Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VIII.EXAMINATION – WINTER 2016

Subject Code: 180505 Date: 24/10/2016

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

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)** Discuss the selection of Operating pressure for various industrial distillation columns with examples. **07**

(b) Write a note on selection of key components in multi-component systems **07**

Q.2 **(a)** Explain Azeotropic distillation with industrial application **07**

(b) Explain vacuum distillation and discuss its advantages and disadvantages **07**

OR

(b) Explain the stepwise procedure of Thiele Geddes method for Multi component distillation **07**

Q.3 **(a)** Discuss Extractive distillation with industrial examples **07**

(b) Discuss the criteria for selection between tray towers and packed towers **07**

OR

Q.3 **(a)** 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 and will produce a distillate product containing 95 % n-butane 5 % iso-pentane. The bottom product is allowed to contain no more than 570 mol/h of n-butane. Compute material balance and use Underwood's method to determine the minimum reflux for the required separation. Feed is 25 % (by mole) vapour. Assume ideal vapour-liquid equilibrium. All compositions are mole%. Also calculate Nm and actual no. of theoretical stages. Ttop = 295 K, Tbottom = 320 K **14**

Component	Vapour Pressure top (atm)	Vapour Pressure bottom (atm)
n-butane	2.17	4.478
iso-pentane	0.8	1.842
n-pentane	0.6	1.426
n-hexane	0.173	0.476

N-butane is light key component and iso-pentane is heavy key component.

Q.4 **(a)** Discuss Lewis-Matheson method for multicomponent distillation. Also explain about how to start the second trial calculation and arrive on final solution. **14**

OR

Q.4 **(a)** Discuss residue curve maps in azeotropic distillation and state properties of entrainer **07**

(b) Enlist the steps involved in designing a distillation column **07**

Q.5	**(a)**	Discuss the stepwise procedure for process design of multi component batch distillation with rectification and with constant overhead composition.	**07**
	(b)	Discuss the use of heat pump with refrigerant in distillation column for energy saving.	**07**

OR

Q.5	**(a)**	Write a note on energy conservation methods in Distillation column and discuss thermally coupled distillation in detail	**07**
	(b)	Discuss selection criteria of type of trays in designing of tray towers	**07**

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