

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 180505****Subject Name: Multi Component Distillation****Date: 08/05/2012****Time: 10.30 am – 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 By using Lewis-Matheson method, calculate the composition of liquid leaving the second tray from the top of the column for following case. **14**

(a) Distillation column details

Component	Feed, mole%	Distillate, mole %	Residue, mole %
n- Butane	37	95.0	16.3
i-Pentane	32	5.0	41.6
n-Pentane	21	--	28.5
n-Hexane	10	--	13.6

(b) $F = 4750$ mol/hr, $D = 1250$ mol/hr and $q = 1$

(c) Operating pressure, $P_t = 2$ atm a

(d) Reflux ratio = 3

(e) Vapour pressure of Component

$$\ln P_v = A - B / (T + C), P_v \text{ in mm Hg and } T \text{ in K}$$

Component	A	B	C
n- Butane	15.6782	2154.9	-34.42
i-Pentane	15.6338	2348.67	-40.05
n-Pentane	15.8333	2477.07	-39.34
n-Hexane	15.8366	2697.55	-48.78

Q.2 (a) Discuss the advantages and disadvantages of vacuum distillation. **07**
 (b) Discuss the selection criteria for different types of trays used in tray tower. **07**

OR

(b) Explain the sequencing of Distillation with suitable example. **07**

- Q.3** (a) Explain the thermally coupled distillation column in detail. **07**
 (b) Explain the stepwise procedure of Thiele Geddes method for Multicomponent distillation. **07**

OR

- Q.3** Discuss the step wise procedure for the process design of multi component batch distillation with rectification. **14**

- Q.4** (a) Explain the Azeotropic distillation with the suitable example. **07**
 (b) Discuss criteria of selection between tray tower and packed tower. **07**

OR

- Q.4** Determine the minimum reflux ratio, minimum number of theoretical stages required and number of theoretical stages required for the desired separation for the following system by FUG method. Feed flow rate is 70 kmol/hr and feed is saturated liquid. Composition of Distillation column streams and average relative volatilities of all components of feed are as follows: **14**

Component	α_{av}	Feed, mole %	Distillate, mole %	Residue, mole %
Benzene	8.96	2.2	22.8	0
Toluene	2.8407	7.4	72.2	0.5
Ethyl Benzene	1	43.4	5.0	47.5
Styrene	0.6596	47	0	52.0

Toluene is light key and ethyl benzene is heavy key component.

- Q.5** (a) Discuss the equation tearing procedure for multi component distillation. **10**
 (b) Define light key component, heavy key component and non key component with example. **04**

OR

- Q.5** (a) Discuss the use of heat pump with refrigerant in distillation column for energy saving. **10**

- (b) Explain the concept of Heat integration for energy conservation in Distillation column. **04**
