

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. Sem. – IInd - Examination – June/July- 2011****Subject code: 1721608****Subject Name: Separation Techniques****Date: 01/07/2011****Time: 10:30 am – 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) Packed tower type scrubber is required for the following **10**
duty.

- (i) Feed gas : 80 kg/h Cl_2 + 320 kg/h air
- (ii) Solvent : 15% NaOH solution
- (iii) Specific heat of solvent : 0.9 kcal/(kg.°C)
- (iii) Concentration of Cl_2 in exit gas : 40 ppm
- (iv) Chemical Reactions :



$$\Delta H_R = -24.65 \text{ kcal/mol}$$

Calculate :

- (a) Amount of solvent required. Tower diameter required for this scrubber is 0.4 m.
 - (b) Calculate the number of overall gas phase transfer unit.
 - (c) Calculate the height of packing required. Mass transfer coefficient, $K_{Ga} = 272 \text{ kmol}/(\text{m}^3 \cdot \text{h})$.
Atomic mass of Na:23, O:16, H:1, Cl:35.5
- (b)** Discuss the selection criteria of Tray Tower as absorber. **04**

- Q.2 (a)** Explain with neat sketch the working of BATCH SUPER CRITICAL EXTRACTION UNIT and discuss about the effect of cosolvent or modifier on super critical extraction. Explain with neat sketch the working of BATCH SUPER CRITICAL EXTRACTION UNIT and discuss about the effect of cosolvent or modifier on super critical extraction. Also list out the commercial applications of the same. **07**
- (b)** Discuss advantages and disadvantages of reactive / catalytic distillation over conventional reaction followed by distillation **07**

OR

- (b)** Discuss about the various types of contacting devices use in catalytic Distillation. **07**

- Q.3** Explain with neat sketch the working of Short Path Distillation Unit and discuss how the most gentle conditions for the distillation of heat sensitive products are obtained in the same. Also list out commercial applications of Short Path Distillation. **14**
- OR**
- Q.3** Explain with neat flowsheet Residuum Oil Supercritical Extraction (ROSE) process. Also discuss about the advantages and disadvantages of this process over conventional propane deasphalting process. **14**
- Q.4** Explain with neat flowsheet working of six bed Pressure Swing Adsorption used for recovery or purification of hydrogen from gas mixture. Also discuss about the advantages and disadvantages of the same over cryogenic distillation. **14**
- OR**
- Q.4** Explain with neat flowsheet working of Pressure Swing Adsorption used for production of nitrogen. Also list out Various commercial applications of Pressure Swing Distillation. **14**
- Q.5** Discuss working principle of Reverse Osmosis and its industrial applications. **14**
- OR**
- Q.5** Write short notes on following.
- (a) Ultra Filtration **07**
- (b) Pervaporization **07**
