Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 713003N **Date: 12-01-2013**

Subject Name: Advance Fluid Flow Operation

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)**	Derive $v_H / v_L = 1 -- x / 1 -- \beta$ for two phase flow. where v_H : specific volume of Homogeneous phase v_L : specific volume of Liquid phase x : dryness fraction β : ratio of gas volume flow rate to total volume flowrate	**07**
	(b)	Discuss about various flow patterns in vertical pipes for two phase flow.	**07**
Q.2	**(a)**	Discuss in detail about two phase flow pattern map of Hewiit and Roberts for vertical pipes.	**07**
	(b)	Discuss any two models of Non-Newtonian fluid in detail.	**07**
		OR	
	(b)	Discuss in detail about two phase flow pattern map of Taitel and Duckler for horizontal pipes.	**07**
Q.3	**(a)**	Explain principle, design and method of calculating viscosity using Plate and Cone Viscometer.	**07**
	(b)	A solution of sodium hydroxide of density 1650 kg/m^3 and viscosity 50 mN s/m^2 is agitated by a propeller mixer of 0.5 m diameter in a tank of 2.28 m diameter, and the liquid depth is 2.28 m. The propeller is situated 0.5 m above the bottom of tank. What is the power which the propeller must impart to the liquid for a rotational speed of 2 Hz.	**07**
		OR	
Q.3	**(a)**	Write in detail on types of mixing.	**07**
	(b)	Explain the concepts of suction lift, cavitations and priming for the centrifugal pumps.	**07**
Q.4	**(a)**	Discuss about types of fluidization.	**07**
	(b)	Write a note on CFD and its application in chemical engineering.	**07**
		OR	
Q.4	**(a)**	Discuss about application of jet in vacuum system.	**07**
Q.4	**(b)**	Write a note on centrifugal blowers.	**07**
Q.5	**(a)**	Derive the expression for the ratio of area occupied by the gas phase to the entire pipe for two phase flow?	**07**
	(b)	Explain how is solid-solid and liquid – solid mixing achieved?	**07**
		OR	
Q.5		A single acting compressor supply 0.1 m^3/s of air measured at 273 K and 101.3kN/m^2 is compressed to 390kN/m^2, if the suction temperature is 289 K, the stroke is 0.25 m, and the speed is 4.0 Hz, what is the cylinder diameter? Assuming the cylinder clearance is 4 per cent and compression and re compression are isentropic (γ = 1.4), what are the theoretical power requirement for the compressor?	**14**

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