

Roll No. ....

Total Pages : 03

**BT-4/M-20**

**34026**

FLUID MECHANICS

ME-208-E

Time : Three Hours]

[Maximum Marks : 100

**Note** Attempt Five questions in all, selecting at least one question from each Unit. Assume any missing data suitably.

**Unit I**

1. (a) What is a fluid ? Discuss some important properties of fluid. **10**
- (b) A circular plate of 1 m diameter is immersed in water in such a way that its plane makes an angle of  $30^\circ$  with the horizontal and its top edge is 1.25 m below the water surface. Find the total pressure on the plate and the point where it acts.
2. (a) What is metacentric height ? What role does it play in stability of floating bodies ? **8**
- (b) Derive the continuity equation in Cartesian coordinates. **12**

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## Unit II

3. A venturimeter has its axis vertical, the inlet and throat diameters being 150 mm and 75 mm respectively. The throat is 225 mm above inlet and venturimeter constant is 0.96. Petrol of sp. gr. 0.78 flows up through the meter at a rate of  $0.029 \text{ m}^3/\text{s}$ . Find the pressure difference between inlet and throat. **20**
4. Explain how the contour of a half-body is obtained. For a volume of  $Q = 2/5 \text{ cm}^3$  per meter depth and a uniform flow velocity  $U_0 = 150 \text{ m/s}$ , calculate the maximum width of the half-body. **20**

## Unit III

5. A horizontal pipe of 5 cm diameter conveys an oil of specific gravity 0.9 and dynamic viscosity  $0.8 \text{ kg/ms}$ . Measurements indicate a pressure drop of  $20 \text{ kN/m}^2$  per metre of pipe length traversed. Make calculations for the (i) flow rate of oil and centre line velocity, (ii) wall shear stress and the frictional drag over 100 m of pipe length, (iii) power of pump required assuming an overall efficiency of 60 percent, (iv) the velocity and shear stress at 1 cm from the pipe surface. **20**

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6. Two pipes of diameters 400 mm and 200 mm are each 300 mm long. When the pipes are connected in series the discharge through the pipeline is 0.10 m<sup>3</sup>/s. Find the loss of head incurred. What would be the loss of head in the system to pass the same total discharge when the pipes are connected in parallel ? Take friction factor = 0.0075 for each pipe. **20**

#### Unit IV

7. (a) What is a boundary layer? Explain the salient features of boundary layer formation over a flat plate. **10**
- (b) What is meant by boundary layer separation? Discuss the methods to prevent it. **10**
8. Discuss the flow patterns and development of lift in a stationary circular cylinder. **20**