

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-VI -Examination May 2011****Subject code: 160505****Subject Name: Computer Aided Process Synthesis****Date: 23/05/2011****Time: 10.30 am to 1.00 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)** Determine pinch point using TI method for the data given below. Also prepare LP model. Assume $\Delta t_m = 20^\circ\text{F}$ **07**

Stream	Tin, $^\circ\text{F}$	Tout, $^\circ\text{F}$	FCp(Btu/ $^\circ\text{F}$)
C1	60	180	3
C2	30	130	2.6
H1	180	40	2
H2	150	40	4

- (b)** With a neat sketch explain Heat pumping, Vapour recompression and Reboiler flashing. **07**

- Q.2 (a)** Use the marginal vapour rate (MV) method to determine a sequence for the separation of light hydrocarbons. Give rank to various sequence. **07**

Separation	Marginal vapour rate	Separation	Marginal vapour rate
	(kmol/hr)		(kmol/hr)

A/B	0	B/CD	227
A/BC	163	AB/CD	435
A/BCD	340	C/D	0
B/C	0	BC/D	385
AB/C	231	ABC/D	613

- (b)** Discuss with formula the number of sequences of ordinary distillation columns. **07**

OR

- (b)** Discuss in detail for phase separation of reactor effluent. **07**

- Q.3 (a)** Discuss the pinch design approach for minimum utility requirements. **07**

- (b)** Discuss heuristics for determining favorable sequences in distillation column. **07**

OR

- Q.3** Develop Expanded Transshipment Model and write MILP model for the following data with $\Delta t_m = 10\text{ K}$. **14**

Stream	Tin, K	Tout, K	C(KW/K)
C1	300	460	12
C2	280	405	15
H1	500	360	22
H2	440	350	18

- Q.4 (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)** List out various separation equipment and discuss their selection criteria. **07**

OR

- Q.4** Discuss about optimum approach temperature. Prepare the table for HCC and GCC. Explain the significance of GCC curve with reference to utilities requirement. Show the heat exchanger area calculation for steam(ST) and C1 region. **14**

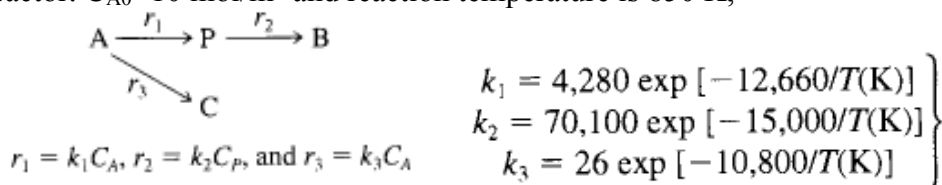
Stream	FCp (KW/K)	T _{in} , K	T _{out} , K	Q available KW	h W/m ² K
H1	12000	580	430	18,00,000	800
H2	12000	510	450	7,20,000	700
ST		650	650		5000
C1	18000	440	590	-27,00,000	600
CW		300	325		600

Assume $\Delta t_m = 20^\circ\text{K}$

- Q.5 (a)** Describe in brief the environmental factors useful in process design of chemical plants. **07**
- (b)** Discuss in brief for design opportunities and general steps in product and process design. **07**

OR

- Q.5 (a)** Draw an attainable region for the following reaction in Plug Flow and Mixed Flow reactor. $C_{A0} = 10 \text{ mol/m}^3$ and reaction temperature is 850 K, **07**



In the above P is the desired product and B and C are undesired byproducts.

- (b)** List out the possible sequences for separation of six products (A,B,C,D,E,F) by ordinary distillation column. **07**
