

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

Subject Code: 130602**Date: 30-11-2013****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.
4. Draw neat sketch where ever necessary.

- Q.1** (a) Enlist the properties of fluid and explain any three of them in detail. **07**
 (b) Determine the dynamic viscosity of an oil used for lubrication between a plate 1.0m X 0.4m and an inclined plane inclined at 30°. The weight of plate is 600 N and it slide down the inclined plane with a uniform velocity of 0.35 m/sec. Thickness of oil film is 2 mm. **07**
- Q.2** (a) Define atmospheric pressure. Enlist different types of pressure and explain how atmospheric pressure is measured by various devices. **07**
 (b) The pressure intensity at a point in a fluid is given 5 N/cm². Find the corresponding height of fluid when fluid is (i) water (ii) oil of sp. Gravity=0.80 and (iii) kerosene of sp. Gravity = 0.74 **07**
- OR**
- (b) A trapezoidal channel 2m wide at the bottom is a 1.5m deep has side slopes 1:1. Determine total pressure and centre of pressure on a vertical gate of channel when it is full of water. **07**
- Q.3** (a) What is metacentre ? Explain how metacentric height is determined analytically. **07**
 (b) State the Archimedes principle and determine the density of a metallic body which floats at the interface of mercury and water. The sp. Gravity of mercury is 13.6 gm/cm³. The body floats at the interface such that 40% of its volume is submersed in mercury and 60% in water. **07**
- OR**
- Q.3** (a) A rectangular open tank 3m x 2m x 1.5m deep is filled with oil of sp. Weight of 85 kN/m³ up to a depth of 1.0m. Find the force acting on side of tank when
 (i) Tank moves upward with acceleration = g/2
 (ii) Tank moves downward with acceleration = g/4
 (iii) Tank moves downward with acceleration = g **07**
 (b) Explain with sketch stable, unstable and neutral equilibrium of floating body. **07**
- Q.4** (a) Derive the continuity equation
 $\partial u/\partial x + \partial v/\partial y + \partial w/\partial z = 0$ in three dimension. **07**
 (b) Write characteristics of flow net, uses of flow net and limitations of flow net. **07**
- OR**
- Q.4** (a) State the Bernoulli's equation and write the assumption made in it. **07**
 (b) The top and bottom diameters of 3m long vertical pipe are 10cm and 5cm respectively. Water flows down the pipe at 40 lit/sec. Calculate the pressure difference between two ends of pipe. **07**
- Q.5** (a) A pipe 25cm in diameter and 60m long conveys water at a velocity of 3 m/sec. Calculate the head loss in friction using (i) Darcy – weisbach formula and (ii) Chezy's formula. Take f = 0.006 and C = 55. **07**

- (b) Explain with sketch the Hydraulic grade line, Total energy line and Equivalent pipe. 07

OR

- Q.5** (a) Classify different types of orifices according to its size, shape, discharge condition and shape of edge. Explain each in brief. 07
- (b) Define Notch and Weir and find the Constant of notch for a right angled triangular notch with 60 lit/min discharge. The head of sill measured was 60mm 07

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