#### **APPENDIX FOR CSCW2014-239**

# **Exhaustive Search of Puzzles in Operational Transformation**

A. UE-CP1-complying Transformation Matrix and Transformation Functions

An UE-CP1-complying transformation matrix  $TM(O_1, O_2)$  and a collection of UE-CP1-complying transformation functions are given below. It can be verified that these transformation functions achieve the same transformation capabilities as specified in  $TM(O_1, O_2)$ .

0,02	PR	TM (O <sub>1</sub> , O <sub>2</sub> )
	p <sub>1</sub> <p<sub>2</p<sub>	$I(p_1, c_1)$
$I(p_1,c_1)$	n =n	$I(p_1, c_1) if O_1 > O_2$
$I(p_2,c_2)$	p <sub>1</sub> =p <sub>2</sub>	$I(p_1+1,c_1)$ if $O_1$
	p <sub>1</sub> >p <sub>2</sub>	$I(p_1+1,c_1)$
T/m ~ \	p <sub>1</sub> <p<sub>2</p<sub>	$I(p_1, c_1)$
$I(p_1, c_1)$ $D(p_2, c_2)$	p <sub>1</sub> =p <sub>2</sub>	$I(p_1, c_1)$
D (P2, C2)	p <sub>1</sub> >p <sub>2</sub>	I(p <sub>1</sub> -1,c <sub>1</sub> )
D/m - 1	p <sub>1</sub> <p<sub>2</p<sub>	$D(p_1, c_1)$
$D(p_1, c_1)$ $I(p_2, c_2)$	p <sub>1</sub> =p <sub>2</sub>	$D(p_1+1,c_1)$
1 (P2, C2)	p <sub>1</sub> >p <sub>2</sub>	$D(p_1+1,c_1)$
D/m - 1	p <sub>1</sub> <p<sub>2</p<sub>	$D(p_1, c_1)$
$D(p_1, c_1)$ $D(p_2, c_2)$	p <sub>1</sub> =p <sub>2</sub>	NULL
D (P2, C2)	p <sub>1</sub> >p <sub>2</sub>	D(p <sub>1</sub> -1,c <sub>1</sub> )

0102	Transformation Functions
I (p <sub>1</sub> , c <sub>1</sub> ) I (p <sub>2</sub> , c <sub>2</sub> )	<pre>T(I(p<sub>1</sub>,c<sub>1</sub>),I(p<sub>2</sub>,c<sub>2</sub>)) {    if p<sub>1</sub><p<sub>2 or (p<sub>1</sub>=p<sub>2</sub> and priority(O<sub>1</sub>)&gt;priority(O<sub>2</sub>))    return I(p<sub>1</sub>,c<sub>1</sub>);    else return I(p<sub>1</sub>+1,c<sub>1</sub>);}</p<sub></pre>
I (p <sub>1</sub> , c <sub>1</sub> ) D (p <sub>2</sub> , c <sub>2</sub> )	$T(I(p_1,c_1),D(p_2,c_2))$ {     if $p_1 \le p_2$ return $I(p_1,c_1)$ ;     else return $I(p_1-1,c_1)$ ;}
D (p <sub>1</sub> , c <sub>1</sub> ) I (p <sub>2</sub> , c <sub>2</sub> )	<pre>T(D(p<sub>1</sub>,c<sub>1</sub>),I(p<sub>2</sub>,c<sub>2</sub>)) {   if p<sub>1</sub><p<sub>2 return D(p<sub>1</sub>,c<sub>1</sub>);   else return D(p<sub>1</sub>+1,c<sub>1</sub>);}</p<sub></pre>
D (p <sub>1</sub> , c <sub>1</sub> ) D (p <sub>2</sub> , c <sub>2</sub> )	<pre>T(D(p<sub>1</sub>,c<sub>1</sub>),D(p<sub>2</sub>,c<sub>2</sub>)) {    if p<sub>1</sub><p<sub>2 return D(p<sub>1</sub>,c<sub>1</sub>);    else if p<sub>1</sub>&gt;p<sub>2</sub> return D(p<sub>1</sub>-1,c<sub>1</sub>);    else return NULL;}</p<sub></pre>

B. Transformation Matrix Properties and Position Relation Derivation Matrix Transformation Matrix  $TM(O_1, O_2)$  properties, that are related to the derivation of the Position Relation Derivation Matrix (PRDM) (shown below), are elaborated below. Notations:

- 1. p represents the original position; and p'represents the corresponding transformed position;
- 2. PR denotes Position Relationship between original positions  $p_1$  and  $p_2$ ; and PR' denotes Position Relationship between transformation positions  $p_1'$  and  $p_2'$ .

$p_2$ 'vs $p_2$	$p_2'=p_2$	p <sub>2</sub> '=p <sub>2</sub> +1	$p_2' = p_2 - 1$
$p_1'=p_1$	PR'=PR	p <sub>1</sub> ' <p<sub>2'</p<sub>	$1.p_1' \le p_2'$ when $p_1 = p_3$ $2.p_1' < p_2'$ when $p_1 < p_3$
$p_1'=p_1+1$	p <sub>2</sub> ' <p<sub>1'</p<sub>	PR'=PR	X
p <sub>1</sub> '=p <sub>1</sub> -1	1. $p_2$ ' $\leq p_1$ ' when $p_2=p_3$ 2. $p_2$ ' $\leq p_1$ ' when $p_2 \leq p_3$	X	PR'=PR

To derive position relationships between transformed operations, we use the following  $TM(O_1, O_2)$  properties, which are directly derivable from definitions and specifications related to  $TM(O_1, O_2)$ :

- **Property 1:** An *insert* operation  $O_2$  may have *right-shifting* effect on another operation  $O_1$  only if  $O_1$  is positioned at or on the right of  $O_2$  ( $p_2 \le p_1$ );  $O_2$  may not have right-shifting effect on  $O_1$  only if  $O_1$  is positioned at or on the left of  $O_2$  ( $p_2 \ge p_1$ ).
- **Property 2:** A delete operation  $O_2$  may have left-shifting effect on another operation  $O_1$  if and only if  $O_1$  is positioned on the right of  $O_2$  ( $p_2 < p_1$ ).
- Property 3: An operation may not have both left- and right-shifting effects on two operations defined on the same state.
- **Property 4:** (Derived from Property 1): Given  $O_1$ ,  $O_2$  and  $O_3$  defined on the same state, after transforming  $O_1$  and  $O_2$  against  $O_3$ , respectively, if  $O_3$  has a *right*-shifting effect on  $O_1$  but not on  $O_2$ , then  $p_2 \le p_3 \le p_1$ ; if  $O_3$  has a *right*-shifting effect on  $O_2$  but not on  $O_1$ , then  $p_1 \le p_3 \le p_2$ .
- **Property 5:** (Derived from Property 2). Given  $O_1$ ,  $O_2$  and  $O_3$  defined on the same state. After transforming  $O_1$  and  $O_2$  against  $O_3$ , respectively, if  $O_3$  has a *left*-shifting effect on  $O_1$  but not on  $O_2$ , then  $p_2 \le p_3 < p_1$ ; if  $O_3$  has a *left*-shifting effect on  $O_2$  but not on  $O_1$ , then  $p_1 \le p_3 < p_2$ .

Based on the transformation results in  $TM(O_1,O_2)$ , there exist only three (3) possible relations between the original position p and the corresponding transformed position p', i.e. p' = p, p' = p + 1, or p' = p - 1. For two operations  $O_1$  and  $O_2$ , after transforming them against the same third operation  $O_3$ , there may exist  $3 \times 3 = 9$  possible different combinations of  $p_1'$  vs  $p_1$  and  $p_2'$  vs  $p_2$  relations, corresponding to the *nine* (9) entries in the PRDM. These entries are elaborated below.

- 1. Two entries, corresponding to  $(p_2' = p_2 + 1, p_1' = p_1 1)$  and  $(p_2' = p_2 1, p_1' = p_1 + 1)$ , are filled with "X", which means they are impossible to occur according to TM Property 3.
- 2. When  $O_3$  has the same effect on both  $O_1$  and  $O_2$ , corresponding to the three entries along the diagonal, the original position relationships between  $O_1$  and  $O_2$  must be preserved, represented as PR' = PR.
- 3. When  $O_3$  has a right-shifting effect on one operation only, then: (1)  $p_2' < p_1'$  if only  $O_1$  is shifted, corresponding to the entry  $(p_1' = p_1 + 1, p_2' = p_2)$ ; and (2)  $p_1' < p_2'$  if only  $O_2$  is shifted, corresponding to the entry  $(p_2' = p_2 + 1, p_1' = p_1)$ . This is because, if  $O_3$  has a right-shifting effect on  $O_1$  but not  $O_2$ , then  $p_2 \le p_3 \le p_1$  according to TM Property 4, which leads to  $p_2' < p_1'$  due to  $p_2' = p_2$  and  $p_1' = p_1 + 1$ . The same reasoning follows if only  $O_2$  is shifted.
- 4. When  $O_3$  has a *left*-shifting effect on one operation only, then: (1) in case that only  $O_1$  is shifted, corresponding to the entry  $(p_1' = p_1 l, p_2' = p_2)$ , we have:  $p_2' \le p_1'$  if  $p_2 = p_3$ ; or  $p_2' < p_1'$  if  $p_2 < p_3$ ; and (2) in case that only  $O_2$  is shifted, corresponding to the entry  $(p_2' = p_2 l, p_1' = p_1)$ , we have:  $p_1' \le p_2'$  if  $p_2 = p_3$ ; or  $p_1' < p_2'$  if  $p_2 < p_3$ . This is because, if  $O_3$  has a left-shifting effect on  $O_1$  but not on  $O_2$  (i.e.  $p_1' = p_1 l$ ,  $p_2' = p_2$ ), then  $p_2 \le p_3 < p_1$  according to TM Property 5, which leads to either  $p_2' \le p_1'$  under the condition  $p_2 = p_3$ ; or  $p_2' < p_1'$  under the condition  $p_2 < p_3$ . The same reasoning follows if only  $O_2$  is shifted.

