Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III • EXAMINATION – SUMMER 2013

Subject Code: 130101   **Date: 29-05-2013**
Subject Name: Fluid mechanics
Time: 02.30 pm - 05.00 pm   **Total Marks: 70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Define following (any seven)   **07**
- Density
- Dynamic viscosity
- Kinematic viscosity
- Capillary
- Bulk modulus of elasticity
- Surface tension
- Vapor presser
- Cavitation
- Cohesion
- Adhesion

(b) A plate 0.05 mm distance from a fixed plate moves at 1.2 m/s and requires a force **04**
of 2.2 N/m^2 to maintain this speed, find the viscosity of the fluid between the plates

(c) A soap bubble 62.5 mm diameter has an internal pressure in excess of the outside **03**
pressure of 20 N/m^2 . what is the tension in soap film?

Q.2 **(a)** Define atmospheric pressure, gauge pressure and absolute pressure. State and **07**
prove Pascal's Law with usual notations

(b) Define manometer. List different types of manometer. Explain single column **07**
manometer with usual notation. State advantages and limitations of manometer.

OR

(b) Explain   **07**
- bourden tube pressure gauge.
- Diaphragm gauge

Q.3 **(a)** Define metacenter and metacentric height. Explain method for determination of **07**
metacentric height.

(b) A wooden block of specific gravity 0.75 floats in water. If the size of the block is 1 **07**
m X 0.5 m X 0.4 m, find its metacentric height.

OR

Q.3 **(a)** For inclined immersed surface derive with usual notations, expression for total **07**
pressure and center of pressure

(b) An isosceles triangular plate of base 3 m and altitude 3 m is immersed vertically in **07**
an oil of specific gravity 0.8. the base of plate coincides with the free surface of oil.
Determine total pressure on the plate

Q.4 **(a)** Differential between   **07**
- steady and unsteady flow
- uniform and non-uniform flow
- rotational and irrotational flow.

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(b) Define rate of flow. Derive continuity equation **07**

OR

Q.4 **(a)** State assumptions for Bernoulli's equations. Derive Bernoulli's equations **07**

(b) The water is flowing through a tapering pipe having diameters 300 mm and 150 mm at section 1 and section 2 respectively. The discharge through the pipes is 40 liters / sec. The section 1 is 10 m above datum and section 2 is 6 m above datum. Find the intensity of pressure at section 2 if that at section 1 is 400 kN/m^2 **07**

Q.5 **(a)** Explain Buckingham's π theorem for dimensional analysis. **07**

(b) The pressure difference p in a pipe of diameter D and length l due to turbulent flow depends on the velocity V, viscosity , density and roughness k. Using Buckingham's π theorem, obtain an expression for p. **07**

OR

Q.5 **(a)** Obtain relationship between shear stress and pressure gradient for laminar flow **07**

(b) Obtain expression for loss of head due to friction in pipe flow **07**

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