Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –IIst 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_2 + 600 kg/h air

(ii)Solvent : 10% NaOH solution

(iii)Concentration of HCl and Cl_2 in exit gas: 20 mg/m³.

(iv)Chemical Reactions :

$2NaOH + Cl_2$ ==== $NaOCl + NaCl + H_2O$

ΔH_R = -24.65 kcal/mol

$NaOH + HCl$ ====$NaCl + H_2O$

ΔH_R = -31.4 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_G=272 kmol/(m³.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 disadvantaes 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 disucss 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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