## C. UE-CP1 Verification Framework and Results

In this section, the UE-CP1 verification framework and verification results (drawn manually for clarity and convenience in describing the derivation process) are given in full detail. Columns in the UE-CP1 framework are explained below:

- 1.  $O_1$  and  $O_2$ : given operation combinations.
- 2. **PR:** given position relationships between  $O_1$  and  $O_2$  for each operation type combination.
- 3. UE-CP1-Equation: S<sub>12</sub>=S<sub>21</sub>=UE(O<sub>1</sub>,O<sub>2</sub>): the UE-CP1 equation to be solved in this verification process.
  1) Derive S<sub>12</sub>=S<sub>1</sub> · O<sub>2</sub> <sup>O1</sup>=S · O<sub>1</sub> · O<sub>2</sub> <sup>O2</sup>: steps in deriving S<sub>12</sub>
  2) Derive S<sub>21</sub>=S<sub>2</sub> · O<sub>1</sub> <sup>O2</sup>=S · O<sub>2</sub> · O<sub>1</sub> <sup>O2</sup>: steps in deriving S<sub>21</sub>
  3) UE(O<sub>1</sub>, O<sub>2</sub>): given union effects for all verification cases
- 4. VR: verification results. A confirmation case is indicated as T (True); a violation case is indicated as F (False). In the UE-CP1 verification, there is no case indicated as F.

0.		UE-CP1-Equ							
$O_2$	PR	Derive $S_{12}=S_1\circ O_2^{\circ 1}=S\circ O_1\circ O_2^{\circ 1}$	Derive S <sub>21</sub> =S <sub>2</sub> O <sub>1</sub> <sup>O2</sup> =SO <sub>2</sub> O <sub>2</sub> O <sub>1</sub> <sup>O2</sup>	UE (O <sub>1</sub> , O <sub>2</sub> )	R				
		$S_1=SoO_1$ =S[0,p <sub>1</sub> -1]+"c <sub>1</sub> "+S[p <sub>1</sub> , S -1] =S <sub>1</sub> [0,p <sub>1</sub> -1]+S <sub>1</sub> [p <sub>1</sub> ]+S <sub>1</sub> [p <sub>1</sub> +1, S <sub>1</sub>  -1]	$S_2=SOO_2$ =S[0,p <sub>2</sub> -1]+"c <sub>2</sub> "+S[p <sub>2</sub> , S -1] =S <sub>2</sub> [0,p <sub>2</sub> -1]+S <sub>2</sub> [p <sub>2</sub> ]+S <sub>2</sub> [p <sub>2</sub> +1, S <sub>2</sub>  -1]	S[0,p <sub>1</sub> -1]					
	177	$O_2^{O_1} = T(O_2, O_1) = I(p_2 + 1, c_2)$	$O_1^{O2} = T(O_1, O_2) = I(p_1, c_1)$	+"c <sub>1</sub> " +S[p <sub>1</sub> ,	П				
	o <sub>1</sub> <p< td=""><td><math>S_{12}=S_1 \circ O_2^{\circ 1}=S_1[0,p_2]+"c_2"+S_1[p_2+1, S_1 -1]</math></td><td><math>S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1-1]+"c_1"+S_2[p_1, S_2 -1]</math></td><td>p<sub>2</sub>-1]</td><td>Т</td></p<>	$S_{12}=S_1 \circ O_2^{\circ 1}=S_1[0,p_2]+"c_2"+S_1[p_2+1, S_1 -1]$	$S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1-1]+"c_1"+S_2[p_1, S_2 -1]$	p <sub>2</sub> -1]	Т				
	2	$\begin{split} &S_{12} = &SoO_1 \circ O_2^{\circ 1} \\ &= &S_1 [0, p_2] + \text{``c}_2 \text{''} + S_1 [p_2 + 1,  S_1  - 1] \\ &= &S_1 [0, p_1 - 1] + S_1 [p_1] + S_1 [p_1 + 1, p_2] \\ &+ \text{``c}_2 \text{''} + S_1 [p_2 + 1,  S_1  - 1] \\ &= &S [0, p_1 - 1] + \text{``c}_1 \text{''} + S [p_1, p_2 - 1] + \text{``c}_2 \text{''} + S [p_2,  S  - 1] \end{split}$	+"c <sub>2</sub> " +S[p <sub>2</sub> ,  S -1]						
		$S_1=S\circ O_1$ = $S[0,p_1-1]+"c_1"+S[p_1, S -1]$ = $S_1[0,p_1-1]+S_1[p_1]+S_1[p_1+1, S_1 -1]$	$\begin{split} & s_2 = s \circ o_2 \\ &= s \left[ 0, p_1 - 1 \right] + c_2'' + s \left[ p_1,  s  - 1 \right] \\ &= s_2 \left[ 0, p_1 - 1 \right] + s_2 \left[ p_1 \right] + s_2 \left[ p_1 + 1,  s_2  - 1 \right] \end{split}$						
		$O_2^{O1} = T(O_2, O_1) = I(p_1 + 1, c_2)$ or $I(p_1, c_2)$	$O_1^{O_2}=T(O_1,O_2)=I(p_1,c_1)$ or $I(p_1+1,c_1)$	0.50 . 11					
$I(p_1, c_1);$	Q	$S_{12}=S_1\circ O_2^{\circ 1}=S_1[0,p_1]+"c_2"+S_1[p_1+1, S_1 -1]$ or $S_{12}=S_1\circ O_2^{\circ 1}=S_1[0,p_1-1]+"c_2"+S_1[p_1, S_1 -1]$	$S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1-1]+"c_1"+S_2[p_1, S_2 -1]$ or $S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1]+"c_1"+S_2[p_1+1, S_2 -1]$	S[0,p <sub>1</sub> -1] +"c <sub>1</sub> c <sub>2</sub> " +S[p <sub>1</sub> ,  S -1]					
); I (p <sub>2</sub> , c <sub>2</sub> )	1	$\begin{split} &\mathbf{S}_{12} \!\!=\!\! \mathbf{SoO_1OO_2}^{01} \\ &=\!\! \mathbf{S}_1[0,p_1] \!+\! \mathbf{^{n}C_2}'' \!+\! \mathbf{S}_1[p_1 \!+\! 1, S_1 -1] \\ &=\!\! \mathbf{S}_1[0,p_1 \!-\! 1] \!+\! \mathbf{^{n}C_1}'' \!+\! \mathbf{S}_1[p_1] \!+\! \mathbf{^{n}C_2}'' \!+\! \mathbf{S}_1[p_1 \!+\! 1, S_1 -1] \\ &=\!\! \mathbf{S}[0,p_1 \!-\! 1] \!+\! \mathbf{^{n}C_1C_2}'' \!+\! \mathbf{S}[p_1, S -1] \\ &\text{or} \\ &\mathbf{S}_{12} \!\!=\!\! \mathbf{SoO_1OO_2}^{01} \\ &=\!\! \mathbf{S}_1[0,p_1 \!-\! 1] \!+\! \mathbf{^{n}C_2}'' \!+\! \mathbf{S}_1[p_1, S_1 -1] \\ &=\!\! \mathbf{S}_1[0,p_1 \!-\! 1] \!+\! \mathbf{^{n}C_2}'' \!+\! \mathbf{S}_1[p_1, S_1 -1] \\ &=\!\! \mathbf{S}[0,p_1 \!-\! 1] \!+\! \mathbf{^{n}C_2C_1}'' \!+\! \mathbf{S}[p_1, S -1] \end{split}$	$\begin{split} &S_{21} = S \circ O_2 \circ O_1^{\circ 2} \\ &= S_2 \left[0, p_1 - 1\right] + \text{``c}_1 \text{''} + S_2 \left[p_1, \left S_2\right  - 1\right] \\ &= S_2 \left[0, p_1 - 1\right] + \text{``c}_1 \text{''} + S_2 \left[p_1\right] + S_2 \left[p_1 + 1, \left S_2\right  - 1\right] \\ &= S \left[0, p_1 - 1\right] + \text{``c}_1 \text{c}_2 \text{''} + S \left[p_1, \left S\right  - 1\right] \\ \text{or} \\ &S_{21} = S \circ O_2 \circ O_1^{\circ 2} \\ &= S_2 \left[0, p_1\right] + \text{``c}_1 \text{''} + S_2 \left[p_1 + 1, \left S_2\right  - 1\right] \\ &= S_2 \left[0, p_1 - 1\right] + S_2 \left[p_1\right] + \text{``c}_1 \text{''} + S_2 \left[p_1 + 1, \left S_2\right  - 1\right] \\ &= S \left[0, p_1 - 1\right] + \text{``c}_2 \text{c}_1 \text{''} + S \left[p_1, \left S\right  - 1\right] \end{split}$	or S[0,p <sub>1</sub> -1] +"c <sub>2</sub> c <sub>1</sub> " +S[p <sub>1</sub> ,  S -1]	Т				
		S <sub>1</sub> =SoO <sub>1</sub> =S[0,p <sub>1</sub> -1]+"c <sub>1</sub> "+S[p <sub>1</sub> , S -1] =S <sub>1</sub> [0,p <sub>1</sub> -1]+S <sub>1</sub> [p <sub>1</sub> ]+S <sub>1</sub> [p <sub>1</sub> +1, S <sub>1</sub>  -1]	$S_2=S\circ O_2$ =S[0,p <sub>2</sub> -1]+"c <sub>2</sub> "+S[p <sub>2</sub> , S -1] =S <sub>2</sub> [0,p <sub>2</sub> -1]+S <sub>2</sub> [p <sub>2</sub> ]+S <sub>2</sub> [p <sub>2</sub> +1, S <sub>2</sub>  -1]	S[0,p <sub>2</sub> -1]					
	_	$O_2^{O1} = T(O_2, O_1) = I(p_2, c_2)$	$O_1^{O_2} = T(O_1, O_2) = I(p_1+1, c_1)$						
	01>K	$S_{12}=S_1\circ O_2^{\circ 1}=S_1[0,p_2-1]+"c_2"+S_1[p_2, S_1 -1]$	$S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1]+"c_1"+S_2[p_1+1, S_2 -1]$	+S[p <sub>2</sub> , p <sub>1</sub> -1]	Т				
	)2	$\begin{split} &S_{12} = S \circ O_1 \circ O_2^{\circ 1} \\ &= S_1 [0, p_2 - 1] + \text{``c}_2 \text{''} + S_1 [p_2,  S_1  - 1] \\ &= S_1 [0, p_2 - 1] + \text{``c}_2 \text{''} \\ &+ S_1 [p_2, p_1 - 1] + S_1 [p_1] + S_1 [p_1 + 1,  S_1  - 1] \\ &= S [0, p_2 - 1] + \text{``c}_2 \text{''} + S [p_2, p_1 - 1] + \text{``c}_1 \text{''} + S [p_1,  S  - 1] \end{split}$	$\begin{split} & S_{21} = S \circ O_2 \circ O_1^{\circ 2} \\ & = S_2 [0, p_1] + \text{``c_1''} + S_2 [p_1 + 1,  S_2  - 1] \\ & = S_2 [0, p_2 - 1] + S_2 [p_2] + S_2 [p_2 + 1, p_1] \\ & + \text{``c_1''} + S_2 [p_1 + 1,  S_2  - 1] \\ & = S [0, p_2 - 1] + \text{``c_2''} + S [p_2, p_1 - 1] + \text{''c_1''} + S [p_1,  S  - 1] \end{split}$	+"C <sub>1</sub> " +S[p <sub>1</sub> ,  S -1]					

