

GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012

Subject code: 160505**Date: 07/01/2013****Subject Name: Computer Aided Process Synthesis****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** For the process fluids as shown in below Table, find **07**
 minimum utility requirements and pinch temperature. Also
 show the cascade heat flow diagram. Consider $\Delta T_{\min} = 10^{\circ}\text{C}$.

Streams	Source $T_s(^{\circ}\text{C})$	Target $T_t(^{\circ}\text{C})$	$MC_p(\text{KW}/^{\circ}\text{C})$
H_1	180	40	20
H_2	160	40	40
C_1	60	220	30
C_2	30	180	22

- (b)** Explain the threshold approach temperature and optimum **07**
 approach temperature.

- Q.2 (a)** Discuss in brief the Environmental issues and various safety **07**
 considerations in product and process design

- (b)** Explain in brief general steps in product and process design **07**

OR

- (b)** Discuss importance of design, equipment sizing and **07**
 optimization in process design.

- Q.3 (a)** Discuss various reactor models in detail. **07**

- (b)** Discuss steps involve in construction of attainable region **07**
 using CSTRs and PFRs.

OR

- Q.3 (a)** Explain reactor design for complex configurations. **07**

- (b)** Discuss criteria for selection of separation methods. **07**

- Q.4 (a)** Develop Expanded Transshipment model for the data given **07**
 below. Also draw the cascade heat flow diagram. (Assume
 $\Delta T_{\min} = 15^{\circ}\text{C}$)

Streams	Source $T_s(^{\circ}\text{C})$	Target $T_t(^{\circ}\text{C})$	$MC_p(\text{KW}/^{\circ}\text{C})$
H_1	430	340	15
C_1	310	395	7
C_2	370	460	32

- (b)** Explain in detail common industrial separation methods **07**

OR

- Q.4 (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	Separation	MV
n		n	
	(mol/sec)		(mol/sec)
A/BCDE	12.3	AB/CD	14.6
AB/CDE	18.6	ABC/D	3.7
ABC/DE	10.4	C/DE	6.7
ABCD/E	4.3	CD/E	2.0
B/CDE	13.3	B/CD	9.3
BC/DE	8.0	BC/D	1.3
BCD/E	2.8	A/BC	2.6
A/BCD	9.1	AB/C	5.4
A/B	0	B/C	0
C/D	0	D/E	0

- Q.4 (b)** Discuss in detail separation sequences for solid-fluid system. **07**

- Q.5 (a)** Draw the stream matching diagram above pinch temperature by considering pinch temperature in hot stream 125°C from the data given as follows. Assume $\Delta T_{\min} = 13^{\circ}\text{C}$ **07**

Streams	Source $T_s(^{\circ}\text{C})$	Target $T_t(^{\circ}\text{C})$	$MC_p(\text{KW}/^{\circ}\text{C})$
H_1	175	45	10
H_2	125	65	40
C_1	20	155	20
C_2	40	112	15

- (b)** Explain detail flow shop and job shop plant with neat diagram. **07**

OR

- Q.5 (a)** What is Gantt chart? Draw Gantt chart recipe ABAB for zero wait transfer and unlimited storage transfer policies from following processing times. **07**

Product	Stage-1	Stage-2	Stage-3
A	6 hrs	4 hrs	3 hrs
B	3 hrs	2 hrs	2 hrs

- (b)** Discuss design of single product processing sequences. **07**
