

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 fractionated 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**
