

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 pressure
 - Cavitation
 - Cohesion
 - Adhesion
- (b)** A plate 0.05 mm distance from a fixed plate moves at 1.2 m/s and requires a force of 2.2 N/m^2 to maintain this speed, find the viscosity of the fluid between the plates **04**
- (c)** A soap bubble 62.5 mm diameter has an internal pressure in excess of the outside pressure of 20 N/m^2 . what is the tension in soap film? **03**
- Q.2 (a)** Define atmospheric pressure, gauge pressure and absolute pressure. State and prove Pascal's Law with usual notations **07**
- (b)** Define manometer. List different types of manometer. Explain single column manometer with usual notation. State advantages and limitations of manometer. **07**
- OR**
- (b)** Explain **07**
- Bourdon tube pressure gauge.
 - Diaphragm gauge
- Q.3 (a)** Define metacenter and metacentric height. Explain method for determination of metacentric height. **07**
- (b)** A wooden block of specific gravity 0.75 floats in water. If the size of the block is 1 m X 0.5 m X 0.4 m, find its metacentric height. **07**
- OR**
- Q.3 (a)** For inclined immersed surface derive with usual notations, expression for total pressure and center of pressure **07**
- (b)** An isosceles triangular plate of base 3 m and altitude 3 m is immersed vertically in an oil of specific gravity 0.8. the base of plate coincides with the free surface of oil. Determine total pressure on the plate **07**
- Q.4 (a)** Differential between **07**
- steady and unsteady flow
 - uniform and non-uniform flow
 - rotational and irrotational flow.

(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 μ , density ρ 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
