Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2180505 Date:13/05/2019

Subject Name:Multi Component Distillation

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)**	List various design options to decrease the energy consumption of distillation.	**03**
	(b)	Discuss about the Determination of Optimum Reflux Ratio.	**04**
	(c)	Discuss the equation tearing procedure for multi component distillation.	**07**
Q.2	**(a)**	Define following terms: Jet flooding, Down comer flooding, Liquid entrainment.	**03**
	(b)	Discuss the advantages of vacuum distillation in detail.	**04**
	(c)	Explain the method of selection of operating pressure in distillation column.	**07**
		OR	
	(c)	Discuss the stepwise procedure for process design of multicomponent batch with constant overhead composition.	**07**
Q.3	**(a)**	Discuss Sequencing of multi component distillation columns.	**03**
	(b)	Discuss heuristics for determining favorable sequences in distillation column.	**04**
	(c)	Write short note on selection of key components in multi component distillation.	**07**
		OR	
Q.3	**(a)**	Discuss methods of determination of Vapour-Liquid Equilibrium data.	**03**
	(b)	Discuss criteria of selection among the different types of trays used in tray tower.	**04**
	(c)	Discuss the use of heat pump with refrigerant in distillation column for energy saving.	**07**
Q.4		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.4		Discuss Lewis-Matheson method for multicomponent distillation. Also explain about how to start the second trial calculation and arrive on final solution.	**14**
Q.5	**(a)**	What is application of hegstebeck and Geddes equation? Discuss the equation.	**03**
	(b)	Write a kirk bride equation with detail specifications for finding the feed stage location in multicomponent distillation column.	**04**
	(c)	Distinguish between azeotropic distillation & extractive distillation with suitable examples.	**07**
		OR	
Q.5	**(a)**	Define following terms: Homogeneous Maximum Boiling Azeotrope, Heterogeneous Minimum Boiling, Entrainer.	**03**
	(b)	Discuss the criteria for selection of solvent for extractive distillation.	**04**
	(c)	Explain the concept of Heat integration for energy conservation in Distillation column.	**07**

****