line

   c) Stream line

   d) Stream tube

10. A cipolletti weir is a trapezoidal weir which has

    a) side inclination 1 vertical to 4 horizontal

    b) 1 vertical to 3 horizontal

    c) 1 horizontal to 4 vertical

    d) No end contraction

II Write short notes on any Seven questions

(5 x 2=10)

1. State Newton's law of viscosity

2. Draw pressure diagram for horizontally immersed surface, vertically immersed surface and inclined immersed surface

3. Differentiate between laminar flow and turbulent flow

4. Write the assumptions in the derivation of Bernoulli's equation

5. What is the difference between a notch and weir

6. If discharge per unit width of a rectangular channel is 3m³/sec/m. What is the critical depth?

7. Explain dimensional homogeneity of equation

III Answer any Five questions

(5 x 4=20)

1. State and prove Pascal's law

2. Calculate pressure difference between two points A and B in a horizontal pipe line, through which water is flowing, when the mercury differential manometer connected to these points gives a deflection of 0.6m

3. A circular plate 2m in diameter is immersed in water. Its greatest and least depths below the free surface being 2m and 1m respectively, find the total pressure and the centre of pressure on one face of the plate.

4. Derive Darcy-Weisbach equation for friction loss in a pipe

5. A 20 cm diameter pipe carries water at the rate of 120 litres/sec. The pressure at a point 'A' in the pipe is 0.2 kg/cm^2. If the point A is 2.5m above the datum line, calculate the total energy at A in meters of water

6. In what ways an open channel flow is different from the flow in a closed conduit?

7. Draw the sketches of hydraulic gradient line and total energy line in case of flow through a pipe as well as flow through an open channel

IV. Answer any one question   (1 x 10=10)

1. Find depth and top width of a V-notch capable of discharging maximum of 0.7m^3/sec and such that the head shall be 7.5cm for a discharge 5.6 litres/sec. It's coefficient of discharge is same as that of a similar right angled V-notch for which $Q=1.407H^{5/2}$

2. Explain Buckingham's π method of dimensional analysis. What are the criteria for selecting repeating variables?