PAPER ID-411697

Roll No: ☐☐☐☐☐☐☐☐☐☐☐☐☐

BTECH
(SEM III) THEORY EXAMINATION 2021-22
FLUID MECHANICS

Time: 3 Hours　　　　　　　　　　　　　　　　　　　　　　*Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.　Attempt *all* questions in brief.　　　　　　　　　**2 x 10 = 20**

a.	Draw the Rheological graph of various fluids.
b.	State the conditions for immersed floating bodies.
c.	Define Newtonian fluids.
d.	Define circulation and vorticity of flow
e.	Define doublet & half body
f.	Define the phenomenon of water hammer.
g.	State Stokes' law.
h.	Distinguish between boundary layer thickness & displacement thickness.
i.	Give the formula for Drag & lift force.
j.	Define Magnus Effect.

SECTION B

2.　Attempt any *three* of the following:　　　　　　　**3 x 10 = 30**

a.	Explain briefly the following types of equilibrium of submerged bodies: i. Stable Equilibrium ii. Unstable Equilibrium iii. Neutral Equilibrium
b.	Define stream function & velocity potential function. Calculate the velocity at the point (3, 3) for the following stream function: $\psi = 0.5(y^2 - x^2) + xy - 6$.
c.	Explain the principle of venturimeter with a neat sketch. Derive rate of flow of fluid through it.
d.	Enumerate the various types of head losses in pipe flow with their formula and derive expression for head loss due to sudden enlargement of pipes.
e.	Explain the concept of boundary layer separation with the help of proper sketch. What measures / methods should be adopted to control it?

SECTION C

3.　Attempt any *one* part of the following:　　　　　　**1 x 10 = 10**

a.	Prove that the pressure in a fluid at rest is same in all directions.
b.	Elaborate the different devices used for measuring pressure in a fluid.

4.　Attempt any *one* part of the following:　　　　　　**1 x 10 = 10**

a.	Discuss different types of fluid flow in detail.
b.	Explain all the dimensionless numbers in detail.

5.　Attempt any *one* part of the following:　　　　　　**1 x 10 = 10**

a.	Explain geometric, kinematic and dynamic similarity in detail.
b.	Illustrate the working of orifice meter with a neat sketch. Derive rate of flow of fluid through it.

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6. **Attempt any *one* part of the following:** **1 x 10 = 10**

a.	Water is flowing with a velocity of 1.5 m/sec in a pipe of length 2500 m and diameter 500 mm. At the end of the pipe, a valve is provided. Find the rise in pressure i) If the valve is closed in 25 seconds. ii) If the valve is closed in 2 seconds. Take value of C = 1460 m/s, K = 19.60 * 10^4 N/cm^2, Assume Rigid Pipe.
b.	Write examples of turbulent flow and explain the characteristics of turbulent flow.

7. **Attempt any *one* part of the following:** **1 x 10 = 10**

a.	Define displacement thickness. Derive an expression for the displacement thickness.
b.	Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$