GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) - EXAMINATION - SUMMER 2016

Subject Code:2153612

Subject Name: Basics of Fluid Flow

Time:02:30 PM to 05:00 PM

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.

Q.1	(a)	i.	Describe any four basic properties of fluid with their consistent units?	04
		ii.	Define Archemide's Principle with respect to submerged bodies.	03
	(b)	i.	Convert the pressure head of mercury into equivalent pressure head of	04
			water.	

- ii. Write a short note on equilibrium of floating bodies.
- 0.2 (a) Discuss the case of boundary layer separation for the case of fluid flowing over 07 a flat plate
 - (b) Find the density of a metallic body which floats at the interface of mercury of 07 specific gravity 13.6 and water such that 40% of its volume is submerged in mercury and remaining 60% is submerged in water.

OR

- (b) Explain the various scales of pressure measurement specifying a relationship 07 between them.
- With a neat sketch explain the main parts, design aspects and working principle 0.3 07 (a) of venturimeter? Derive the equation of discharge for horizontal venturimeter.
 - An iceberg floats in ocean such that one-eighth of its volume is above the **(b)** 07 surface. Find the specific gravity of iceberg with respect to the ocean water.

OR

- Q.3 (a) Explain the concept of flow in non-circular cross sections
 - 07 (b) An orifice meter consisting of 100mm diameter orifice in a 250mm diameter 07 pipe has a $C_d = 0.65$. The pipe delivers oil of specific gravity 0.8. The pressure difference on two sides of the orifice plate is measured by a mercury oil differential manometer. If the differential gauge reading is 800 mm of mercury, find the rate of flow in liters/sec.
- Derive a relationship to measure the pressure drop between two points in case 07 0.4 (a) of fluid flowing through a pipeline.
 - A fluid of viscosity 0.1 Ns/m^2 is flowing through a pipe of diameter 0.15 m at 07 **(b)** the rate of 0.01m^3 /s with the density 900kg/m^3 . The length of pipe is 1500m. Determine the power required to maintain the flow rate.

OR

- Write about i) Uniform flow ii) Stream tube iii) Reynolds Number 07 **Q.4** (a) iv) Drag v) Sphericity vi) Terminal settling velocity vii) Equivalent diameter
 - (b) Water is flowing through a pipe of 30 cm diameter with the average velocity of 07 2 m/sec and a pressure of 30 x 10^{-4} N/m². Determine the total head if the potential head is 6m.
- Q.5 What is the significance of macroscopic momentum balances? Explain how 07 **(a)** momentum correction factor is derived from the same?
 - (b) Write a short note on flow pattern in agitated vessels with the ways adopted for 07 prevention of swirling?

03

Date:06/05/2016

- Q.5 (a) A Flat blade turbine with six blades is installed centrally in a tank. The tank is 1.83 m in diameter with turbine 0.61m and positioned 0.61m from the bottom of the tank. The turbine blades are 127mm wide. The tank is filled up to a depth of 1.83 m with a solution of 50% caustic soda at 65.6 °C having a viscosity of 12 cp having a density of 1498 kg/m³. The turbine is operated at 90 rpm. The tank is baffled. What is the power requirement to operate the mixer? Assume the value of $N_P = 5$.
 - (b) Explain the concept of Fluidization deriving an expression for minimum **07** fluidization velocity? Mention the concept of minimum fluidization velocity?
