Sub Code:RCE303

Paper Id: 100313 **Roll No:**

B.TECH
(SEM-III) THEORY EXAMINATION 2019-20
FLUID MECHANICS

Time: 3 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.	Distinguish between Kinematic & Dynamic fluid
b.	State the equilibrium condition for floating bodies
c.	Differentiate between notches & weirs
d.	Define the phenomenon of water hammer
e.	Give the formula for Drag & lift force.
f.	Give the formula for Darcy's Weishbach equation
g.	What do you understand by dynamic similarity of models

SECTION B

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

a.	Derive an expression for the resultant pressure force on a curved surface immersed in a liquid. Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that centre of plate is 3m below the free surface of water
b.	Explain the principle of venturimeter with a neat sketch. Derive for rate of flow of fluid through it.
c.	Define stream function & velocity potential function. Calculate the velocity at the point (3,3) for the following stream function: $\psi = 0.5(y^2-x^2)+xy-6$
d.	Derive shear stress distribution and velocity distribution in circular pipe for laminar flow. Draw their graphical diagram as per the expressions derived
e.	250 litres/sec of water is flowing in a pipe having a diameter of 30 cm. If the pipe is bent by 135 degree, Find the magnitude & direction of resultant force on the bend.The pressure of the water flowing in the pipe is 400 KPa

SECTION C

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

(a)	Oil of viscosity 0.1 Pa.s and specific gravity 0.90, flows through a horizontal pipe of 25 mm diameter. If the pressure drop per meter length of the pipe is 12 KPa, determine **(a)** the rate of flow in N/min **(b)** the shear stress at the pipe wall **(c)** the Reynolds number of the flow **(d)** the power required in Watt per meter length of pipe to maintain the flow. Take Y_w=9810 N/m^3
(b)	For laminar flow of an oil having dynamic viscosity μ = 1.766 Pa.s in a 0.3 diameter pipe flows with a maximum central line velocity of 3m/s. Calculate shearing stress at the pipe wall and within the fluid 50 mm from the pipe wall

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

(a)	1. Write a short note on : i) Distorted and undistorted models ii) Merits and applications of model testing Similarity laws / Model Laws
(b)	Discuss Dynamic similarities of Models.

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

(a)	The velocity distribution in boundary layer is given by: (U/V) = $(3/2\eta - \eta^2/2)$ .Find the boundary layer thickness, momentum thickness & energy thickness .
(b)	The velocity distribution in the boundary layer is given by, $u/U=1.5y/\delta-0.5y^2/\delta^2$. Find **(i)** Ratio of displacement thickness to boundary layer thickness **(ii)** Ratio of momentum thickness to boundary layer thickness

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

(a)	Justify that velocity potential function & stream function are orthogonal
(b)	In 2-D incompressible flow, the fluid velocity components are given by **u= x-4y & v= -y-4x** .Show that velocity potential exists & determine its form. Find the stream function also.

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

(a)	A pipe line of 0.6 m diameter is 1.5km long. To increase the discharge, another line of the same discharge is introduced parallel to the first in the second half of the length.Neglecting the minor losses, Find the increase in the discharge if 4f = 0.04. The head at inlet is 300mm.
(b)	Derive the expression for triangular notch. Also, find the depth of triangular notch, when notch angle is 60 degree, discharge is $0.040 m^3/sec$ & assuming $C_d = 0.6$.