

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI • EXAMINATION – SUMMER • 2014****Subject Code: 160505****Date: 26-05-2014****Subject Name: Computer Aided Process Synthesis****Time: 10:30 am - 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 Write a short note on Threshold approach temperature and optimum approach temperature for HENS. **7**

B Write the importance of CAPS in chemical engineering. **7**

Q.2 A Use the marginal vapour rate (MV) method to determine a sequence for the separation of light hydrocarbons. Give rank to various sequences. **7**

Separation	MV (kmol/hr)	Separation	MV
A/B	0	B/CD	277
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 Write a short note on Geometric concepts for Reactor attainable region **7**

OR

B Discuss in detail for phase separation of reactor effluent. **7**

Q.3 A 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. Assume $\Delta T_m = 20^\circ\text{K}$ **14**

Stream	FCp (KW/K)	T _{in} , K	T _{out} , K	Q available KW	h W/m ² K
H1	10000	600	450	15,00,000	800
H2	10000	500	400	10,00,000	700
ST		650	650		5000
C1	15000	450	590	-21,00,000	600
CW		300	325		600

OR

A Draw and explain algorithm for establishing distillation column pressure and condenser type. **7**

B Explain the concept of multi effect distillation as possibility of energy integration. **7**

Q.4 A Given the processing times for these products A, B, C, below. Determine with a Gantt Chart the make span and cycle time for manufacturing two batches of A, 1 of B and 1 of C for the following cases: **7**

- a. Zero-Wait policy with sequence AABC.
- b. Same as (a) but with no intermediate storage policy (NIC)
- c. Same as (a) but with unlimited intermediate storage policy (UIS)

Processing Times (hr)			
	Stage 1	Stage 2	Stage 3
A	5	4	3
B	3	1	3
C	4	3	2
Zero Cleanup Times			

B Explain in detail various transfer policies for batch process scheduling. 7

OR

A Show steps in Product and Process design in Chemical Engineering 7

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 ? 7

Q.5 A For the Heat Exchanger Network Synthesis (HENS) problem following stream information is available: 7

Stream	T in °K	Tout °K	FCp kW/°K
Liquid, H1	430	340	15
Liquid, C1	310	395	7
Vapor, C2	370	460	32

Find out minimum utility targets and pinch point for $\Delta T_{min} = 20^\circ K$.

B Prepare Transshipment model for the above data and prepare LP formulation. 7

OR

A Explain how parallel units and intermediate storage supports optimum utilization of resources for batch plant with fermentation separation system. 7

B Explain with example- how transfer policies affects the cycle time. 7
