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GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VIII(OLD) • EXAMINATION – WINTER 2017

Subject Code: 180505 **Date: 15-11-2017**

Subject Name: Multicomponent Distillation

Time: 02:30 pm to 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)** Define following: **07**
Light key component, Heavy key component, Split key, Adjacent key, Non distributed component, Non key component and Optimum reflux ratio.

(b) Explain the fixing of operating pressure in distillation column. **07**

Q.2 **(a)** What are the selection criteria between packed column and tray column? **07**

(b) Write the steps for distillation column design. **07**

OR

(b) A distillation column is to separate 4750 mol/h of feed composed of 37% n-butane, 32% iso-pentane, 21% n-pentane and 10% n-hexane. The column operates at an average pressure of 2 atm a and will produce a distillate product containing 95% n-butane and 5% iso-pentane. The bottom product is allowed to contain no more than 570 mol/h of n-butane. The minimum reflux ratio is 1.45. The average relative volatility of light key component is 2.567. **07**

(a) Complete the material balance over still.

(b) Calculate number of theoretical stages required for desired separation by FUG method.

Q.3 **(a)** Explain Jet flooding, Down comer flooding in detail **07**

(b) What are the parameters on the basis of which various types of trays selected explain in detail? **07**

OR

Q.3 **(a)** Explain the working principle of Azeotropic Distillation with flow sheet of one industrial application. **07**

(b) Discuss Equation-Tearing Procedure using Tridiagonal matrix algorithm for multicomponent distillation. **07**

Q.4 **(a)** What is sequencing of distillation column? Explain it with industrial examples. **07**

(b) Explain Lewis Matheson method in detail. **07**

OR

Q.4 **(a)** A saturated liquid, consisting of phenol and cresols with some xylenols, is fractioned to give a top product of 95.3 mole % phenol. Metacresol is heavy key and phenol is light key component. Total condenser is used. The compositions of the top product and of the phenols in the bottoms are given. **07**

Component	Average Relative Volatility	Feed, mole %	Distillate, mole %	Residue, mole %
Phenol	1.98	35	95.3	5.24
O-cresol	1.59	15	4.55	?
m- cresol	1.00	30	0.15	?
Xylenols	0.59	20	--	?

(a) Complete the material balance over still for the feed rate of 1000 kmol/h.

(b) Calculate minimum reflux ratio by Underwood's method.

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(b) Describe determination of optimum reflux ratio. **07**

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Q.5 **(a)** Explain energy saving in thermally coupled distillation column. **07**

(b) Explain Theile- Geddes method in detail. **07**

OR

Q.5 **(a)** Discuss batch distillation with rectification. **07**

(b) Discuss energy saving in distillation column by heat integration. **07**

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