Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – WINTER • 2014

Subject Code: 143403 **Date: 31-12-2014**

Subject Name: Fluid Mechanics and Machinery

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.**

Q.1	**(a)**	Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid.	**07**
	(b)	Derive the momentum equation and moment of momentum equation.	**07**
Q.2	**(a)**	Derive Euler's equation of motion along a stream line for an ideal fluid stating clearly the assumption.	**07**
	(b)	Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air?	**07**
		OR	
	(b)	Differentiate between: 1) Liquids and gases; 2) Real fluid and ideal fluid; 3)Specific weight and specific volume of a fluid	**07**
Q.3	**(a)**	How will you determine the loss of head due to friction in pipes by using Darcy formula?	**07**
	(b)	Define and explain the terms: 1) Hydraulic gradients; 2) Total energy line	**07**
		OR	
Q.3	**(a)**	Prove that the head loss due to friction is equal to one-third of the total head at inlet for maximum power transmission through pipes.	**07**
	(b)	Explain the terms: 1) Pipes in parallel; 2) Equivalent pipe; 3) Equivalent size of pipe.	**07**
Q.4	**(a)**	Discuss the performance curves for centrifugal pumps.	**07**
	(b)	Define the specific speed of a turbine. Derive expression for the Specific speed.	**07**
		OR	
Q.4	**(a)**	Water is flowing through a pipe of diameter 30 cm at a velocity of 4 m/s. Find the velocity of oil flowing in another pipe of diameter 10 cm, if the condition of dynamic similarity is satisfied between the two pipes. The viscosity of water and oil is given as 0.01 poise and 0.025 poise. The Sp. Gravity of oil = 0.8.	**07**
	(b)	Calculate the capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in (a) water and (b) mercury. Take surface tensions σ = 0.0725 N/m and σ = 0.52 N/m for mercury in contact with air. The specific gravity for mercury is given as 13.6 and angle of contact = 130°.	**07**
Q.5	**(a)**	Discuss the performance curves for hydraulic turbines.	**07**
	(b)	Define indicator diagram. How will you prove that area of indicator diagram is proportional to the work done by the reciprocating pump?	**07**
		OR	
Q.5	**(a)**	State the Buckingham's π theorem. What do you mean by repeating variables?	**07**
	(b)	What do you mean by Dimensionless number? Explain any three dimensionless numbers.	**07**

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