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		$\begin{split} &S_1 = S \circ O_1 \\ &= S \left[ 0, p_1 - 1 \right] + ``c_1'' + S \left[ p_1,  S  - 1 \right] \\ &= S_1 \left[ 0, p_1 - 1 \right] + S_1 \left[ p_1 \right] + S_1 \left[ p_1 + 1,  S_1  - 1 \right] \end{split}$	$S_2=SOO_2$ =S[0,p <sub>2</sub> -1]+S[p <sub>2</sub> +1, S -1] =S <sub>2</sub> [0,p <sub>2</sub> -1]+S <sub>2</sub> [p <sub>2</sub> , S <sub>2</sub>  -1]			
		$O_2^{O1} = T(O_2, O_1) = D(p_2 + 1, C_2)$	$O_1^{O2} = T(O_1, O_2) = I(p_1, c_1)$	S[0,p <sub>1</sub> -1] +"c <sub>1</sub> "		
	p1 <p2< td=""><td><math>S_{12}=S_1\circ O_2^{\circ 1}=S_1[0,p_2]+S_1[p_2+2, S_1 -1]</math></td><td><math>S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1-1]+"c_1"+S_2[p_1, S_2 -1]</math></td><td>+S[p<sub>1</sub>,</td><td>Т</td></p2<>	$S_{12}=S_1\circ O_2^{\circ 1}=S_1[0,p_2]+S_1[p_2+2, S_1 -1]$	$S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1-1]+"c_1"+S_2[p_1, S_2 -1]$	+S[p <sub>1</sub> ,	Т	
	$p_2$	$\begin{split} &S_{12} = S \circ O_1 \circ O_2^{\circ 1} \\ &= S_1 \left[ 0 , p_2 \right] + S_1 \left[ p_2 + 2 ,  S_1  - 1 \right] \\ &= S_1 \left[ 0 , p_1 - 1 \right] + S_1 \left[ p_1 \right] + S_1 \left[ p_1 + 1 , p_2 \right] \\ &+ S_1 \left[ p_2 + 2 ,  S_1  - 1 \right] \\ &= S \left[ 0 , p_1 - 1 \right] + \text{``} c_1 \text{''} + S \left[ p_1 , p_2 - 1 \right] + S \left[ p_2 + 1 ,  S  - 1 \right] \end{split}$	$\begin{split} &S_{21} = S \circ O_2 \circ O_1^{\circ 2} \\ &= S_2 \left[0, p_1 - 1\right] + \text{``c}_1 \text{''} + S_2 \left[p_1,  S_2  - 1\right] \\ &= S_2 \left[0, p_1 - 1\right] + \text{``c}_1 \text{''} + S_2 \left[p_1, p_2 - 1\right] + S_2 \left[p_2,  S_2  - 1\right] \\ &= S \left[0, p_1 - 1\right] + \text{``c}_1 \text{''} + S \left[p_1, p_2 - 1\right] + S \left[p_2 + 1,  S  - 1\right] \end{split}$	$p_2-1$ +S[ $p_2+1$ ,  S -1]		
I (p <sub>1</sub>		$S_1=SoO_1$ =S[0,p <sub>1</sub> -1]+"c <sub>1</sub> "+S[p <sub>1</sub> , S -1] =S <sub>1</sub> [0,p <sub>1</sub> -1]+S <sub>1</sub> [p <sub>1</sub> ]+S <sub>1</sub> [p <sub>1</sub> +1, S <sub>1</sub>  -1]	$S_2=S \circ O_2$ =S[0,p_2-1]+S[p_2+1, S -1] =S_2[0,p_2-1]+S_2[p_2, S_2 -1]			
(p <sub>1</sub> , c <sub>1</sub> );D	ď	$O_2^{O1} = T(O_2, O_1) = D(p_2 + 1, c_2)$	$O_1^{O2} = T(O_1, O_2) = I(p_1, c_1)$	$S[0,p_1-1]$		
; D	$p_1=p_2$	$S_{12}=S_1\circ O_2^{\circ 1}=S_1[0,p_1]+S_1[p_1+2, S_1 -1]$	$S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1-1]+"c_1"+S_2[p_1, S_2 -1]$	+"c <sub>1</sub> " +S[p <sub>1</sub> +1,	Т	
$(p_2, c_2)$		$\begin{array}{llllllllllllllllllllllllllllllllllll$		S -1]		
		$S_1=SoO_1$ = $S[0,p_1-1]+"c_1"+S[p_1, S -1]$ = $S_1[0,p_1-1]+S_1[p_1]+S_1[p_1+1, S_1 -1]$	$S_2=S \circ O_2$ =S[0,p <sub>2</sub> -1]+S[p <sub>2</sub> +1, S -1] =S <sub>2</sub> [0,p <sub>2</sub> -1]+S <sub>2</sub> [p <sub>2</sub> , S <sub>2</sub>  -1]	S[0,p <sub>2</sub> -1]		
	3	$O_2^{O1} = T(O_2, O_1) = D(p_2, c_2)$	$O_1^{\circ 2} = T(O_1, O_2) = I(p_1 - 1, c_1)$	$+S[p_2+1,$		
	p <sub>1</sub> >p <sub>2</sub>	$S_{12}=S_1 \circ O_2^{\circ 1}=S_1[0,p_2-1]+S_1[p_2+1, S_1 -1]$	$S_{21}=S_2\circ O_1^{O2}=S_2[0,p_1-2]+"c_1"+S_2[p_1-1, S_2 -1]$	p <sub>1</sub> -1]	Т	
	)2	$\begin{split} &S_{12} = &S \circ O_1 \circ O_2^{\circ 1} \\ &= &S_1 \left[ 0 , p_2 - 1 \right] + S_1 \left[ p_2 + 1 ,   S_1  - 1 \right] \\ &= &S_1 \left[ 0 , p_2 - 1 \right] + S_1 \left[ p_2 + 1 , p_1 - 1 \right] + S_1 \left[ p_1 \right] \\ &+ &S_1 \left[ p_1 + 1 ,   S_1  - 1 \right] \\ &= &S \left[ 0 , p_2 - 1 \right] + S \left[ p_2 + 1 , p_1 - 1 \right] + \text{``c}_1'' + S \left[ p_1 ,   S  - 1 \right] \end{split}$	$\begin{array}{c} S_{21} = S \circ O_2 \circ O_1^{\circ 2} \\ S_1   -1] \\ = S_2 [0, p_1 - 2] + "c_1" + S_2 [p_1 - 1,  S_2  - 1] \\ = S_2 [0, p_2 - 1] + S_2 [p_2, p_1 - 2] + "c_1" + S_2 [p_1 - 1,  S_2  - 1] \\ = S_2 [0, p_2 - 1] + S_2 [p_2, p_1 - 2] + "c_1" + S_2 [p_1 - 1,  S_2  - 1] \end{array}$			
		$S_1=SoO_1$ =S[0,p <sub>1</sub> -1]+S[p <sub>1</sub> +1, S -1] =S <sub>1</sub> [0,p <sub>1</sub> -1]+S <sub>1</sub> [p <sub>1</sub> , S <sub>1</sub>  -1]	$[-1] + S[p_1+1,  S -1]$ $[-1] + S[p_2+1,  S -1]$			
	מ	$O_2^{O1} = T(O_2, O_1) = D(p_2 - 1, C_2)$	$O_1^{O2} = T(O_1, O_2) = D(p_1, C_1)$	S[0,p <sub>1</sub> -1] +S[p <sub>1</sub> +1,		
	p1 <p.< td=""><td><math>S_{12}=S_1\circ O_2^{\circ 1}=S_1[0,p_2-2]+S_1[p_2, S_1 -1]</math></td><td><math>S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1-1]+S_2[p_1+1, S_2 -1]</math></td><td>p<sub>2</sub>-1] +S[p<sub>2</sub>+1,</td><td>Т</td></p.<>	$S_{12}=S_1\circ O_2^{\circ 1}=S_1[0,p_2-2]+S_1[p_2, S_1 -1]$	$S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1-1]+S_2[p_1+1, S_2 -1]$	p <sub>2</sub> -1] +S[p <sub>2</sub> +1,	Т	
	2	$\begin{split} &S_{12} = S \circ O_1 \circ O_2^{\circ 1} \\ &= S_1 \left[ 0, p_2 - 2 \right] + S_1 \left[ p_2,  S_1  - 1 \right] \\ &= S_1 \left[ 0, p_1 - 1 \right] + S_1 \left[ p_1, p_2 - 2 \right] + S_1 \left[ p_2,  S_1  - 1 \right] \\ &= S \left[ 0, p_1 - 1 \right] + S \left[ p_1 + 1, p_2 - 1 \right] + S \left[ p_2 + 1,  S  - 1 \right] \end{split}$	$ = S_{1}[p_{1}, p_{2}-2] + S_{1}[p_{2},  S_{1} -1] $ $ = S_{2}[0, p_{1}-1] + S_{2}[p_{1}+1, p_{2}-1] + S_{2}[p_{2},  S_{2} -1] $			
D(p <sub>1</sub> , o		$S_1=S \circ O_1$ =S[0,p <sub>1</sub> -1]+S[p <sub>1</sub> +1, S -1] =S <sub>1</sub> [0,p <sub>1</sub> -1]+S <sub>1</sub> [p <sub>1</sub> , S <sub>1</sub>  -1]	$S_2=S \circ O_2$ =S[0,p <sub>2</sub> -1]+S[p <sub>2</sub> +1, S -1] =S <sub>2</sub> [0,p <sub>2</sub> -1]+S <sub>2</sub> [p <sub>2</sub> , S <sub>2</sub>  -1]			
(1);	$p_1=p_2$	$O_2^{O1}$ =T ( $O_2$ , $O_1$ )=NULL	$O_1^{O_2}$ =T $(O_1, O_2)$ =NULL	$S[0,p_1-1] + S[p_1+1,$	т	
D(p	=p2	$S_{12}=S_1\circ O_2^{01}=S_1$	$S_{21}=S_2\circ O_1^{O2}=S_2$	S -1]	ľ	
$(p_1,c_1);D(p_2,c_2)$		$S_{12} = SoO_1 \circ O_2^{\circ 1} = S_1$ = $S_1 [0, p_1-1] + S_1 [p_1,  S_1 -1]$ = $S[0, p_1-1] + S[p_1+1,  S -1]$	$S_{21}=S \circ O_2 \circ O_1^{\circ 2}=S_2$ = $S_2[0,p_1-1]+S_2[p_1, S_2 -1]$ = $S[0,p_1-1]+S[p_1+1, S -1]$			
		$S_1=S_0O_1$ =S[0,p <sub>1</sub> -1]+S[p <sub>1</sub> +1, S -1] =S <sub>1</sub> [0,p <sub>1</sub> -1]+S <sub>1</sub> [p <sub>1</sub> , S <sub>1</sub>  -1]	$S_2 = Soo_2$ = $S[0, p_2-1] + S[p_2+1,  S -1]$ = $S_2[0, p_2-1] + S_2[p_2,  S_2 -1]$	S[0,p <sub>2</sub> -1]		
	Q	$O_2^{O1} = T(O_2, O_1) = D(p_2, C_2)$				
	p1>p2	$S_{12}=S_1\circ O_2^{\circ 1}=S_1[0,p_2-1]+S_1[p_2+1, S_1 -1]$	$S_{21}=S_2\circ O_1^{\circ 2}=S_2[0,p_1-2]+S_2[p_1, S_2 -1]$	$+S[p_2+1, p_1-1]$	Т	
	2	$\begin{split} &S_{12} = S \circ O_1 \circ O_2^{\circ 1} \\ &= S_1 \left[ 0, p_2 - 1 \right] + S_1 \left[ p_2 + 1,  S_1  - 1 \right] \\ &= S_1 \left[ 0, p_2 - 1 \right] + S_1 \left[ p_2 + 1, p_1 - 1 \right] + S_1 \left[ p_1,  S_1  - 1 \right] \\ &= S \left[ 0, p_2 - 1 \right] + S \left[ p_2 + 1, p_1 - 1 \right] + S \left[ p_1 + 1,  S  - 1 \right] \end{split}$	$\begin{split} &S_{21} = S_{00} \circ 0_{0}^{\circ 2} \\ &= S_{2} [0, p_{1} - 2] + S_{2} [p_{1},  S_{2}  - 1] \\ &= S_{2} [0, p_{2} - 1] + S_{2} [p_{2}, p_{1} - 2] + S_{2} [p_{1},  S_{2}  - 1] \\ &= S[0, p_{2} - 1] + S[p_{2} + 1, p_{1} - 1] + S[p_{1} + 1,  S  - 1] \end{split}$	-+S[p <sub>1</sub> +1,  S -1]		

