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Total No. of Questions: 09 **Total No. of Pages: 02**

B. Tech. (CE) (Sem. 3)
FLUID MECHANICS-I
Subject Code: BTCE-301
Paper ID: A1113

Time: 3 Hrs. **Max. Marks: 60**

INSTRUCTIONS TO CANDIDATES:

1. **Section A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **Section B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **Section C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION A

1.

a) Which characteristics of fluid properties attribute to form spherical shape of a drop of a liquid?

b) If the absolute pressure at a point in a fluid flow domain is 150 kN/m^2 what will be the gauge pressure at that point?

c) When will be the streamline, pathline and streakline are identical?

d) Write the expression for the determination of acceleration of a fluid particle.

e) "A body floats in stable equilibrium when metacentre is above the centre of gravity of a body". Justify the statement with reasons.

f) What is the difference between the friction drag and pressure drag?

g) Write the expression for momentum correction factor.

h) What is the scale ratio for discharge in model analysis according to Froude's number?

i) Write the various components of orificemeter with a neat sketch.

j) Write an application of U-tube differential manometer.

SECTION B

2. Derive the expression for capillary rise or fall when a glass tube of small diameter is Inserted in a liquid.

3. A circular opening of 2 m diameter in the vertical side of a tank is closed by a disc of 2 m diameter which can rotate about the horizontal diameter. Calculate the force on the disc and the torque required to maintain the disc in equilibrium in vertical position when the head of water above the horizontal diameter of disc is 3 m.

4. The velocity components in a fluid flow are given as
$u = -4ax(x^2 - 3y^2)$;$v = -4ay(3x^2 - y^2)$. Find whether these velocity components represent a physically possible two dimensional flow.

5. A cylinder has a diameter 0.3 m and specific gravity of 0.75. What is the maximum permissible length required in order to float the cylinder in water with its axis vertical?

6. What are the guidelines generally followed for selection of repeating variables in Buckingham π method of dimensional analysis.

SECTION C

7. Water flows through a 0.9 m diameter pipe at the end of which there is a reducer connecting to a 0.6 m diameter pipe. If the gauge pressure at the entrance to the reducer is 411.02 kN/m^2 and the velocity is 2 m/s, determine the resultant thrust on the reducer assuming the frictional loss of head in the reducer is 1.5 m.

8. Derive the expression to determine the time required for the emptying of the rectangular tank with no inflow having an orifice at the bottom of the tank.

9. What is meant by Magnus effect? How does the circulation originate around an airfoil?