Code No: 153AX **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, September/October - 2023
FLUID MECHANICS
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Define Surface Tension.	[2]
b)	Differentiate between Absolute and gauge pressure.	[3]
c)	Define the Steady flow.	[2]
d)	Name the different forces present in a fluid flow.	[3]
e)	Distinguish between External mouthpiece and internal mouth piece.	[2]
f)	How are the weirs and Notches classified?	[3]
g)	What do you understand about turbulent flow?	[2]
h)	Define Reynold's number.	[3]
i)	Define Viscosity.	[2]
j)	What are the assumptions in Boundary Layer theory?	[3]

PART – B

(50 Marks)

2.a) How does the Viscosity of a fluid vary with temperature?
b) A plate 0.025 mm distant from a fixed plate, moves at 60 cm/s and requires a force of $2N/m^2$ to maintain this speed. Determine the fluid viscosity between the plates. [5+5]

OR

3.a) What do you mean by single column manometers? How are they used for the measurement of Pressure?
b) The pressure intensity at a point in a fluid is given 3.924 N/cm^2. Find the corresponding height of fluid when the fluid is : (i) water and (ii) oil of specific gravity 0.9. [5+5]

4.a) Differentiate Stream function and Velocity Potential function.
b) The velocity vector of a fluid flow is given by $V = 2x^3\,\mathbf{i} + 5x^2y\,\mathbf{j} + 4\,t\,\mathbf{k}$. find the velocity and acceleration of a fluid particle at (1,2,3) at time, t = 1. [5+5]

OR

5.a) What is Euler's equation of motion? How do you obtain Bernoulli's equation from it?
b) The water is flowing through a pipe having diameters 20 cm and 15 cm at sections **A** and **B** respectively. The rate of flow through pipe is 40 liters/s. The section, **A** is 6 m above datum line and section **B** is 3 m above the datum. If the pressure at section **A,** is 29.43 N/cm^2, find the intensity of pressure at section **B**. [5+5]

6.a) Prove the expression for discharge through an external mouthpiece is given by

$$Q = 0.855 * a * V$$

Where **a** = Area of mouthpiece at outlet and **V** = the velocity of jet of water at outlet.

b) A closed tank partially filled with water up to a height of 1m, having an orifice of diameter 20 mm at the bottom of the tank. Determine the pressure required for a discharge of 3.0 liters/sec through the orifice. Take coefficient of discharge, $C_d = 0.62$. [5+5]

OR

7. Water flows through a triangular right angled weir first and then over a rectangular weir of 1 m width. The discharge coefficients of the triangular and rectangular weirs are 0.6 and 0.7 respectively. If the depth of water over the triangular weir is 360 mm, find the depth of water over the rectangular weir. [10]

8.a) Derive the Darcy-Weisbach Equation.

b) The discharge through a pipe is 200 liters/sec. Find the loss of head when the pipe is suddenly enlarged from 150 mm to 300 mm diameter. [5+5]

OR

9. A pipe of diameter 300 mm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipe is 500 m. find the maximum power available at the outlet of the pipe, if the value of, **f** = 0.006. [10]

10. A crude oil of viscosity 0.97 Poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 150 mm and length of 10m. Calculate the difference of pressure at the ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. [10]

OR

11.a) What do you understand the terms Boundary layer, and Boundary layer theory?

b) What are the different methods of preventing the layers separation of boundary? [5+5]

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