* S F - 8 3 1 5 / 2 0 0 *

SF-8315

B. E. - III (Sem. - VI) (Chemical) Examination

May/June – 2011

Computer Aided Process Synthesis

(New Syllabus) (GTU)

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 3 (SEM. - 6) (CHEMICAL)**

Name of the Subject :

☛ **COMPUTER AIDED PROCESS SYNTHESIS (NEW)**

☛ Subject Code No. : **8 3 1 5** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Figures to the right indicate full marks.

(3) Draw sketches wherever necessary and assume appropriate data if required.

(4) Notations used have conventional meaning.

SECTION - I

1 Answer the following (any **two**) **18**

(a) For the Heat Exchanger Network Synthesis (HENS) problem following stream information is available :

	Fcp(MW/K)	T_{in} (°C)	T_{out} (^oC)
H1	1.3	400	110
C1	1.6	160	400
C2	1.8	110	260

Draw Composite Curves and find out pinch point for ΔT_{min} = 10 °C.

(b) For the Heat Exchanger Network Synthesis (HENS) problem following stream information is available :

Stream	T_{in} (°C)	T_{out} (°C)	FC_p kW/°C
C1	80	180	2
C2	40	115	1
H1	180	50	3
H2	150	40	2

Find out pinch point for ΔT_{min} = 20 °C.

(c) The following streams exists at and just above the pinch point for a heat exchanger network synthesis problem. Propose all possible configurations which correspond to matches that split the fewest streams. Split a stream into at most two branches.

Stream	FCp
H1	10
H2	6
H3	1
C1	9
C2	7
C3	2

2 Answer the following : (any **two**) **16**

(a) Discuss importance of composite curves for HENS and clearly show the information available from any composite curve.

(b) Explain algorithm with example to identify energy loops.

(c) Write steps for pinch design approach to inventing a heat exchanger network.

3 Answer the following : **16**

(a) Discuss Optimum Approach Temperature and Threshold Approach Temperature.

(b) Explain Reactor Network Synthesis with example.

SECTION - II

4 (a) Answer the following : **5×2=10**

(i) Write Fenske-Underwood Gilliland equation.

(ii) What is EPA ?

(iii) What is unlimited intermediate storage strategy ?

(iv) Define relief Devices. Name any two.

(v) What do you mean by maximum and minimum boiling azeotrop ?

(b) On what basis the selection of separation methods is made ? Explain any one criterian in detail. 8

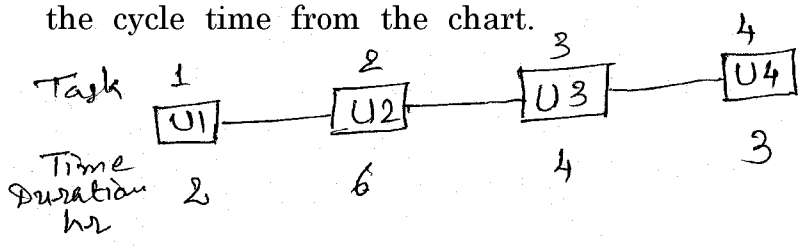
5 Answer any **two** : **8×2=16**

(a) What is the role of safety considerations in product and process design ? Discuss fire and explosion in detail.

(b) Compute the vapor flow rate and marginal vapor flow rate for separation given in table.

Separation	Distillation Rate kmol/hr	Reflux Ratio
A/B	136.2	10.7
A/BC	136.2	11.9
A/BCD	136.2	13.2
B/C	226.8	2.06
AB/C	362.9	1.55
B/CD	226.8	3.06
AB/CD	362.9	2.11
C/D	181.5	13.5
BC/D	408.3	6.39
ABC/D	544.4	4.96

(c) Figure shows the typical recipe of chemical process plant. Prepare the Gantt chart from it. Calculate the cycle time from the chart.



6 Answer any **two** : **8×2=16**

(a) In an isothermal batch process reactor, the irreversible reactions

$$A \rightarrow B \rightarrow C$$

are taking place with desired product B and undesired byproduct C. The reactions are of first order. :Assuming suitable data and derive the mole traction profile in time for reactants and products.

(b) Discuss separation sequences for solid fluid systems.

(c) Discuss the steps in product and process design.