Seat No.: _____ Enrolment No._____

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/cm^2 . 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 slide 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/cm^3. 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/m^3 up to a depth of 1.0m. Find the force acting on side of tank when **07**

(i) Tank moves upward with acceleration = g/2

(ii) Tank moves downward with acceleration = g/4

(iii) Tank moves downward with acceleration = g

(b) Explain with sketch stable , unstable and neutral equilibrium of floating body. **07**

Q.4 **(a)** Derive the continuity equation **07**

$\partial u/\partial x + \partial v/\partial y + \partial w/\partial z = 0$ in three dimension.

(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 dimensions 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 – wesbach 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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