

Midterm Exam

Q1 a. Find the minimum utility requirements for a network of heat exchangers involving the following streams:

Process	Temperature, °C		Heat-Capacity Flow Rate, CP (kW/°C)
	Supply	Target	
1	100	430	1.6
2	180	350	3.27
3	200	400	2.6
4	440	150	2.8
5	520	300	2.38
6	390	150	3.36

The minimum approach temperature, ΔT_{\min} is 10 °C.

b. For (a), position the heat exchangers so as to achieve a network that requires the minimum utilities.

Q2 Consider the following streams:

	T_s (°C)	T_t (°C)	CP (kW/°C)
H1	350	160	3.2
H2	400	100	3
H3	110	60	8
C1	50	250	4.5
C2	70	320	2
C3	100	300	3

When $\Delta T_{\min} = 10$ °C, the minimum utilities for heating and cooling are 237 kW and 145 kW, respectively, and the pinch temperatures for the hot and cold streams are 110 °C and 100 °C, respectively.

Design a network of heat exchangers that has the minimum utilities for heating and cooling. Match the streams *to avoid stream splitting*.

Show the heat duties and temperatures for each heat exchanger.