### D. CP2 Verification Framework and Results

In this section, the CP2 verification framework and verification results (generated by OTX) are given in full detail. Columns in the CP2 framework are explained below:

- 1.  $O_1$ ,  $O_2$ ,  $O_3$ : given operation type permutations.
- 2. **PR:** given position relationships among  $O_1$ ,  $O_2$  and  $O_3$  for each operation type permutation.
- 3. CP2-Equation O<sub>1</sub><sup>O2,O3</sup> = O<sub>1</sub><sup>O3,O2</sup>: the CP2 equation to be solved in this verification process.
  1) Derive O<sub>1</sub><sup>O2,O3</sup> = T(O<sub>1</sub><sup>O2</sup>, O<sub>3</sub><sup>O2</sup>): steps in deriving O<sub>1</sub><sup>O2,O3</sup>
  (1) O<sub>1</sub><sup>O2</sup> = T(O<sub>1</sub>, O<sub>2</sub>): deriving O<sub>1</sub><sup>O2</sup> by consulting the TM according to operation types and position relationships among  $O_1$  and  $O_2$ . (2)  $O_3^{O2} = T(O_3, O_2)$ : deriving  $O_3^{O2}$  by consulting the TM according to operation types and position
  - relationships among  $O_3$  and  $O_2$ .
  - (3) **Derived PR** $(O_1^{02}, O_3^{02})$ : deriving position relationships between the transformed operations  $O_1^{O2}$  and  $O_3^{O2}$ , according to the Position Relation Derivation Matrix (PRDM) shown in
  - (4)  $O_1^{O2,O3} = T(O_1^{O2}, O_3^{O2})$ : deriving  $O_1^{O2,O3}$  according to the operation types of  $O_1$  and  $O_3$  and the derived position relation by consulting the TM.

    2) **Derive**  $O_1^{O3,O2} = T(O_1^{O3}, O_2^{O3})$ : steps in deriving  $O_1^{O3,O2}$  (similar steps in deriving  $O_1^{O2,O3}$ )
  - - (1)  $O_1^{O3} = T(O_1, O_3)$ (2)  $O_2^{O3} = T(O_2, O_3)$

    - (3) Derived  $PR(O_1^{O3}, O_2^{O3})$
    - (4)  $O_1^{03,02} = T(O_1^{03}, O_2^{03})$
- 4. VR: verification results. A confirmation case is indicated as T (True); a violation case is indicated as F (False). In the CP2 verification, only one case (Case 20) is indicated as F.
- 5. **#:** verification case number.

From the verification results, we can see that there is only one CP2-violation case (Case 20) among a total of 58 verification cases. Case 20 has the following operation types and position relationships:  $O_I$  =  $I(p_1,c_1)$ ,  $O_2 = D(p_2,c_2)$  and  $O_3 = I(p_3,c_3)$ , with  $(p_1-1) = p_2 = p_3$ . This case gives a general description of the scenario-based FT puzzle in Figure 2, where the document state S = "abc",  $O_1 = I(2,x)$ ,  $O_2 = D(1,b)$ and  $O_3 = I(1,y)$ , respectively, and  $((p_1=2)-1) = (p_2=1) = (p_3=1)$ . Case 20 can be converted into a CP2confirmation case by changing the priority to  $priority(O_1) < priority(O_2) < priority(O_3)$ , but Case 10, which is a CP2-confirmation case under  $priority(O_1) > priority(O_2) > priority(O_3)$ , will be turned to a CP2-violation case. In other words, no priority among the three operations is able to make both Case 20 and Case 10 comply with CP2.

