

**013305****Mar. 2022****B.Tech. (ME) III SEMESTER****Fluid Mechanics (ME-203C)**

Time : 90 Minutes]

[Max. Marks : 25

*Instructions :*

1. *It is compulsory to answer all the questions (1 mark each) of Part-A in short.*
2. *Answer any three questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

**PART-A**

1. (a) Define metacentric height. (1)
- (b) What is a 'flow-net'? Enumerate the methods of drawing flow nets. (1)
- (c) What do you understand by vorticity and circulation? (1)
- (d) What are the limitations of the Bernoulli's equation? (1)
- (e) What is the difference between a laminar flow and a turbulent flow? (1)

- (f) What do you mean by the separation of boundary layer? (1)
- (g) What do you understand by total energy line and hydraulic gradient line? (1)
- (h) What is an equivalent pipe? (1)
- (i) What is an open channel? (1)
- (j) Define hydraulic jump. (1)

**PART-B**

- 2. State and prove Pascal's law. (5)
- 3. Define continuity equation. Obtain an expression for continuity equation in a three-dimensional flow. (5)
- 4. What is venturimeter? Explain its working principle. Also obtain an expression for the discharge through it. (5)
- 5. Derive Hagen-Poiseuille equation and state the assumptions made. (5)
- 6. (a) Find the head lost due to friction in a pipe of diameter 0.15 m and length 60 m carrying water at a velocity of 2.5 m/s, using (i) Darcy-Weisbach formula and (ii) Chezy's formula for which  $C = 58$ . Take kinematic viscosity of water as 0.012 stoke. (2.5)

- (b) A rectangular channel is to be dug in the rocky portion of a soil. Find its most economical cross-section if it is to convey  $12 \text{ m}^3/\text{s}$  of water with an average velocity of 3 m/s. Take Chezy's constant  $C = 50$ . (2.5)

