Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – SUMMER 2016

Subject Code:130602 **Date:14/06/2016**

Subject Name:Fluid Mechanics

Time:10:30 AM to 01:00 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 the following terms: **07**
Specific weight, Relative density, Cohesion, Pressure, Capillarity, Steady flow, Streamline.

(b) State and explain: Newton's law of viscosity. **07**
A rectangular plate, 0.7m X 0.4m, weighing 750N slides down a 30˚ inclined surface at a uniform speed of 1.1m/s. If the 2mm gap between the plate and the inclined surface is filled with castor oil, determine the viscosity of the oil.

Q.2 **(a)** Enlist different types of manometer. Explain, with suitable sketch, working of a differential U-tube manometer. **07**

(b) State and explain 'Bernoulli's theorem'. What are the assumptions in Bernoulli's theorem? Write Bernoulli's equations for real fluid and ideal fluid. **07**

OR

(b) Differentiate between the following: **07**
(i) Absolute pressure and Gauge pressure
(ii) Rotational flow and Irrotational flow
(iii) Source and Sink

Q.3 **(a)** State and explain: Hydrostatic law of pressure variation. **07**
Compute the pressure at the bottom of the tank, 2m diameter, filled with water to a depth of 3m. Also, work out the absolute pressure at the bottom, if the local atmospheric pressure head is 75cm of mercury.

(b) Explain the terms: Metacenter, Center of buoyancy. **07**
What are the different stability conditions for the floating body? Discuss each of them in detail.

OR

Q.3 **(a)** Derive an equation for the discharge passing over a rectangular notch and show that percentage error in estimation of discharge is 1.5 times the percentage error in head measurement. **07**

(b) Explain: Center of pressure **07**
Determine the pressure force and the position of centre of pressure on a circular plate 1m diameter which is placed vertically in water in such a way that the centre of plate is 2m below the free surface

Q.4 **(a)** An oil of specific gravity 0.9 flows through a Venturimeter (VM) with inlet diameter of 15cm and throat diameter 7.5cm. The mercury manometer connected between the inlet and throat of VM shows a deflection of 15cm. Calculate the discharge of the oil, coefficient of discharge of VM C_d = 0.95. **07**

(b) Show that the equipotential lines and streamlines are orthogonal to each other. What are the uses of flownet? **07**

OR

Q.4	**(a)**	Differentiate between ‘Major’ and ‘Minor’ energy losses, for the flow through pipes. Explain, Total Energy Line (TEL) and Hydraulic Grade Line (HGL). Also sketch TEL and HGL for the flow through a Venturimeter.	**07**
	(b)	What are different devices used for the measurement of flow through pipes? Enlist the components of a Venturimeter and explain the functions of one of them.	**07**
Q.5	**(a)**	Define: Mach number. Classify the compressible flow based on Mach number. If an aircraft moves with a speed of 250kmph through an atmosphere where velocity of sound is 330m/s, find the Mach number. What type of flow it represents?	**07**
	(b)	State: Momentum principle. Starting from Newton’s second law of motion, obtain an equation for momentum principle. Discuss different applications of momentum principle.	**07**

OR

Q.5	**(a)**	How does an orifice differ from a mouthpiece? State different hydraulic coefficient of an orifice and obtain the relation between them.	**07**
	(b)	Discuss, with the help of a representative sketch, propagation of sound for the flow having Mach number less than one.	**07**

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