

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. **07**
 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
- (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 Hewitt 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 $0.1 \text{ m}^3/\text{s}$ of air measured at 273 K and 101.3 kN/m^2 is compressed to 390 kN/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 ($\gamma = 1.4$), what are the theoretical power requirement for the compressor? **14**
