PAPER ID-311144

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B.TECH.
(SEM III.) THEORY EXAMINATION 2020-21
FLUID MECHANICS

Time: 2 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a.	Differentiate between steady and unsteady flow.
b.	State the relation between Manning's constant and Chezy's constant
c.	Define sub sonic, sonic and supersonic flow.
d.	State Bernoulli's theorem.
e.	What is the use of pitot tube?
f.	What do you mean by stream line?
g.	What do you mean by Drag and Lift force?

SECTION B

2. Attempt any *03 parts* of the following: 7 x 3 = 21

a.	Define the terms; buoyancy, center of buoyancy, meta centre and meta centric height.
b.	(i) Define the following terms; Stream function, velocity potential function (ii) What are the conditions for flow to be irrotational.
c.	Determine the displacement thickness and momentum thickness of the following velocity profiles in the boundary layer on a flat plate. $u/U_0 = 1.5\,(y/\delta) - 0.5\,(y/\delta)^3$ where u is the velocity at a height y above the surface and U_0 is the free stream velocity
d.	A pipe of diameter 500 mm carrying water at rate 0.5 m^3/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 m^3/sec. Determine velocity of flow in each pipe.
e.	The resulting force F of a supersonic plane during flight can be considered as dependent upon the length of the aircraft l, velocity V, air viscosity μ, air density ρ, and bulk modulus of air K. Express the functional relationship between these variables and the resisting force.

SECTION C

3. Attempt any *01* part of the following: 7 x 1 = 7

(a)	What is the use of manometers? Give the classification of manometers and discuss any one of them with suitable diagram.
(b)	Explain the condition of stability for floating body and immersed body with neat sketch.

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4. Attempt any *01* part of the following: 7 x 1 = 7

(a)	Write different types of fluid flow. Derive continuity equation in Cartesian coordinates.
(b)	A 2D flow is described by the velocity components: $u = 5x^3$ and $v = -15x^2y$ Evaluate the stream function, velocity and acceleration at point P(x = 1 m and y = 2 m).

5. Attempt any *01* part of the following: 7 x 1 = 7

(a)	An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$.
(b)	Write short notes on the following (i) Notches and weirs (ii) Water hammer

6. Attempt any *01* part of the following: 7 x 1 = 7

(a)	Give important characteristics of laminar flow. An oil of specific gravity 0.85 and viscosity 3.8 poise flows in a 5 cm diameter horizontal pipe at the rate of 4 ltr/sec. Comment whether the flow is laminar or turbulent.
(b)	What do you mean by separation of boundary layer? Define with neat sketch.

7. Attempt any *01* part of the following: 7 x 1 = 7

(a)	To study the pressure drop in flow of water through a pipe, a model of scale 1/10 is used. Determine the ratio of pressure drops between model and prototype if water is used in the model. In case air is used determine the ratio of pressure drops.
(b)	Define various dimensionless numbers and write their significance.