B.Tech (Mechanical Engineering) (Sem.–4)
FLUID MECHANICS-I
Subject Code : ME-206
M.Code : 59015

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. **Write briefly :**

   a. Define vapour pressure.

   b. What is kinematic viscosity? Write their units of measurement.

   c. What do you understand by Pascal's law?

   d. Define the term Meta center and Metacentric height.

   e. Distinguish between compressible and incompressible flow.

   f. What do you understand by dimensionless numbers?

   g. Define equivalent pipe.

   h. What is the function of manometer?

   i. What is the difference between notch and weir?

   j. What do you understand by flow net?

SECTION-B

2. The space between two square flat parallel plates is filled with oil. Each side of the plate is 720 mm. The thickness of the oil film is 15 mm. The upper plate, which moves at 3 m/s requires a force of 120 N to maintain the speed. Determine :

   a) The dynamic viscosity of the oil;

   b) The kinematic viscosity of oil if the specific gravity of oil is 0.95.

3. State Newton's law of viscosity. What is the effect of temperature on viscosity of water and that of air?

4. Write down the five differences between free and forced vortex motions.

5. A stream function is given by ψ = 5x - 6y. Calculate the velocity components and also magnitude and direction of the resultant velocity at any point.

6. State Buckingham's π theorem. Why this theorem is considered superior over Rayleigh's method for dimensional analysis?

SECTION-C

7. A rectangular pontoon 10.0 m long, 7 m broad and 2.5 m deep weighs 686.7 KN. It carries on its upper deck an empty boiler of 5.0 m diameter weighing 588.6 KN. The center of gravity of the boiler and the pontoon are at their respective centers along a vertical line. Find the Meta centric height. Weight density of sea water is 10.104 KN/m³.

8. How will you determine the loss of head due to friction in pipes by using (a) Darcy formula and (b) Chezy's formula?

9. A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all loses of head which occur, determine the rate of flow. Take f = 0.1 for both sections of the pipe.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.