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B TECH
(SEM III) THEORY EXAMINATION 2017-18
FLUID MECHANICS

Time: 3Hours

Max. Marks: 70

Note: Attempt all Sections. Assume missing data, if any.

SECTION -A

1. Attempt all question in brief. (2x7=14)
- Define the term Cohesion and Adhesion.
 - Explain gauge pressure, vacuum pressure and absolute pressure with suitable sketch.
 - Write the difference between Eulerian and Lagrangian approach.
 - Explain the Rotational and Irrotational flow.
 - Write short note on Pitot Static Tube.
 - What do you understand by shape Factor?
 - Explain the Drag and Lift.

SECTION -B

2. Attempt any **three** parts of the following : (7x3=21)
- Liquid of specific gravity 1.0 flows through pipes A and B at positive pressure of 0.5 bar and 0.25 bar respectively. Pipe A is 1.6 m higher than B. what would be the difference in the level of U- tube manometer connected to A and B, having manometer liquid of specific gravity 13.6? Liquid level in the limb attached to A is lower than that in the order.
 - Derive the continuity equation for steady Irrotational flows in Cartesian co-ordinate for incompressible fluids.
 - What are the minor losses and major losses in a pipe flow?
 - The velocity distribution in the boundary layer is given by,

$$\frac{u}{U} = \sin^2\left(\frac{\pi y}{2\delta}\right)$$
 Find Displacement thickness and Momentum thickness.
 - Explain the Magnus effect with an example.

SECTION -C

3. Attempt any **one** part of the following: (7x1=7)
- Explain the condition of stability for floating body and immersed body with neat sketch.
 - A circular plate 6 m diameter is immersed in water in such a way that its greatest and least depth below the free surface of water is 4m and 2 m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure.
4. Attempt any **one** part of the following: (7x1=7)
- Velocity field in fluid medium is given by:

$$\mathbf{V} = 10x^2y\mathbf{i} + 15xy\mathbf{j} + (25t - 3xy)\mathbf{k}$$
 Find acceleration at (1, 2, -1)m and t = 0.5 sec.
 - A 500 mm diameter pipe carrying water at rate 0.5 m³/sec. branches into two pipes of 200 mm and 400 mm diameters. If the rate of flow of water through small diameter pipe is 0.2 m³/sec. Determine velocity of flow in each pipe.





5. Attempt any **one** part of the following:

(7x1=7)

- a) Write about Venturimeter. Derive the expression for rate of flow of fluid through Venturimeter.
- b) Find the discharge through a trapezoidal notch which is 1 m wide at the top and 0.4 m at the bottom and is 30 cm in height. The head of water on the notch is 20 cm. Assume C_d for rectangular portion = 0.62 while for triangular portion = 0.60.

6. Attempt any **one** part of the following:

(7x1=7)

- a) Oil with density 900 kg/m^3 and kinematic viscosity $10^{-5} \text{ m}^2/\text{sec}$ is flowing over a plate of 3m long and 2 m wide with a velocity of 3 m/sec parallel to 3m side. Find the boundary layer thickness at the point of transition and at the end of plate.
- b) What do you mean by separation of boundary layer? Define with neat sketch.

7. Attempt any **one** part of the following:

(7x1=7)

- a) A square plate of side 2 m is moved in a stationary air of density 1.2 kg/m^3 with a velocity of 50km/hr. If the coefficient of drag and lift are 0.2 and 0.8 respectively, determine the drag force, lift force, and resultant force.
- b) Find the form of equation for discharge Q through a sharp edged triangular notch; assuming Q depends upon the central angle α of the notch, head H , gravitational acceleration g , and on the mass density ρ , viscosity μ , and surface tension σ of the fluid.