BT-4/M-20   **34118**
FLUID MECHANICS
ME-208-N

Time : Three Hours]   [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least

question from each Unit. Assume any missing data

suitably.

Unit I

1. (a) Define Viscosity. What are the causes of viscosity ?

7

(b) A U-tube mercury differential manometer is used to

measure the difference of pressure between inlet

throat of a venturimeter placed with its axis

horizontal in a pipeline. Calculate the difference in

pressure between inlet and throat when the

manometer reading is 250 mm and water flows

through the pipeline.   **8**

2. (i) Discuss the stability criteria of a floating body.

(2)L-34118   1

(ii) A rectangular plane surface 1 m wide and 3 m deep lies in water in such a way that its plane makes an angle of 30º with the free water surface. Determine the total pressure and position of centre of pressure when the upper edge is 2 m below the free surface.

10

Unit II

3. Derive the continuity equation in Cartesian coordinates.

15

4. A venturimeter with 150 mm diameter at inlet and 100 mm at throat is laid with its axis horizontal and is used for measuring the flow of oil of specific gravity 0.9. The oil mercury differential manometer shows a gauge difference of 200 mm. Calculate the discharge. Assume the coefficient of meter as 0.98. **15**

Unit III

5. Derive the Hagen-Poiseuille equation and state the assumptions made. **15**

6. The rate of flow of water pumped into a pipe ABC, which is 180 m long, is 0.05. The pipe is laid on an upward slope of 1 in 60. The length of the portion AB is 90 m and its diameter is 150 mm, while the length of the portion BC is also 90 m but its diameter is 300 mm. The

(2)L-34118 2

change of diameter at B is sudden. The flow is taking place from A to C where the pressure at A is 137.34 kN/m² and end C is connected to a closed end tank. Find the pressure at the discharge end C and sketch the total energy and the hydraulic gradient lines. **15**

Unit IV

7. Obtain an expression for the boundary shear stress in terms of momentum thickness. **15**

8. (i) What is meant by Magnus effect ? **5**

(ii) A metallic ball (sp. Gr. = 12) of 2 mm diameter is allowed to fall in fluid of sp. Gr 0.95 and kinematic viscosity 1.5 Ns/m². Determine (i) drag force, (ii) pressure drag and skin friction drag, (iii) terminal velocity of ball in fluid. **10**