# **GUJARAT TECHNOLOGICAL UNIVERSITY** BE – SEMESTER – VI EXAMINATION – WINTER 2015

Subject Code:160505	Date:10/12/ 2015
Subject Name: Computer Aided Process Synthesis	
Time:2:30pm to 5:00pm	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 design opportunities and steps in product and process design. 07
  - (b) Write a short note on threshold approach temperature and optimum approach 07 temperature for HENS.
- Q.2 (a) Discuss geometric concept of attainable region for reactor network design. 07
  - (b) Discuss heuristics for selection of separation methods.

### OR

- (b) What are the residue curves? Draw the residue curves for a system containing octane, ethylbenzene and 2-ethoxyethanol with boiling point 398.8 K, 409.2 K and 408.1 K respectively. 2-ethoxyethanol makes binary azeotrope with octane and ethylbenzene at 389.1 K and 400.1K respectively.
- Q.3 (a) Find pinch point and minimum hot and cold utilities required for the following 07 system for  $\Delta T_{min} = 10 \text{ }^{\circ}\text{C}$

Stream	T <sub>in</sub> °C	Tout °C	FC <sub>p</sub> kW/°C
C1	60	180	3
C2	30	100	2
H1	180	40	2
H2	150	40	4

(b) Discuss reactor designs used for handling large adiabatic changes in 07 temperature.

## OR

- Q.3 (a) Discuss the role of computers in product and process design.
  - (b) Find minimum utility targets and pinch point for  $\Delta T_{min}=20$  K using TI method 07 for heat exchanger network synthesis for the following streams.

Stream	T <sub>in</sub> K	Tout K	FC <sub>p</sub> kW/K
H1	430	340	15
C1	310	395	7
C2	370	460	32

- Q.4 (a) Draw the algorithm to establish the distillation column pressure and condenser 07 type.
  - (b) Discuss scope of heat and power integration in chemical process plant using the 07 concept of heat engine and heat pump.

### OR

- Q.4 (a) Discuss mixed integer linear programming for heat exchanger network design. 07
  - (b) Discuss approach used by Linhof and Hindmarsh for stream matching at pinch. 07

07

07

- Q.5 (a) Products A, B, C are manufactured in three stages. The processing time for stage 1, 2 and 3 for product A are 5, 4 and 3 hr respectively, for product B are 3, 1 and 3 hr respectively and for product C are 4, 3 and 2 respectively. Assuming zero cleanup time, determine the span and cycle time for manufacturing of 2 batches of A,1 of B and 1 of C for (a) zero wait policy, (b)no intermediate storage policy and (c) unlimited intermediate storage policy.
  - (b) Discuss environmental issues and factors affecting the product and process 07 design.

# OR

Q.5 (a) Rank the sequence to separate four components using marginal vapor rate 07 method with the following details.

Separation	Marginal vapor rate kmol/hr	Separation	Marginal vapor rate kmol/hr
A/B	0	ABC/D	613
A/BC	163	B/C	0
A/BCD	340	B/CD	277
AB/C	231	BC/D	385
AB/CD	435	C/D	0

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

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