	Verification Fra	linework (Frior	ity setting.or.		ano n	02,03 0 03,0	12				
0		CP2-Equation: 0 <sub>1</sub> 02,03,02									
0 <sub>1</sub> 0 <sub>2</sub>	Original		Derive O <sub>1</sub> 02,0	O3=T(O <sub>1</sub> O3,O <sub>2</sub> O3)			Derive O <sub>1</sub> O3,O	<sup>2</sup> =T(O <sub>1</sub> <sup>O2</sup> ,O <sub>3</sub> <sup>O2</sup> )		v	
03	PR(O <sub>1</sub> ,O <sub>2</sub> ,O <sub>3</sub> )	0 <sub>1</sub> <sup>02</sup> =	0302=	Derived	0,02,03=	0 <sub>1</sub> 03=	0203=	Derived	0,03,02=	R	
		T(O <sub>1</sub> ,O <sub>2</sub> )	T(O3,O2)	PR (0 <sub>1</sub> 02,0 <sub>3</sub> 02)	T(O <sub>1</sub> O2,O <sub>3</sub> O2)	T(O <sub>1</sub> ,O <sub>3</sub> )	T(O <sub>2</sub> ,O <sub>3</sub> )	PR(O <sub>1</sub> O <sub>2</sub> O <sub>3</sub> )	T(O <sub>1</sub> O3,O <sub>2</sub> O3)		
	p1 <p2<p3< td=""><td>I(p1,c1)</td><td>I(p3+1,c3)</td><td>p1<p3+1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>I(p2,c2)</td><td>p1<p2< td=""><td>I(p1,c1)</td><td>T</td><td>1</td></p2<></td></p3+1<></td></p2<p3<>	I(p1,c1)	I(p3+1,c3)	p1 <p3+1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>I(p2,c2)</td><td>p1<p2< td=""><td>I(p1,c1)</td><td>T</td><td>1</td></p2<></td></p3+1<>	I(p1,c1)	I(p1,c1)	I(p2,c2)	p1 <p2< td=""><td>I(p1,c1)</td><td>T</td><td>1</td></p2<>	I(p1,c1)	T	1
	p1=p2 <p3< td=""><td>I(p1,c1) I(p1,c1)</td><td>I (p3+1,c3) I (p3+1,c3)</td><td>p1<p3+1 p1<p3+1< td=""><td>I(p1,c1) I(p1,c1)</td><td>I(p1,c1) I(p1,c1)</td><td>I(p2,c2) I(p2,c2)</td><td>p1=p2 p1=p2</td><td>I(p1,c1) I(p1,c1)</td><td>T</td><td>3</td></p3+1<></p3+1 </td></p3<>	I(p1,c1) I(p1,c1)	I (p3+1,c3) I (p3+1,c3)	p1 <p3+1 p1<p3+1< td=""><td>I(p1,c1) I(p1,c1)</td><td>I(p1,c1) I(p1,c1)</td><td>I(p2,c2) I(p2,c2)</td><td>p1=p2 p1=p2</td><td>I(p1,c1) I(p1,c1)</td><td>T</td><td>3</td></p3+1<></p3+1 	I(p1,c1) I(p1,c1)	I(p1,c1) I(p1,c1)	I(p2,c2) I(p2,c2)	p1=p2 p1=p2	I(p1,c1) I(p1,c1)	T	3
I(p1,c1)	p1=p2=p3 p1 <p2=p3< td=""><td>I(p1,c1)</td><td>I (p3+1,c3)</td><td>p1<p3+1 p1<p3+1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>I(p2,c2)</td><td>p1~p2 p1<p2< td=""><td>I(p1,c1)</td><td>T</td><td>4</td></p2<></td></p3+1<></p3+1 </td></p2=p3<>	I(p1,c1)	I (p3+1,c3)	p1 <p3+1 p1<p3+1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>I(p2,c2)</td><td>p1~p2 p1<p2< td=""><td>I(p1,c1)</td><td>T</td><td>4</td></p2<></td></p3+1<></p3+1 	I(p1,c1)	I(p1,c1)	I(p2,c2)	p1~p2 p1 <p2< td=""><td>I(p1,c1)</td><td>T</td><td>4</td></p2<>	I(p1,c1)	T	4
I(p2,c2)	p2 <p1<p3< td=""><td>I(p1+1,c1)</td><td>I (p3+1,c3)</td><td>p1+1<p3+1< td=""><td>I(p1+1,c1)</td><td>I(p1,c1)</td><td>I(p2,c2)</td><td>p1&gt;p2</td><td>I(p1+1,c1)</td><td>T</td><td>5</td></p3+1<></td></p1<p3<>	I(p1+1,c1)	I (p3+1,c3)	p1+1 <p3+1< td=""><td>I(p1+1,c1)</td><td>I(p1,c1)</td><td>I(p2,c2)</td><td>p1&gt;p2</td><td>I(p1+1,c1)</td><td>T</td><td>5</td></p3+1<>	I(p1+1,c1)	I(p1,c1)	I(p2,c2)	p1>p2	I(p1+1,c1)	T	5
I(p3,c3)	p2 <p1=p3< td=""><td>I(p1+1,c1)</td><td>I(p3+1,c3)</td><td>p1+1=p3+1</td><td>I(p1+1,c1)</td><td>I(p1,c1)</td><td>I(p2,c2)</td><td>p1&gt;p2</td><td>I(p1+1,c1)</td><td>Т</td><td>6</td></p1=p3<>	I(p1+1,c1)	I(p3+1,c3)	p1+1=p3+1	I(p1+1,c1)	I(p1,c1)	I(p2,c2)	p1>p2	I(p1+1,c1)	Т	6
	p2 <p3<p1< td=""><td>I(p1+1,c1)</td><td>I(p3+1,c3)</td><td>p1+1&gt;p3+1</td><td>I(p1+2,c1)</td><td>I(p1+1,c1)</td><td>I(p2,c2)</td><td>p1+1&gt;p2</td><td>I(p1+2,c1)</td><td>T</td><td>7</td></p3<p1<>	I(p1+1,c1)	I(p3+1,c3)	p1+1>p3+1	I(p1+2,c1)	I(p1+1,c1)	I(p2,c2)	p1+1>p2	I(p1+2,c1)	T	7
	p2=p3 <p1< td=""><td>I(p1+1,c1)</td><td>I(p3+1,c3)</td><td>p1+1&gt;p3+1</td><td>I(p1+2,c1)</td><td>I(p1+1,c1)</td><td>I(p2,c2)</td><td>p1+1&gt;p2</td><td>I(p1+2,c1)</td><td>Т</td><td>8</td></p1<>	I(p1+1,c1)	I(p3+1,c3)	p1+1>p3+1	I(p1+2,c1)	I(p1+1,c1)	I(p2,c2)	p1+1>p2	I(p1+2,c1)	Т	8
	p1 <p2<p3< td=""><td>I(p1,c1)</td><td>I(p3-1,c3)</td><td>p1<p3-1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1<p2< td=""><td>I(p1,c1)</td><td>Т</td><td>9</td></p2<></td></p3-1<></td></p2<p3<>	I(p1,c1)	I(p3-1,c3)	p1 <p3-1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1<p2< td=""><td>I(p1,c1)</td><td>Т</td><td>9</td></p2<></td></p3-1<>	I(p1,c1)	I(p1,c1)	D(p2,c2)	p1 <p2< td=""><td>I(p1,c1)</td><td>Т</td><td>9</td></p2<>	I(p1,c1)	Т	9
	p1=p2 <p3< td=""><td>I(p1,c1)</td><td>I(p3-1,c3)</td><td>p1<p3-1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1=p2</td><td>I(p1,c1)</td><td>T</td><td>1</td></p3-1<></td></p3<>	I(p1,c1)	I(p3-1,c3)	p1 <p3-1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1=p2</td><td>I(p1,c1)</td><td>T</td><td>1</td></p3-1<>	I(p1,c1)	I(p1,c1)	D(p2,c2)	p1=p2	I(p1,c1)	T	1
				p1=p3-1	I(p1,c1)					Т	1
	p1=p2=p3	I(p1,c1)	I(p3,c3)	p1=p3	I(p1,c1)	I(p1,c1)	D(p2+1,c2)	p1 <p2+1< td=""><td>I(p1,c1)</td><td>T</td><td>1</td></p2+1<>	I(p1,c1)	T	1
	p1 <p2=p3< td=""><td>I(p1,c1)</td><td>I(p3,c3)</td><td>p1<p3< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2+1,c2)</td><td>p1<p2+1< td=""><td>I(p1,c1)</td><td>Т</td><td>1</td></p2+1<></td></p3<></td></p2=p3<>	I(p1,c1)	I(p3,c3)	p1 <p3< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2+1,c2)</td><td>p1<p2+1< td=""><td>I(p1,c1)</td><td>Т</td><td>1</td></p2+1<></td></p3<>	I(p1,c1)	I(p1,c1)	D(p2+1,c2)	p1 <p2+1< td=""><td>I(p1,c1)</td><td>Т</td><td>1</td></p2+1<>	I(p1,c1)	Т	1
	p1 <p3<p2< td=""><td>I(p1,c1)</td><td>I(p3,c3)</td><td>p1<p3< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2+1,c2)</td><td>p1<p2+1< td=""><td>I(p1,c1)</td><td>T</td><td>1</td></p2+1<></td></p3<></td></p3<p2<>	I(p1,c1)	I(p3,c3)	p1 <p3< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2+1,c2)</td><td>p1<p2+1< td=""><td>I(p1,c1)</td><td>T</td><td>1</td></p2+1<></td></p3<>	I(p1,c1)	I(p1,c1)	D(p2+1,c2)	p1 <p2+1< td=""><td>I(p1,c1)</td><td>T</td><td>1</td></p2+1<>	I(p1,c1)	T	1
I(p1,c1)	p1=p3 <p2< td=""><td>I(p1,c1)</td><td>I(p3,c3)</td><td>p1=p3</td><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2+1,c2)</td><td>p1<p2+1< td=""><td>I(p1,c1)</td><td>T</td><td>1</td></p2+1<></td></p2<>	I(p1,c1)	I(p3,c3)	p1=p3	I(p1,c1)	I(p1,c1)	D(p2+1,c2)	p1 <p2+1< td=""><td>I(p1,c1)</td><td>T</td><td>1</td></p2+1<>	I(p1,c1)	T	1
D (p2,c2)	p2 <p1<p3< td=""><td>I(p1-1,c1)</td><td>I (p3-1,c3)</td><td>p1-1<p3-1< td=""><td>I(p1-1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1&gt;p2</td><td>I (p1-1,c1)</td><td>T</td><td>1</td></p3-1<></td></p1<p3<>	I(p1-1,c1)	I (p3-1,c3)	p1-1 <p3-1< td=""><td>I(p1-1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1&gt;p2</td><td>I (p1-1,c1)</td><td>T</td><td>1</td></p3-1<>	I(p1-1,c1)	I(p1,c1)	D(p2,c2)	p1>p2	I (p1-1,c1)	T	1
