

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– III (NEW) EXAMINATION – SUMMER 2015

Subject Code: 2130602

Date: 04/06/2015

Subject Name: Fluid Mechanics

Time: 02.30pm-05.00pm

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 the terms: (1) kinematic viscosity (2) surface tension (3) specific gravity (4) specific weight (5) Ideal fluid (6) capillarity (7) Newtonian fluid **07**
- (b) A square plate of size 1m x 1m and weighing 500 N slides down an inclined plane with a uniform velocity of 2 m/s. The plane makes an angle of 30° to the horizontal and has oil film of 1.5 mm thickness. Find the dynamic viscosity of oil. **07**
- Q.2** (a) State Pascal's law of pressure and prove it. **07**
- (b) Absolute pressure at a point is 30 kPa. Convert this pressure in terms of gauge pressure. Also calculate the corresponding height in terms of oil of specific gravity 0.9 for both of the above values. Take atmospheric pressure = 101.39 **07**
- OR**
- (b) Write a short note on (1) piezometer & (2) inverted U-tube differential manometer with neat sketches. **07**
- Q.3** (a) Rectangular lamina of size 3m x 5m is immersed vertically in water such that 5m side is parallel and lies below 1m to the free water surface. Determine the total hydrostatic force and centre of pressure. **07**
- (b) Discuss the equilibrium conditions for floating and submerged bodies with proper sketches. **07**
- OR**
- Q.3** (a) Briefly discuss about (1) uniform and non-uniform flow (2) velocity potential function & (3) uses of flow net. **07**
- (b) Tapering pipe has diameters of 40 cm and 25 cm at two different sections. Oil of specific gravity 0.85 flows through it. If the velocity of flow at 25 cm section is 3 m/s and pressure is 200 kPa, determine the pressure at the other end. Assume pipe is laid horizontal and losses are negligible between two sections. **07**
- Q.4** (a) Open cylindrical tank of 15 cm diameter and 35 cm deep contains water upto the brim. Tank is rotated at 400 rpm about its vertical axis. Determine the volume of water left in the tank. **07**
- (b) Give derivation of Bernoulli's equation from Euler's equation of motion. Enumerate assumptions made in derivation and explain the meaning of each term of Bernoulli's equation. **07**
- OR**
- Q.4** (a) Derive the equation for determining the discharge from Borda's mouthpiece running full. **07**
- (b) Briefly discuss about drag force and lift force. Explain the types of drag. **07**
- Q.5** (a) Define various hydraulic coefficients. How to determine coefficient of velocity experimentally? **07**

- (b) A tank has two identical orifices in one of its vertical side. The upper and lower orifices are 3m and 5 m below the water surface respectively. Determine the point of intersection of two jets if coefficient of velocity is 0.92 for both the orifices. **07**

OR

- Q.5** (a) Classify various types of notches. Derive the equation for discharge through a rectangular notch. **07**
- (b) Define Mach number. Give classification and explanation of the type of flow based on Mach number. **07**
