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## PRESIDENCY UNIVERSITY BENGALURU

**SET A**

### SCHOOL OF ENGINEERING END TERM EXAMINATION - JAN 2024

**Semester :** Semester III - 2022

**Date :** 04-JAN-2024

**Course Code :** MEC2010

**Time :** 9:30AM - 12:30 PM

**Course Name :** Fluid Mechanics

**Max Marks :** 100

**Program :** B.Tech.

**Weightage :** 50%

**Instructions:**

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

#### PART A

**ANSWER ALL THE QUESTIONS**

**4 X 5M = 20M**

1. Write the conditions of equilibrium of a floating body.

(CO1) [Knowledge]

2. Write the relationship between Velocity potential function and stream function.

(CO2) [Knowledge]

3. Define the term Buoyancy, and Metacentric height.

(CO3) [Knowledge]

4. State the working principle of Venturimeter and Orificemeter.

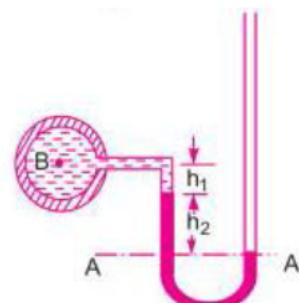
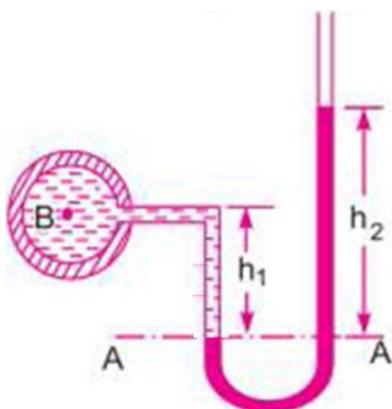
(CO4) [Knowledge]

#### PART B

**ANSWER ALL THE QUESTIONS**

**5 X 10M = 50M**

5. Derive the equation to measure the pressure at point B for the following case.



(CO1) [Comprehension]

6. Interpret the relation between Absolute, Gauge, Atmospheric and Vacuum pressures with a neat sketch.  
 (CO2) [Comprehension]
7. A water-flowing pipe has a diameter of 20 cm at cross section 1 and 15 cm at cross section 2, respectively. Section 1's water velocity is specified as 5 m/s. (1) At sections 1 and 2, locate the velocity head. (2) Determine the discharge rate at each section.  
 (CO3) [Comprehension]
8. Deduce the relationship between Compressibility and Bulk modulus.  
 (CO4) [Comprehension]
9. (a) A venturimeter with a 30 cm inlet diameter and a 10 cm throat diameter is passing oil with a specific gravity of 0.8 through it. The reading on the oil-mercury differential manometer is 25 cm. Determine how much oil will be released by the horizontal venturimeter. Let  $C_d$  equal 0.98.  
 (b) Determine the oil flow rate through a pipe when there is a 50mm mercury level disparity in a U-tube differential manometer attached to the two pitot tube tappings. Assume 0.7 sp. gr. of oil and a 0.98 coefficient of Pitot tube.  
 (CO4) [Comprehension]

## PART C

**ANSWER ALL THE QUESTIONS**

**2 X 15M = 30M**

10. (a) A hydraulic lift consist of 60 cm diameter ram and slides in a cylinder of diameter 60.02 cm, while the annular space is filled up with oil having kinematic viscosity of  $0.05 \text{ cm}^2/\text{s}$ , and specific gravity of 0.85. If the rate of travel of ram 10m/min. Find the frictional resistance when 3.85 m of ram is engaged in cylinder.  
 (b) Assume a cubical block of 20 cm side and of 20 kg weight is allowed to slide down along a plane inclined at 30 degree to the horizontal on which there is a film of oil having viscosity of  $2.16 \times 10^{-3}$ . What will be the terminal velocity of the block if the film thickness is 0.04mm?  
 (CO2) [Application]
11. (a) An orifice meter with orifice diameter 15cm is inserted in a pipe of 30cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50cm of mercury. Find the rate of flow of oil of sp. gr. 0.9 when the coefficient of discharge of the orifice meter is 0.64  
 (b) Determine the oil flow rate through a pipe when there is a 50mm mercury level disparity in a U-tube differential manometer attached to the two pitot tube tappings. Assume 0.7 sp. gr. of oil and a 0.98 coefficient of Pitot tube.  
 (CO4) [Application]