I(p3,c3)	p2 <p1=p3< td=""><td>I(p1-1,c1)</td><td>I (p3-1,c3)</td><td>p1-1=p3-1</td><td>I(p1-1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1&gt;p2</td><td>I (p1-1,c1)</td><td>T</td><td>1</td></p1=p3<>	I(p1-1,c1)	I (p3-1,c3)	p1-1=p3-1	I(p1-1,c1)	I(p1,c1)	D(p2,c2)	p1>p2	I (p1-1,c1)	T	1
	p3 <p1<p2< td=""><td>I(p1,c1)</td><td>I(p3,c3)</td><td>p1&gt;p3</td><td>I (p1+1,c1)</td><td>I (p1+1,c1)</td><td>D(p2+1,c2)</td><td>p1+1<p2+1< td=""><td>I (p1+1,c1)</td><td>T</td><td>1</td></p2+1<></td></p1<p2<>	I(p1,c1)	I(p3,c3)	p1>p3	I (p1+1,c1)	I (p1+1,c1)	D(p2+1,c2)	p1+1 <p2+1< td=""><td>I (p1+1,c1)</td><td>T</td><td>1</td></p2+1<>	I (p1+1,c1)	T	1
	p3 <p1=p2< td=""><td>I(p1,c1) I(p1-1,c1)</td><td>I(p3,c3)</td><td>p1&gt;p3 p1-1&gt;p3-1</td><td>I(p1+1,c1) I(p1,c1)</td><td>I (p1+1,c1)</td><td>D(p2+1,c2) D(p2,c2)</td><td>p1+1=p2+1 p1+1&gt;p2</td><td>I(p1+1,c1)</td><td>T</td><td>1</td></p1=p2<>	I(p1,c1) I(p1-1,c1)	I(p3,c3)	p1>p3 p1-1>p3-1	I(p1+1,c1) I(p1,c1)	I (p1+1,c1)	D(p2+1,c2) D(p2,c2)	p1+1=p2+1 p1+1>p2	I(p1+1,c1)	T	1
	p2 <p3<p1 p2=p3<p1< td=""><td>I(p1-1,c1)</td><td>I(p3-1,c3) I(p3,c3)</td><td>p1-1&gt;p3-1 p1-1&gt;p3</td><td>I(p1,c1)</td><td>I (p1+1,c1) I (p1+1,c1)</td><td>D(p2,G2) D(p2+1,C2)</td><td>p1+1&gt;p2 p1+1&gt;p2+1</td><td>I(p1,c1) I(p1,c1)</td><td>T</td><td>2</td></p1<></p3<p1 	I(p1-1,c1)	I(p3-1,c3) I(p3,c3)	p1-1>p3-1 p1-1>p3	I(p1,c1)	I (p1+1,c1) I (p1+1,c1)	D(p2,G2) D(p2+1,C2)	p1+1>p2 p1+1>p2+1	I(p1,c1) I(p1,c1)	T	2
	p2-p3 <p1< td=""><td>1(p1 1,01)</td><td>1 (50,00)</td><td>p1-1=p3</td><td>I(p1-1,c1)</td><td>1(2111,01)</td><td>D (P2 11, 02)</td><td>prinzprin</td><td>1(21,01)</td><td>F</td><td>2</td></p1<>	1(p1 1,01)	1 (50,00)	p1-1=p3	I(p1-1,c1)	1(2111,01)	D (P2 11, 02)	prinzprin	1(21,01)	F	2
	p3 <p2<p1< td=""><td>I(p1-1,c1)</td><td>I(p3,c3)</td><td>p1-1&gt;p3</td><td>I(p1,c1)</td><td>I(p1+1,c1)</td><td>D(p2+1,c2)</td><td>p1+1&gt;p2+1</td><td>I(p1,c1)</td><td>T</td><td>2</td></p2<p1<>	I(p1-1,c1)	I(p3,c3)	p1-1>p3	I(p1,c1)	I(p1+1,c1)	D(p2+1,c2)	p1+1>p2+1	I(p1,c1)	T	2
	p1 <p2<p3< td=""><td>I(p1,c1)</td><td>D(p3-1,c3)</td><td>p1<p3-1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1<p2< td=""><td>I(p1,c1)</td><td>Т</td><td>2</td></p2<></td></p3-1<></td></p2<p3<>	I(p1,c1)	D(p3-1,c3)	p1 <p3-1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1<p2< td=""><td>I(p1,c1)</td><td>Т</td><td>2</td></p2<></td></p3-1<>	I(p1,c1)	I(p1,c1)	D(p2,c2)	p1 <p2< td=""><td>I(p1,c1)</td><td>Т</td><td>2</td></p2<>	I(p1,c1)	Т	2
	p1=p2 <p3< td=""><td>I(p1,c1)</td><td>D(p3-1,c3)</td><td>p1<p3-1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1=p2</td><td>I(p1,c1)</td><td>T</td><td>2</td></p3-1<></td></p3<>	I(p1,c1)	D(p3-1,c3)	p1 <p3-1< td=""><td>I(p1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1=p2</td><td>I(p1,c1)</td><td>T</td><td>2</td></p3-1<>	I(p1,c1)	I(p1,c1)	D(p2,c2)	p1=p2	I(p1,c1)	T	2
	pr pr pr	- (22/02/	2 (20 2/00)	p1=p3-1	I(p1,c1)	- (P1/01)	2 (22) 32)	P- P-	- (22/02/	T	2
I(p1,c1)	p1=p2=p3	I(p1,c1)	NULL	ANY	I(p1,c1)	I(p1,c1)	NULL	ANY	I(p1,c1)	Т	2
D(p2,c2)	p1 <p2=p3< td=""><td>I(p1,c1)</td><td>NULL</td><td>ANY</td><td>I(p1,c1)</td><td>I(p1,c1)</td><td>NULL</td><td>ANY</td><td>I(p1,c1)</td><td>Т</td><td>2</td></p2=p3<>	I(p1,c1)	NULL	ANY	I(p1,c1)	I(p1,c1)	NULL	ANY	I(p1,c1)	Т	2
D(p3,c3)	p2 <p1<p3< td=""><td>I(p1-1,c1)</td><td>D(p3-1,c3)</td><td>p1-1<p3-1< td=""><td>I(p1-1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1&gt;p2</td><td>I(p1-1,c1)</td><td>Т</td><td>2</td></p3-1<></td></p1<p3<>	I(p1-1,c1)	D(p3-1,c3)	p1-1 <p3-1< td=""><td>I(p1-1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1&gt;p2</td><td>I(p1-1,c1)</td><td>Т</td><td>2</td></p3-1<>	I(p1-1,c1)	I(p1,c1)	D(p2,c2)	p1>p2	I(p1-1,c1)	Т	2
	p2 <p1=p3< td=""><td>I(p1-1,c1)</td><td>D(p3-1,c3)</td><td>p1-1=p3-1</td><td>I(p1-1,c1)</td><td>I(p1,c1)</td><td>D(p2,c2)</td><td>p1&gt;p2</td><td>I(p1-1,c1)</td><td>Т</td><td>2</td></p1=p3<>	I(p1-1,c1)	D(p3-1,c3)	p1-1=p3-1	I(p1-1,c1)	I(p1,c1)	D(p2,c2)	p1>p2	I(p1-1,c1)	Т	2
	p2 <p3<p1< td=""><td>I(p1-1,c1)</td><td>D(p3-1,c3)</td><td>p1-1&gt;p3-1</td><td>I(p1-2,c1)</td><td>I(p1-1,c1)</td><td>D(p2,c2)</td><td>p1-1&gt;p2</td><td>I(p1-2,c1)</td><td>Т</td><td>2</td></p3<p1<>	I(p1-1,c1)	D(p3-1,c3)	p1-1>p3-1	I(p1-2,c1)	I(p1-1,c1)	D(p2,c2)	p1-1>p2	I(p1-2,c1)	Т	2
	p2=p3 <p1< td=""><td>I(p1-1,c1)</td><td>NULL</td><td>ANY</td><td>I(p1-1,c1)</td><td>I(p1-1,c1)</td><td>NULL</td><td>ANY</td><td>I(p1-1,c1)</td><td>T</td><td>2</td></p1<>	I(p1-1,c1)	NULL	ANY	I(p1-1,c1)	I(p1-1,c1)	NULL	ANY	I(p1-1,c1)	T	2
	p1 <p2<p3< td=""><td>D(p1,c1)</td><td>I(p3+1,c3)</td><td>p1<p3+1< td=""><td>D(p1,c1)</td><td>D(p1,c1)</td><td>I(p2,c2)</td><td>p1<p2< td=""><td>D(p1,c1)</td><td>T</td><td>3</td></p2<></td></p3+1<></td></p2<p3<>	D(p1,c1)	I(p3+1,c3)	p1 <p3+1< td=""><td>D(p1,c1)</td><td>D(p1,c1)</td><td>I(p2,c2)</td><td>p1<p2< td=""><td>D(p1,c1)</td><td>T</td><td>3</td></p2<></td></p3+1<>	D(p1,c1)	D(p1,c1)	I(p2,c2)	p1 <p2< td=""><td>D(p1,c1)</td><td>T</td><td>3</td></p2<>	D(p1,c1)	T	3
	p1=p2 <p3< td=""><td>D(p1+1,c1)</td><td>I (p3+1,c3)</td><td>p1+1<p3+1< td=""><td>D(p1+1,c1)</td><td>D(p1,c1)</td><td>I(p2,c2)</td><td>p1=p2</td><td>D(p1+1,c1)</td><td>T</td><td>3</td></p3+1<></td></p3<>	D(p1+1,c1)	I (p3+1,c3)	p1+1 <p3+1< td=""><td>D(p1+1,c1)</td><td>D(p1,c1)</td><td>I(p2,c2)</td><td>p1=p2</td><td>D(p1+1,c1)</td><td>T</td><td>3</td></p3+1<>	D(p1+1,c1)	D(p1,c1)	I(p2,c2)	p1=p2	D(p1+1,c1)	T	3
	p1=p2=p3	D(p1+1,c1)	I (p3+1,c3)	p1+1=p3+1	D(p1+2,c1)	D(p1+1,c1)	I(p2,c2)	p1+1>p2	D(p1+2,c1)	T	3
D(p1,c1) I(p2,c2)	p1 <p2=p3< td=""><td>D(p1,c1)</td><td>I(p3+1,c3)</td><td>p1<p3+1< td=""><td>D(p1,c1)</td><td>D(p1,c1)</td><td>I(p2,c2)</td><td>p1<p2< td=""><td>D(p1,c1)</td><td>T</td><td>3</td></p2<></td></p3+1<></td></p2=p3<>	D(p1,c1)	I(p3+1,c3)	p1 <p3+1< td=""><td>D(p1,c1)</td><td>D(p1,c1)</td><td>I(p2,c2)</td><td>p1<p2< td=""><td>D(p1,c1)</td><td>T</td><td>3</td></p2<></td></p3+1<>	D(p1,c1)	D(p1,c1)	I(p2,c2)	p1 <p2< td=""><td>D(p1,c1)</td><td>T</td><td>3</td></p2<>	D(p1,c1)	T	3
I (p2,c2)	p2 <p1<p3< td=""><td>D(p1+1,c1)</td><td>I(p3+1,c3)</td><td>p1+1<p3+1< td=""><td>D(p1+1,c1)</td><td>D(p1,c1)</td><td>I(p2,c2)</td><td>p1&gt;p2</td><td>D(p1+1,c1)</td><td>T</td><td>3</td></p3+1<></td></p1<p3<>	D(p1+1,c1)	I(p3+1,c3)	p1+1 <p3+1< td=""><td>D(p1+1,c1)</td><td>D(p1,c1)</td><td>I(p2,c2)</td><td>p1&gt;p2</td><td>D(p1+1,c1)</td><td>T</td><td>3</td></p3+1<>	D(p1+1,c1)	D(p1,c1)	I(p2,c2)	p1>p2	D(p1+1,c1)	T	3
