Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER– VII EXAMINATION – SUMMER 2026

Subject Code:3170507 Date:20-05-2026

Subject Name: Computer Aided Process Synthesis

Time: 02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1 **(a)** Explain how stream splitting can help in getting better design alternatives. **03**

(b) Explain pinch design approach for inventing heat exchanger network. **04**

(c) Discuss in brief for design opportunities and general steps in product and process design. **07**

Q.2 **(a)** Explain in detail common industrial separation methods. **03**

(b) Explain transshipment model for stream matching. **04**

(c) Calculate the number of possible sequences of ordinary distillation column for 5 number of product and draw the sequences. **07**

OR

(c) Discuss the procedure for reactor network design using concept of attainable region. **07**

Q.3 **(a)** Discuss in brief about environmental issues. **03**

(b) Describe engineering ethics briefly. **04**

(c) For ΔT_{min} = 20°C, find out pinch point and construct the Hohmann composite curve (HCC). Find out sink (Qh_{min}) and source (Qc_{min}). **07**

Stream	T^{in} (°C)	T^{out} (°C)	mC_p (kW/°C)
H_1	180	40	2
H_2	150	40	4
C_1	60	180	3
C_2	30	105	2.6

OR

Q.3 **(a)** Discuss various reactor models in detail. **03**

(b) Explain reactor design for complex configurations. **04**

(c) Explain the concept of threshold approach temperature and optimum approach temperature. **07**

Q.4 **(a)** For stream matching to be feasible at pinch, justify that Ch ≥ Cc must be satisfied on cold side of pinch. **03**

(b) Discuss the properties of residue curve map. **04**

(c) Explain Heuristics for determining favorable sequences of ordinary distillation column. **07**

OR

Q.4 **(a)** Describe the use of grand composite curve to select utility. **03**

(b) Draw the superstructures for one cold stream and three hot streams. **04**

(c) For the process fluids as shown in the table, find minimum utility requirements and pinch temperature using temperature-interval method. Consider ΔT_{min} = 10^oC. **07**

Stream	T^s (°C)	T^t (°C)	mC_p (kW/°C)
H_1	180	40	20
H_2	160	40	40
C_1	220	600	30
C_2	180	300	22

Q.5 **(a)** Explain reboiler flashing in heat integration of distillation column. **03**

(b) Explain energy saving in multi-effect distillation compared to the conventional distillation using TQ diagram. **04**

(c) Given the processing times for two products A and B, determine make span and cycle time for manufacturing two batch of A and two batch of B using i) zero wait policy (ABAB), ii) no intermediate storage policy (ABAB), and iii) unlimited intermediate storage policy (ABAB). **07**

	Processing Times (hr)		
	Stage 1	**Stage 2**	**Stage 3**
A	6	4	3
B	3	2	2

OR

Q.5 **(a)** Construct three alternatives for the placement of heat engines. **03**

(b) Compare forward heat integration and reverse heat integration in distillation with necessary figure. **04**

(c) Determine make span and cycle time for processing times of two product plants are as given below: i) single product (AABB) campaigns, ii) mixed product (ABAB) campaigns, and iii) mixed product with clean up time (1 hr). **07**

Product	Stage 1 (hr)	Stage 2 (hr)
A	5	2
B	2	4

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