Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(New) EXAMINATION – SUMMER 2016

Subject Code:2130101 **Date:09/06/2016**

Subject Name:Fundamentals of 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.**

			MARKS
Q.1		**Define the following terms:**	**14**
	1	Hydrostatic paradox	
	2	Buoyancy	
	3	Metacentric height	
	4	Turbulent flow	
	5	Surface tension	
	6	Laminar flow	
	7	Steady flow	
	8	Non uniform flow	
	9	Streak line	
	10	Stream tube	
	11	Path line	
	12	Viscosity	
	13	Geometric similarity	
	14	Discharge	
Q.2	**(a)**	Find the pressures due to the following in *Pa* (Pascals) (i) 40 cm of water (ii) 80 cm of oil whose specific gravity is 0.8 (iii) 20 cm of *Hg*	**03**
	(a)	State Newton's law of viscosity and give examples of its application.	**04**
	(b)	Differentiate between the following and state application of following pressure measuring devices. (i) Manometers and mechanical gauges (ii) U-tube differential manometer and inverted U-tube manometer	**07**
		OR	
	(b)	Explain with sketch stable , unstable and neutral equilibrium of floating body.	
Q.3	**(a)**	Differentiate between (i) Real fluid – ideal fluid (ii) Cohesion – adhesion (iii) Specific weight – mass density	**03**
	(b)	Calculate the capillary effect in a glass tube of 4 mm diameter when inserted in (i) water (ii) mercury. The value of surface tension of water and mercury is *0.075 N/m* and *0.52 N/m* respectively. The contact angle may be taken as 0° and 130° for water and mercury respectively.	**04**
	(c)	State Hydrostatic law. Derive equation for variation of pressure vertically for a fluid under the gravity.	**07**
		OR	
Q.3	**(a)**	What is orifice and mouthpiece? What is its use?	**03**
	(b)	The stream function for a flow field is given by $\Psi = 2xy$. Show that the flow is continuous and irrotational.	**04**

	(c)	Derive continuity equation for three dimensional incompressible flow.	**07**
Q.4	**(a)**	What is pitot tube? How velocity at any point is determined by pitot tube ?	**03**
	(b)	A converging pipe of 30 cm and 15 cm diameter carrying water is positioned inclined whose inlet and outlet are 6 m and 1 m above the datum. The pressure at inlet is 1.5 bar and velocity is 5 m/s. Find the pressure of water at the outlet of the pipe. Neglect the losses.	**04**
	(c)	Derive Euler's equation of motion stating all assumptions made. Also derive Bernoulli's equation from Euler's equation of motion.	**07**

OR

Q.4	**(a)**	How to determine coefficient of velocity experimentally?	**03**
	(b)	Differentiate between the following in brief: (i) Rotational flow and Ir-rotational flow (ii) Compressible flow and Incompressible flow	**04**
	(c)	Write a note on Principle of Venturimeter and derive an equation for theoretical discharge.	**07**
Q.5	**(a)**	Give the dimensions in M L T system for the following: (i) Energy (ii) Power (iii) Mass Flow rate (iv) Dynamic viscosity (v) Bulk modulus (vi) Surface tension	**03**
	(b)	State Buckingham's theorem and mention the advantages of dimensional analysis.	**04**
	(c)	Discuss different similarity conditions for the model similitude.	**07**

OR

Q.5	**(a)**	What do you understand by repeating variables? How the repeating variables are selected in dimensional analysis technique.	**03**
	(b)	Define Reynolds's number and give its significant. Explain reynold experiment with neat sketch.	**04**
	(c)	Derive Hagen-Poiseuille equation for laminar flow in the circular pipe.	**07**

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