1 (20/00)	p2 <p1=p3< td=""><td>D(p1+1,c1)</td><td>I(p3+1,c3)</td><td>p1+1=p3+1</td><td>D(p1+2,c1)</td><td>D(p1+1,c1)</td><td>I(p2,c2)</td><td>p1+1&gt;p2</td><td>D(p1+2,c1)</td><td>Т</td><td>3</td></p1=p3<>	D(p1+1,c1)	I(p3+1,c3)	p1+1=p3+1	D(p1+2,c1)	D(p1+1,c1)	I(p2,c2)	p1+1>p2	D(p1+2,c1)	Т	3
	p2 <p3<p1< td=""><td>D(p1+1,c1)</td><td>I(p3+1,c3)</td><td>p1+1&gt;p3+1</td><td>D(p1+2,c1)</td><td>D(p1+1,c1)</td><td>I(p2,c2)</td><td>p1+1&gt;p2</td><td>D(p1+2,c1)</td><td>T</td><td>3</td></p3<p1<>	D(p1+1,c1)	I(p3+1,c3)	p1+1>p3+1	D(p1+2,c1)	D(p1+1,c1)	I(p2,c2)	p1+1>p2	D(p1+2,c1)	T	3
		_ : _ : _ : _ :						p1+1>p2	D(p1+2,c1)		3
	p2=p3 <p1< td=""><td>D(p1+1,c1)</td><td>I(p3+1,c3)</td><td>p1+1&gt;p3+1</td><td>D(p1+2,c1)</td><td>D(p1+1,c1)</td><td>I(p2,c2)</td><td></td><td></td><td>Т</td><td></td></p1<>	D(p1+1,c1)	I(p3+1,c3)	p1+1>p3+1	D(p1+2,c1)	D(p1+1,c1)	I(p2,c2)			Т	
	p2=p3 <p1 p1<p2<p3< td=""><td>D(p1,c1)</td><td>I(p3-1,c3)</td><td>p1<p3-1< td=""><td>D(p1,c1)</td><td>D(p1,c1)</td><td>D(p2,c2)</td><td>p1<p2< td=""><td>D(p1,c1)</td><td>Т</td><td>3</td></p2<></td></p3-1<></td></p2<p3<></p1 	D(p1,c1)	I(p3-1,c3)	p1 <p3-1< td=""><td>D(p1,c1)</td><td>D(p1,c1)</td><td>D(p2,c2)</td><td>p1<p2< td=""><td>D(p1,c1)</td><td>Т</td><td>3</td></p2<></td></p3-1<>	D(p1,c1)	D(p1,c1)	D(p2,c2)	p1 <p2< td=""><td>D(p1,c1)</td><td>Т</td><td>3</td></p2<>	D(p1,c1)	Т	3
	p2=p3 <p1 p1<p2<p3 p1=p2<p3< td=""><td>D(p1,c1) NULL</td><td>I (p3-1,c3) I (p3-1,c3)</td><td>p1<p3-1 ANY</p3-1 </td><td>D(p1,c1) NULL</td><td>D(p1,c1) D(p1,c1)</td><td>D(p2,c2) D(p2,c2)</td><td>p1<p2 p1=p2</p2 </td><td>NULL</td><td>T T</td><td>3</td></p3<></p2<p3 </p1 	D(p1,c1) NULL	I (p3-1,c3) I (p3-1,c3)	p1 <p3-1 ANY</p3-1 	D(p1,c1) NULL	D(p1,c1) D(p1,c1)	D(p2,c2) D(p2,c2)	p1 <p2 p1=p2</p2 	NULL	T T	3
	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3</p3 </p2<p3 </p1 	D(p1,c1) NULL NULL	I (p3-1,c3) I (p3-1,c3) I (p3,c3)	p1 <p3-1 ANY ANY</p3-1 	D(p1,c1) NULL NULL	D(p1,c1) D(p1,c1) D(p1+1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2)	p1 <p2 p1=p2 p1+1=p2+1</p2 	NULL NULL	T T	3
	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3 p1<p2=p3< td=""><td>D(p1,c1) NULL NULL D(p1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3)</td><td>p1<p3-1 ANY ANY p1<p3< td=""><td>D(p1,c1) NULL NULL D(p1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1< td=""><td>NULL NULL D(p1,c1)</td><td>T T T</td><td>3 4 4</td></p2+1<></p2 </td></p3<></p3-1 </td></p2=p3<></p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3)	p1 <p3-1 ANY ANY p1<p3< td=""><td>D(p1,c1) NULL NULL D(p1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1< td=""><td>NULL NULL D(p1,c1)</td><td>T T T</td><td>3 4 4</td></p2+1<></p2 </td></p3<></p3-1 	D(p1,c1) NULL NULL D(p1,c1)	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1< td=""><td>NULL NULL D(p1,c1)</td><td>T T T</td><td>3 4 4</td></p2+1<></p2 	NULL NULL D(p1,c1)	T T T	3 4 4
	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3 p1<p2=p3 p1<p3<p2< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3)</td><td>p1<p3-1 ANY ANY p1<p3 p1<p3< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1< td=""><td>NULL NULL D(p1,c1) D(p1,c1)</td><td>T T T T</td><td>3 4 4 4</td></p2+1<></p2+1 </p2 </td></p3<></p3 </p3-1 </td></p3<p2<></p2=p3 </p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3)	p1 <p3-1 ANY ANY p1<p3 p1<p3< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1< td=""><td>NULL NULL D(p1,c1) D(p1,c1)</td><td>T T T T</td><td>3 4 4 4</td></p2+1<></p2+1 </p2 </td></p3<></p3 </p3-1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1)	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1< td=""><td>NULL NULL D(p1,c1) D(p1,c1)</td><td>T T T T</td><td>3 4 4 4</td></p2+1<></p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1)	T T T T	3 4 4 4
D(p1,c1)	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2<p3 p1<p2=p3 p1<p2=p3 p1<p3<p2 p1=p3<p2< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3)</td><td>p1<p3-1 ANY ANY p1<p3 p1<p3 p1=p3</p3 </p3 </p3-1 </td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1< td=""><td>NULL D(p1,c1) D(p1,c1) D(p1+1,c1)</td><td>T T T T</td><td>3 4 4 4</td></p2+1<></p2+1 </p2+1 </p2 </td></p2<></p3<p2 </p2=p3 </p2=p3 </p3 </p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3)	p1 <p3-1 ANY ANY p1<p3 p1<p3 p1=p3</p3 </p3 </p3-1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1)	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1< td=""><td>NULL D(p1,c1) D(p1,c1) D(p1+1,c1)</td><td>T T T T</td><td>3 4 4 4</td></p2+1<></p2+1 </p2+1 </p2 	NULL D(p1,c1) D(p1,c1) D(p1+1,c1)	T T T T	3 4 4 4
D(p1,c1) D(p2,c2)	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3 p1<p2=p3 p1<p2=p3 p1<p3<p2 p1=p3<p2 p2<p1<p3< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3)</td><td>p1<p3-1 ANY ANY p1<p3 p1<p3 p1=p3 p1=p3 p1-1<p3-1< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1&gt;p2</p2+1 </p2+1 </p2+1 </p2 </td><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1)</td><td>T T T T T T</td><td>3 4 4 4 4</td></p3-1<></p3 </p3 </p3-1 </td></p1<p3<></p2 </p3<p2 </p2=p3 </p2=p3 </p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3)	p1 <p3-1 ANY ANY p1<p3 p1<p3 p1=p3 p1=p3 p1-1<p3-1< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1&gt;p2</p2+1 </p2+1 </p2+1 </p2 </td><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1)</td><td>T T T T T T</td><td>3 4 4 4 4</td></p3-1<></p3 </p3 </p3-1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1)	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1&gt;p2</p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1)	T T T T T T	3 4 4 4 4
	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3 p1<p2=p3 p1<p2=p3 p1<p3<p2 p1=p3<p2 p2<p1<p3 p2<p1=p3< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3)</td><td>p1<p3-1 ANY ANY p1<p3 p1=p3 p1=p3 p1-1<p3-1 p1-1=p3-1</p3-1 </p3 </p3-1 </td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1&gt;p2 p1+1&gt;p2</p2+1 </p2+1 </p2+1 </p2+1 </p2 </td><td>NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>T T T T T T T</td><td>3 4 4 4 4 4</td></p1=p3<></p1<p3 </p2 </p3<p2 </p2=p3 </p2=p3 </p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3)	p1 <p3-1 ANY ANY p1<p3 p1=p3 p1=p3 p1-1<p3-1 p1-1=p3-1</p3-1 </p3 </p3-1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1)	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1&gt;p2 p1+1&gt;p2</p2+1 </p2+1 </p2+1 </p2+1 </p2 	NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1)	T T T T T T T	3 4 4 4 4 4
