Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII EXAMINATION – SUMMER 2016

Subject Code:180505 **Date:16/05/2016**

Subject Name:Multi Component Distillation (Department Elective-II)

Time:10:30 AM 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)**	Explain : (1) Light key (2) Heavy key (3) Split Key (4) Adjacent key	**08**
	(b)	Discuss criteria for selection between tray tower and packed tower with industrial examples.	**06**
Q.2	**(a)**	What is vacuum distillation? Why it is used? State its advantages and disadvantages.	**07**
	(b)	Write short note on FUG method.	**07**

OR

	(b)	Explain the thermally coupled distillation column in detail.	**07**
Q.3		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. Complete material balance.. Feed is 25% (by mole) vapor. Assume ideal vapor-liquid equilibrium. All compositions are mole%. Average relative volatility for n-butane, iso-pentane, n-pentane and n-hexane is 2.567, 1, 0.762 and 0.236 respectively. For reflux ratio R=3, Determine the number of theoretical stages required for desired separation by FUG method.	**14**

OR

Q.3	**(a)**	Explain the sequencing of Distillation.	**07**
	(b)	Compare tray tower and packed tower	**07**

Q.4 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. **14**

Component	Average Relative Volatility	Feed, mole %	Top product, mole %	Bottom product, 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	-	?

(1) Compute the material balance over the still for a feed rate 100 kmol/h.
(2) Calculate the minimum reflux ratio by Underwood's method.
(3) For $R=3R_m$, calculate the composition of vapor entering to the top most tray by Lewis-Matheson method.

OR

Q.4 **(a)** Discuss the equation tearing procedure for multi component distillation. **10**
(b) Write short note on Optimum reflux ratio. **04**

Q.5 Discuss the step wise procedure for the process design of multi Component batch distillation with rectification. **14**

OR

Q.5 **(a)** Explain the stepwise procedure of Thiele Geddes method for Multi component distillation. **07**
(b) Discuss the criteria of selection among various types of plates. **07**

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