Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VI (OLD).EXAMINATION – WINTER 2016

Subject Code: 160505 Date: 24/10/2016

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)** 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**

Q.2 **(a)** 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**

(b) Discuss in brief about design opportunities and general steps in product and process design. **07**

OR

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

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

(b) For the heat exchanger synthesis problem, following stream information is available: **07**

Stream	Tin, K	Tout, K	FCp, kW/K
H1	430	340	15
C1	310	395	7
C2	370	460	32

Find out minimum utility targets and pinch point for ΔT_{min} = 20K using temperature interval method.

OR

Q.3 **(a)** Write a short note on side stripper and side enriches. **07**

(b) Discuss effect of operating pressure on TQ diagram for distillation column and explain the concept of multi-effect distillation as possibility of energy integration. **07**

Q.4 **(a)** Discuss Thompson and King Formula to compute the Number of possible sequences for separation. **07**

(b) You are to separate the following relatively ideally behaving mixture of A, B, and C. The feed is at its bubble point of 345.8 K at 1 bar. Feed contains 50 kmol/hr A, 100 kmol/hr B and 30 kmol/hr C. The Antoine constant for A are 11.1, 3000, -70, for B are 10.2, 2800, -70, and for C are 10,3000, -70; where T is in K and pressure is in bar. Which sequence is better, direct or indirect? Why? **07**

OR

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

integration in distillation columns .

(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 marginal vapor flows estimated for non-key species are as under: **07**

	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.

Q.5 **(a)** What is Gantt Chart? Why do you use Gantt Chart? Draw a Gantt chart for the following processing times in the sequence of AAABBB (Single Campaigns) and ABABAB (Multi Campaigns). **07**

	Stage 1	**Stage 2**
A	5	2
B	2	4

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

OR

Q.5 **(a)** Discuss effect of transfer policies on cycle time for multi product batch plant. **07**

(b) A given batch plant produces one single product for which stage 1 requires 8 hours/batch; stage 2, 4 hours/batch and stage 3, 7 hours/batch. If zero – wait transfer is used, what is the cycle time? How many parallel units should be placed in each stage to reduce the cycle time to 4 hours? **07**

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