Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 160505 **Date: 01/05/2017**

Subject Name: Computer Aided Process Synthesis

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)** Define: Approach temperature, Threshold approach temperature, Optimum approach temperature, Minimum approach temperature. **07**

(b) List the heuristics for determining favorable sequence of distillation operation. **07**

Q.2 **(a)** Discuss steps involve in construction of attainable region using CSTRs and PFRs. **07**

(b) Discuss in brief environmental issues and various safety considerations in product and process design. **07**

OR

(b) What is pinch point? Explain its importance in heat exchanger network synthesis giving step wise procedure to design heat exchanger network using pinch design approach. **07**

Q.3 **(a)** Describe Transshipment model briefly. **07**

(b) Two cold streams C1 and C2 are to be heated and two hot streams H1 and H2 are to be cooled without phase change. Find out minimum utility targets using Temperature interval method. Use ΔT_{min} =10°C . **07**

Stream	T^s (ºC)	T^t (ºC)	$m*C_p$ (KJ / s ºC)
C1	120	235	2
C2	180	240	4
H1	260	160	3
H2	250	130	1.5

OR

Q.3 **(a)** Explain Heat Pumping, Vapour Recompression and Reboiler Flasing configuration for increasing thermodynamic efficiency of distillation columns. **07**

(b) Write a short note on side stripper and side enriches. **07**

Q.4 **(a)** To separate five components into five single component products, calculate: **07**
(i) Number of sequences of ordinary distillation columns.
(ii) Number of sequences using three different separation methods.

(b) We have a mixture of five alcohols labeled as A, B, C, D and E with flows in the feed of 1, 0.5, 1, 7 and 10 mol/s respectively, for a total of 19.5 mol/s and relative volatilities are 4.3,4,3,2, and 1 respectively. The information about **07**

marginal vapor flows estimated for non-key species are as under:

	A	B	C	D	E
A/B	--	--	2.6	6.5	3.2
B/C	5.3	--	--	9.3	4.0
C/D	2.4	1.3	--	--	6.7
D/E	1.5	0.8	2.0	--	--

Find the best distillation based separation sequence.

OR

Q.4 **(a)** Discuss impact of operating pressure and multi-effect distillation for Heat integration in distillation columns. **07**

(b) Find the best distillation based separation sequence if the following data hold for marginal vapor flows using a branch and bound search. The components behave relatively ideally. **07**

	A	B	C	D	E
A/B	--	--	100	1	1
B/C	1	--	--	1	1
C/D	1	100	--	--	1
D/E	1	1	100	--	--

Q.5 **(a)** Define span and cycle time for batch processes. Explain various transfer policies with example. **07**

(b) Discuss effect of transfer policies on cycle time for multi product batch plant. **07**

OR

Q.5 **(a)** Explain how parallel units and intermediate storage supports optimum utilization of resources for batch plant with fermentation separation system. **07**

(b) Write importance of CAPS in chemical engineering. **07**

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