Roll No. | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(IE) (2008 Batch) / (ME) (Sem.–4)

FLUID MECHANICS-I

Subject Code : ME-206

Paper ID : [A0810]

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

INSTRUCTION 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 has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

1. Write briefly :

(a) Define compressibility and bulk modulus.

(b) What is metacentric height?

(c) What is circulation?

(d) Write continuity equation in polar coordinates.

(e) Write the four properties of stream function.

(f) What do you mean by dimensional homogeneity and what are its applications?

(g) What are various losses in pipes?

(h) Distinguish between orifice and mouthpieces.

(i) Define Euler number.

(j) What is Archimede's Principle?

SECTION-B

2. Derive an expression for calculating time of rolling of a floating body.

3. Does the velocity potential exist for the two dimensional incompressible flow prescribed by $u = x - 4y$ and $v = -(y + 4x)$

   If so determine its form as well as that of stream function.

4. A geometrically similar model of an air duct is built to 1/25 scale and tested with water which is 50 times more viscous and 800 times denser than air. When tested under dynamically similar conditions, the pressure drop is 2 bar in model. Find corresponding pressure drop in prototype and express in water column.

5. Derive an expression for the depth of centre of pressure from free surface of liquid of an inclined plane surface submerged in liquid.

6. Discuss the working of Rota meter in detail with the help of diagram.

SECTION-C

7. A solid cone (S = 0.8) diameter 36 cm and height 30 cm floats with its vertex downward in water. Calculate meta centric height. Is this cone in stable equilibrium?

8. Derive Darcy equation. What are the various head losses in pipes and pipe fittings?

9. The pressure difference in a pipe of diameter D and length 1 due to turbulent flow depends upon the velocity V, viscosity, density, and roughness k. Using Buckingham's pi theorem obtain an expression for pressure difference.