

(3 Hours)

[Total Marks 80]

Note:

1. Question no.1 is compulsory
2. Solve any 3 questions out of remaining
3. Assume data wherever necessary and clearly mention the assumptions made.
4. Draw neat figures as required.

- 1 Answer any 4 questions out of following 20
- a. Define- density, Specific Volume, Specific Gravity and Viscosity
 - b. Explain Cipolletti Weir
 - c. Derive Pascal's Law
 - d. Explain Steady, Unsteady Flow & Uniform, Non Uniform Flow
 - e. Explain Borda's Mouthpiece
 - f. State Bernoulli's Equation & Derive it from Eulers Equation also mention assumptions made
- 2 a. A flat plate weighing 0.45 KN has a surface area of 0.1 m². It slides down an inclined plane at 30° to the horizontal, at a constant speed of 3 m/s. If the inclined plane is lubricated with an oil of viscosity 0.1 Ns/m², find the thickness of the oil. 10
- b. An orificemeter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter give readings of 14.715 N/cm² and 9.81 N/cm² respectively. Find the rate of flow of water through the pipe in litres/s. Take C_d = 0.6 10
- 3 a. State Condition of equilibrium for floating body. 05
- b. An oil of specific gravity 0.85 is contained in a vessel. At a point the height of oil is 35 m. Find the corresponding height of water at the point. 05
- c. A jet of water issues from a circular orifice 25 mm diameter, under a constant head of 1 m. it falls 35 mm vertically down and strikes the ground at a distance of 350 mm from the center of the vena contracta. If the discharge through the jet is 1.35 liters/s, find Coefficient of discharge, Coefficient of velocity and Coefficient of Contraction 10

- 4 a. A circular plate of 1 m diameter is immersed in water in such a way that its plane makes an angle of 30° 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. 10
- b. Derive the equation for discharge through large rectangular orifice 10
- 5 a. For the following stream functions calculate velocity at a point (1,2) 06
 1) $\Psi = 3xy$ 2) $\Psi = 3x^2y - y^3$
- b. Explain Stream function and Velocity Potential Function 04
- c. A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to inlet and throat is 10 cm of mercury. Determine the rate of flow. Take $C_d = 0.98$ 10
- 6 a. A solid cylinder 3 m in diameter and 4 m high is floating in water with its axis vertical. If its specific gravity is 0.6, find the metacentric height. Also state whether the equilibrium is stable or unstable. 10
- b. Derive the equation for discharge through Venturimeter. 10