

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – WINTER 2013****Subject Code: 153502****Date: 29-11-2013****Subject Name: Basics of Mass Transfer****Time: 10:30 pm 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) State dimensions and SI units of viscosity, heat capacity, and molar flux. Convert 1 centipoise, 1 cal/g °C, and 1 mol/cm² s to corresponding SI units. **07**

(b) What is Fick's law of diffusion? Derive an integrated equation to compute the molar flux of gas A diffusing through gas B in equimolar counterdiffusion. **07**

Q.2 (a) Define humidity, percentage relative humidity, humid heat, and dew point with pertinent equations. **07**

(b) Define liquid extraction. What are different stages in the process of liquid extraction? Draw a schematic diagram to explain these stages. Explain binodal solubility curve. **07**

OR

(b) Define leaching and give at least two industrial applications of the process. Describe the effect of various factors on the rate of leaching. Explain the terms overflow and underflow. **07**

Q.3 (a) With the help of neat diagrams describe horizontal tube and vertical tube natural circulation evaporators. **07**

(b) Describe the process of binary distillation with the help of a T-xy diagram. **07**

OR

Q.3 (a) What do you mean by single effect evaporator? Write mass and heat balance equations for a single effect evaporator. **07**

(b) Define the term relative volatility (α) and hence derive the following equation for a binary system $y = \frac{\alpha x_A}{1 + (\alpha - 1)x_A}$ **07**

Q.4 (a) Write Henry's law and Raoult's law. Derive a relation between individual and overall mass transfer coefficients according to two film theory. **07**

(b) Describe flash distillation with the help of a neat diagram. What is the importance of reflux ratio in fractional distillation? **07**

OR

Q.4 (a) What are bound, unbound, critical, and equilibrium moisture contents of a solid? **07**

(b) Describe with a schematic diagram circulating-magma vacuum crystallizer. **07**

Q.5 (a) Describe with a diagram drying curve. **07**

(b) Describe with a schematic diagram circulating-liquid evaporator crystallizer. **07**

OR

Q.5 (a) What are the advantages of membrane separation processes? Give any three membrane separation processes and mention their driving forces. **07**

(b) With the help of two film theory explain the phenomena of mass transfer with a moderately fast chemical reaction. Draw appropriate diagram. **07**
