DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Winter Examination – 2022

Course: B. Tech.   **Branch: Mechanical Engg.**   **Semester : III**

Subject Code & Name: BTMC302 / Fluid Mechanics

Max Marks: 60   **Date: 11 Mar 2023**   **Duration: 3 Hr.**

Instructions to the Students:
1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Attempt the following.**		**12**
A)	Describe any three terms: 1) Density, 2) Pascal's Law, 3) Specific Gravity, 4) Surface Tension, 5) Mach number and its significance	Understand	6
B)	i) Calculate the capillary rise in a glass tube of 2.0 mm diameter when immersed vertically in (a) water and (b) Mercury. Take surface tension = 0.08 N/m for water and 0.5 N/m for mercury in contact with air. The specific gravity of mercury is 13.6 and angle of contact is 120º. ii) A hydraulic press has a ram of 20 cm diameter and plunger of 3 cm diameter. It is used to lift a weight of 30 kN. Find the force required at the plunger.	Evaluate	6
C)	What is the purpose of a manometer? Describe the various types of manometers along with neat schematics and its working.	Understand	6
Q.2	**Solve Any Two of the following.**		**12**
A)	A rectangular vertical plane surface is 2 m wide and 3 m deep. Determine the total pressure force and position of centre of pressure on the plane surface when its upper edge is horizontal and coincides with water level. Also determine the force and centre of pressure position when the top edge of plane surface is 2.5 m below the water level.	Evaluate	6
B)	Describe the conditions of stability of floating as well as submerged bodies along with neat schematic and tabular presentation.	Understand	6
C)	A rectangular block is 5.0 m long, 3 m wide and 1.2 m high. The depth of immersion of the block is 0.8 m in the sea water. If the centre of gravity is 0.6 m above the bottom of the block, determine the Metacentric height. Assume density of sea water as 1025 kg/cu. m.	Analyze and Evaluate	6
Q. 3	**Attempt any two of the following**		**12**
A)	Derive the Bernoulli's equation with the help of Euler's equation. Also discuss the significance of each terms of Bernoulli's equation.	Understand	6
B)	An oil of viscosity 0.1 Ns/m² and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 300 m. The rate of flow of fluid through the pipe is 3.5 litres/s. Find the pressure drop in a length of 300 mm and also the shear stress at the pipe wall.	Analyze and Evaluate	6
C)	A 0.30 m × 0.15 m Venturimeter is inserted in a vertical pipe of diameter 0.30 m. The throat size is 0.15 m. The water is flowing through the pipe in the upward direction. A differential mercury manometer connected to the inlet and throat of Venturimeter gives a reading of 0.2 m. Find the flow rate of water (Assume, C_d = 0.98).	Evaluate	6

Q.4 **Attempt any two of the following** — 12

A) Describe in detail the various types of major and minor losses in pipes. — Understand — 6

B) Explain: i) Dimensional Homogeneity and ii) Raleigh's method — Understand — 6

C) Explain: i) Water hammer effect in pipes, ii) Hydraulic gradient line and Total gradient line — Remember — 6

Q. 5 **Attempt the following** — 12

A) Describe Reynolds experiment with the help of neat sketches along with the significance of Reynolds number. — Understand — 6

B) Three pipes of lengths 800m, 500m, and 400 m and of diameters 50 cm, 40 cm and 30 cm, respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700 m. Find the diameter of single equivalent pipe. — Analyze and Evaluate — 6

*** End ***