

## Index Sets for 4 Component Separation: Splits Between Consecutive Key Components

1.  $TASKS = \{t \mid t \text{ is a separation task}\}$   
 $TASKS = \{A/BCD, AB/CD, ABC/D, AB/C, A/BC, BC/D, B/CD, A/B, B/C, C/D\}$
2.  $STATES = \{s \mid s \text{ is a state/mixture in the network}\}$   
 $STATES = \{ABCD, ABC, BCD, AB, BC, CD, A, B, C, D\}$
3.  $FEED = \text{state that is the feed to the system}$   
 $FEED = \{ABCD\}$
4.  $FS_F = \{\text{columns whose feed is the initial mixture}\}$   
 $FS_F = \{A/BCD, AB/CD, ABC/D\}$
5.  $TS_s = \{\text{tasks } t \text{ that state } s \text{ is able to produce}\}$   
 $TS_{ABCD} = \{ABC/D, AB/CD, ABC/D\}$   
 $TS_{ABC} = \{A/BC, AB/C\}$   
 $TS_{BCD} = \{B/CD, BC/D\}$   
 $TS_{AB} = \{A/B\}$   
 $TS_{BC} = \{B/C\}$   
 $TS_{CD} = \{C/D\}$
6.  $ST_s = \{\text{tasks } t \text{ that are able to produce state } s\}$   
 $ST_{ABC} = \{ABC/D\}$   
 $ST_{BCD} = \{A/BCD\}$   
 $ST_{AB} = \{AB/CD, AB/C\}$   
 $ST_{BC} = \{A/BC, BC/D\}$   
 $ST_{CD} = \{AB/CD, B/CD\}$   
 $ST_A = \{A/BCD, A/BC, A/B\}$   
 $ST_B = \{B/CD, A/B, B/C\}$   
 $ST_C = \{AB/C, B/C, C/D\}$   
 $ST_D = \{ABC/D, BC/D, C/D\}$
7.  $PRE_i = \{\text{tasks } t \text{ that produce final product } i \text{ through a rectifying section}\}$   
 $PRE_A = \{A/BCD, A/BC, A/B\}$   
 $PRE_B = \{B/CD, B/C\}$   
 $PRE_C = \{C/D\}$
8.  $PST_i = \{\text{tasks } t \text{ that produce final product } i \text{ through a stripping section}\}$   
 $PST_B = \{A/B\}$

$$PST_C = \{AB/C, B/C\}$$

$$PST_D = \{ABC/D, BC/D, C/D\}$$

9.  $COMP = \{i \mid i \text{ is a component in the mixture}\}$   
 $COMP = \{A, B, C, D\}$
10.  $RECT_s = \{\text{tasks } t \text{ that produce state } s \text{ through a rectifying section}\}$   
 $RECT_{ABC} = \{ABC/D\}$   
 $RECT_{AB} = \{AB/C, AB/CD\}$   
 $RECT_{BC} = \{BC/D\}$   
 $RECT_A = \{A/BCD, A/BC, A/B\}$   
 $RECT_B = \{B/CD, B/C\}$   
 $RECT_C = \{C/D\}$
11.  $STRIP_s = \{\text{tasks } t \text{ that produce state } s \text{ through a stripping section}\}$   
 $STRIP_{BCD} = \{A/BCD\}$   
 $STRIP_{BC} = \{A/BC\}$   
 $STRIP_{CD} = \{AB/CD, B/CD\}$   
 $STRIP_B = \{A/B\}$   
 $STRIP_C = \{B/C, AB/C\}$   
 $STRIP_D = \{ABC/D, BC/D, C/D\}$
12.  $ISTATE = \{s \mid s \text{ is an intermediate state in the network}\}$   
 $ISTATE = \{ABC, BCD, AB, BC, CD\}$
13.  $IREC_s = \{\text{tasks } t \text{ that produce an intermediate state } s \text{ through a rectifying section}\}$   
 $IREC_{ABC} = \{ABC/D\}$   
 $IREC_{AB} = \{AB/C, AB/CD\}$   
 $IREC_{BC} = \{BC/D\}$
14.  $ISTRIP_s = \{\text{tasks } t \text{ that produce an intermediate state } s \text{ through a stripping section}\}$   
 $ISRIP_{BCD} = \{A/BCD\}$   
 $ISRIP_{BC} = \{A/BC\}$   
 $ISRIP_{CD} = \{AB/CD, B/CD\}$
15.  $LK_t = \{i \mid i \text{ is the light key component in separation task } t\}$   
 $LK_{A/BCD} = A$   
 $LK_{AB/CD} = B$   
 $LK_{ABC/D} = C$   
 $LK_{AB/C} = B$   
 $LK_{A/BC} = A$   
 $LK_{BC/D} = C$   
 $LK_{B/CD} = B$   
 $LK_{A/B} = A$   
 $LK_{B/C} = B$   
 $LK_{C/D} = C$

16.  $HK_t = \{i \mid i \text{ is the heavy key component in separation task } t\}$   
 $HK_{A/BCD} = B$   
 $HK_{AB/CD} = C$   
 $HK_{ABC/D} = D$   
 $HK_{AB/C} = C$   
 $HK_{A/BC} = B$   
 $HK_{BC/D} = D$   
 $HK_{B/CD} = C$   
 $HK_{A/B} = B$   
 $HK_{B/C} = C$   
 $HK_{C/D} = D$
17.  $R = \{r \mid r \text{ is an Underwood root}\}$   
 $R = \{r_1, r_2, r_3\}$   
*note: a system with  $N$  components will have  $N-1$  active Underwood roots*
18.  $RU A_t = \{\text{active Underwood roots for task } t\}$   
 $RU A_{A/BCD} = \{r_1, r_2, r_3\}$   
 $RU A_{AB/CD} = \{r_1, r_2, r_3\}$   
 $RU A_{ABC/D} = \{r_1, r_2, r_3\}$   
 $RU A_{AB/C} = \{r_1, r_2\}$   
 $RU A_{A/BC} = \{r_1, r_2\}$   
 $RU A_{BC/D} = \{r_2, r_3\}$   
 $RU A_{B/CD} = \{r_2, r_3\}$   
 $RU A_{A/B} = \{r_1\}$   
 $RU A_{B/C} = \{r_2\}$   
 $RU A_{C/D} = \{r_3\}$