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

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI- EXAMINATION – SUMMER 2016

Subject Code:160505 **Date:11/05/2016**

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 scope of heat and power integration in chemical process plant using the concept of heat engine and heat pump. **07**

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

Q.2 **(a)** Discuss design opportunities and steps in product and process design. **07**

(b) Draw the algorithm to establish the distillation column pressure and condenser type. **07**

OR

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

Q.3 **(a)** Formulate the LP model for following data. Take ΔT_{min}= 10 ^{o}F. **07**

Stream	Source Temperature ^{O}F	Target Temperature ^{O}F	M x C_p Btu/hr ^{O}F
C1	120	235	2
C2	180	240	4
H1	260	160	3
H2	250	130	1.5

(b) Explain the generalized rules for stream splitting on both sides of the pinch to satisfy MER requirements. **07**

OR

Q.3 **(a)** Discuss approach used by Linhof and Hindmarsh for stream matching at pinch. **07**

(b) Find pinch point and minimum hot and cold utilities required for the following system for ΔT_{min} =10 ^{o}C **07**

Stream	T_{in} ^{o}C	T_{out} ^{o}C	FC_p kW/^{o}C
C1	60	180	3
C2	30	100	2
H1	180	40	2
H2	150	40	4

Q.4 **(a)** Discuss environmental issues and factors affecting the product and process design. **07**

(b) Write a short note on Threshold approach temperature and optimum approach temperature for HENS. **07**

OR

Q.4 **(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. **07**

(b) Write a Short note on the role of computers in product and process design. **07**

Q.5 **(a)** Explain the five steps procedure for construction of Attainable region. **07**

(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. **07**

OR

Q.5 **(a)** Use the marginal vapor rate (MV) method to determine a sequence for the separation of alcohol mixture. Give rank to various sequences. **07**

Separation	MV (mol/sec)	Separation	MV (mol/sec)
A/BCDE	12.3	BC/DE	8.0
AB/CD	14.6	BC/D	1.3
AB/CDE	18.6	BCD/E	2.8
ABC/D	3.7	A/BC	2.6
ABC/DE	10.4	A/BCD	9.1
C/DE	6.7	AB/C	5.4
ABCD/E	4.3	A/B	0
CD/E	2.0	B/C	0
B/CDE	13.3	C/D	0
B/CD	9.3	D/E	0

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

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