

**GUJARAT TECHNOLOGICAL UNIVERSITY****M.E –II<sup>st</sup> SEMESTER–EXAMINATION – JULY- 2012****Subject code: 1721608****Date: 14/07/2012****Subject Name: Inter Disciplinary Elective II Separation Techniques****Time: 10:30 am – 13:00 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 duty. **10**
- (i) Feed gas : 15 kg/h HCl + 15 kg/h Cl<sub>2</sub> + 600 kg/h air
- (ii) Solvent : 10% NaOH solution
- (iii) Concentration of HCl and Cl<sub>2</sub> in exit gas: 20 mg/m<sup>3</sup>.
- (iv) Chemical Reactions :
- $$2\text{NaOH} + \text{Cl}_2 \rightleftharpoons \text{NaOCl} + \text{NaCl} + \text{H}_2\text{O}$$
- $$\Delta H_R = -24.65 \text{ kcal/mol}$$
- $$\text{NaOH} + \text{HCl} \rightleftharpoons \text{NaCl} + \text{H}_2\text{O}$$
- $$\Delta H_R = -31.4 \text{ kcal / mol}$$
- Calculate :
- (a) Amount of solvent required. Tower diameter required for this scrubber is 0.36 m.
- (b) Calculate the number of overall gas phase transfer unit.
- (c) Calculate the height of packing required. Mass transfer coefficient, K<sub>G</sub>=272 kmol/(m<sup>3</sup>.h)
- Atomic mass of Na:23, O:16, H:1, Cl:35.5
- (b)** Discuss the selection criteria of Packed tower as absorber. **04**
- Q.2 (a)** Write the advantages and disadvantages of supercritical solvent over conventional liquid solvent. **07**
- (b)** Discuss advantages and disadvantages of reactive / catalytic distillation over conventional reaction followed by distillation **07**
- OR**
- (b)** Discuss with neat flowsheet about Decaffeination of coffee via super critical extraction. **07**
- Q.3** Discuss working principle of Reverse Osmosis and its Industrial applications... **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 two bed and four bed Pressure Swing Adsorption. Also discuss about the advantages and disadvantages of the same over cryogenic distillation. **14**
- OR**
- Q.4** Discuss working principle of Ultra Filtration and its Industrial applications. **14**
- Q.5** Discuss working principle of Pervaporization and its Industrial applications. **14**
- OR**
- Q.5** Write short notes on following.
- (a)** Short path distillation **07**
- (b)** Falling film absorber **07**

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