

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Summer 2022 - 23 Examination

Semester: 4**Subject Code: 203104285****Subject Name: Hydraulic Engineering****Date: 24/03/2023****Time: 02:00 pm to 04:30 pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) (15)

1. What is Reynolds stress?
 - a) Stress due to velocity fluctuations
 - b) Tangential component of pressure
 - c) Stress due to pressure fluctuations
 - d) Normal component of viscosity
2. In turbulent flow, the
 - a) Fluid particles move in an orderly manner
 - b) Momentum transfer is on molecular scale only
 - c) Shear stress is caused more effectively by cohesion than momentum transfer
 - d) Shear stresses are generally larger than in a similar laminar flow
3. Dimension of Dynamic viscosity _____
4. Hydraulic jump is observed in _____
5. Open channel flow takes place _____
 - a) On a free surface
 - b) In the pipe
 - c) Within a cylindrical depth
 - d) In a pump
6. The flow in which the parameters do not change with respect to time is called as _____
7. In unsteady flow, the streamline also changes from instant to instant.
 - a) true
 - b) false
8. How can we determine whether the flow is laminar or turbulent?
9. The swirl caused due to eddies are called as _____
 - a) Vortices
 - b) Vertices
 - c) Volume
 - d) Velocity
10. With the boundary layer separation, displacement thickness _____
11. Total drag is the sum of _____
12. What is the value of C_D corresponding to a Reynold's number between 5 and 1000?
13. What are the dimensions of drag coefficient?
14. Which component of the total force is perpendicular to the direction of motion?
15. What is energy per unit head of water called as _____

Q.2 Answer the following questions. (Attempt any three) (15)

- A) Differentiate between hydrodynamically rough and smooth boundary.
- B) Explain shear stress in turbulent flow.
- C) What do you understand by Boundary layer theory.
- D) What do you understand by lift and drag.

Q.3 A) Explain Source and Sink flow with appropriate sketches. (07)

B) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by (08)

$$\frac{u}{U} = \frac{y}{\delta}$$

Where $u=U$ at $y= \delta$.

OR

B) A rectangular channel carries water at the rate of 400 litres/s when bed slope is 1 in 2000. Find the most economical dimensions of the channel if $C = 50$. (08)

Q.4 A) Derive expression for depth of hydraulic jump. (07)

OR

A) Derive expression for conditions for most economical trapezoidal section. (07)

B) The efficiency η of a fan depends on density ρ , dynamic viscosity μ of the fluid, angular velocity ω , diameter D of the rotor and the discharge Q . Express η in terms of dimensionless parameters. (08)