D(p2,c2)	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3 p1<p2=p3 p1<p2=p3 p1<p3<p2 p1=p3<p2 p2<p1<p3 p2<p1=p3 p3<p1<p2< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3)</td><td>p1<p3-1 ANY ANY p1<p3 p1=p3 p1=p3 p1-1<p3-1 p1-1=p3-1 p1&gt;p3</p3-1 </p3 </p3-1 </td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1&gt;p2 p1+1&gt;p2 p1+1<p2+1< td=""><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1,c1) D(p1+1,c1)</td><td>T T T T T T T T</td><td>3 4 4 4 4 4 4</td></p2+1<></p2+1 </p2+1 </p2+1 </p2+1 </p2 </td></p1<p2<></p1=p3 </p1<p3 </p2 </p3<p2 </p2=p3 </p2=p3 </p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3)	p1 <p3-1 ANY ANY p1<p3 p1=p3 p1=p3 p1-1<p3-1 p1-1=p3-1 p1&gt;p3</p3-1 </p3 </p3-1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1&gt;p2 p1+1&gt;p2 p1+1<p2+1< td=""><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1,c1) D(p1+1,c1)</td><td>T T T T T T T T</td><td>3 4 4 4 4 4 4</td></p2+1<></p2+1 </p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1,c1) D(p1+1,c1)	T T T T T T T T	3 4 4 4 4 4 4
D(p2,c2)	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3 p1<p2=p3 p1<p2=p3 p1<p2=p3 p1<p3<p2 p2=p3<p2 p2<p1<p3 p2<p1=p3 p3<p1<p2 p3<p1=p2< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3)</td><td>p1<p3-1 ANY ANY p1<p3 p1=p3 p1=p3 p1-1<p3-1 p1-1=p3-1</p3-1 </p3 </p3-1 </td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1+p2 p1+1&gt;p2 p1+1&gt;p2 p1+1<p2+1 p1+1=p2+1</p2+1 </p2+1 </p2+1 </p2+1 </p2+1 </p2 </td><td>NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>T T T T T T T</td><td>3 4 4 4 4 4 4 4</td></p1=p2<></p1<p2 </p1=p3 </p1<p3 </p2 </p3<p2 </p2=p3 </p2=p3 </p2=p3 </p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3)	p1 <p3-1 ANY ANY p1<p3 p1=p3 p1=p3 p1-1<p3-1 p1-1=p3-1</p3-1 </p3 </p3-1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1+p2 p1+1&gt;p2 p1+1&gt;p2 p1+1<p2+1 p1+1=p2+1</p2+1 </p2+1 </p2+1 </p2+1 </p2+1 </p2 	NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1)	T T T T T T T	3 4 4 4 4 4 4 4
D(p2,c2)	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3 p1<p2=p3 p1<p2=p3 p1<p3<p2 p1=p3<p2 p2<p1<p3 p2<p1=p3 p3<p1<p2< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3)</td><td>p1<p3-1 ANY ANY p1<p3 p1<p3 p1=p3 p1=p3 p1-1<p3-1 p1-1=p3-1 p1&gt;p3 ANY</p3-1 </p3 </p3 </p3-1 </td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1&gt;p2 p1+1&gt;p2 p1+1<p2+1< td=""><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1,c1) D(p1+1,c1) NULL</td><td>T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 4</td></p2+1<></p2+1 </p2+1 </p2+1 </p2+1 </p2 </td></p1<p2<></p1=p3 </p1<p3 </p2 </p3<p2 </p2=p3 </p2=p3 </p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3)	p1 <p3-1 ANY ANY p1<p3 p1<p3 p1=p3 p1=p3 p1-1<p3-1 p1-1=p3-1 p1&gt;p3 ANY</p3-1 </p3 </p3 </p3-1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1&gt;p2 p1+1&gt;p2 p1+1<p2+1< td=""><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1,c1) D(p1+1,c1) NULL</td><td>T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 4</td></p2+1<></p2+1 </p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1,c1) D(p1+1,c1) NULL	T T T T T T T T T T T	3 4 4 4 4 4 4 4 4
D(p2,c2)	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3 p1<p2=p3 p1<p2=p3 p1<p3<p2 p1<p3<p2 p1<p3<p2 p2<p1<p3 p2<p1=p3 p3<p1=p3 p3<p1=p2 p3<p1=p2< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1-1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3)</td><td>p1<p3-1 ANY ANY p1<p3 p1<p3 p1=p3 p1-1<p3-1 p1-1=p3-1 p1&gt;p3 ANY p1-1&gt;p3-1</p3-1 </p3 </p3 </p3-1 </td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1=p2+1 p1+1=p2+1 p1+1&gt;p2</p2+1 </p2+1 </p2+1 </p2 </td><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) NULL D(p1,c1)</td><td>T T T T T T T T T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 4 4</td></p1=p2<></p1=p2 </p1=p3 </p1=p3 </p1<p3 </p3<p2 </p3<p2 </p3<p2 </p2=p3 </p2=p3 </p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1-1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3)	p1 <p3-1 ANY ANY p1<p3 p1<p3 p1=p3 p1-1<p3-1 p1-1=p3-1 p1&gt;p3 ANY p1-1&gt;p3-1</p3-1 </p3 </p3 </p3-1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1,c1)	D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1=p2+1 p1+1=p2+1 p1+1&gt;p2</p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) NULL D(p1,c1)	T T T T T T T T T T T T T T T T T T T	3 4 4 4 4 4 4 4 4 4
D(p2,c2)	p2=p3 <p1 p1<p2<p3 p1=p2<p3 p1=p2=p3 p1<p2=p3 p1<p2=p3 p1<p3<p2 p1<p3<p2 p1<p3<p2 p2<p1<p3 p2<p1=p3 p3<p1=p3 p3<p1=p2 p3<p1=p2< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1-1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3)</td><td>p1<p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p3 ANY p1-1&gt;p3-1 p1-1&gt;p3-1 p1-1&gt;p3-1</p3-1></td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1<p2+1 p1+1=p2+1 p1+1=p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2</p2+1 </p2+1 </p2+1 </p2+1 </p2+1 </p2 </td><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) NULL D(p1,c1)</td><td>T T T T T T T T T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 4 4 4</td></p1=p2<></p1=p2 </p1=p3 </p1=p3 </p1<p3 </p3<p2 </p3<p2 </p3<p2 </p2=p3 </p2=p3 </p3 </p2<p3 </p1 	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1-1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3)	p1 <p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p3 ANY p1-1&gt;p3-1 p1-1&gt;p3-1 p1-1&gt;p3-1</p3-1>	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1<p2+1 p1+1=p2+1 p1+1=p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2</p2+1 </p2+1 </p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) NULL D(p1,c1)	T T T T T T T T T T T T T T T T T T T	3 4 4 4 4 4 4 4 4 4 4
D(p2,c2)	p2=p3 <p1 p1="p3&lt;p2" p1<p2="p3" p1<p2<p3="" p1<p3<p2="" p2="p3&lt;p1" p2<p1="p3" p2<p1<p3="" p2<p3<p1="" p3<p1="p2" p3<p1<p2="" p3<p2<p="" p3<p2<p1="">p3<p1<p>p2<p1<p>p2<p3<p1 p2="p3&lt;p1&lt;/td"><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1-1,c1) D(p1-1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3)</td><td>p1<p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p3 ANY p1-1&gt;p3-1 p1-1&gt;p3-1 p1-1&gt;p3 p1-1&gt;p3 p1-1&gt;p3 p1-1&gt;p3</p3-1></td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) D(p1,c1) D(p1+1,c1) NULL D(p1,c1) D(p1,c1) D(p1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1<p2+1 p1+1=p2+1 p1+1=p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2</p2+1 </p2+1 </p2+1 </p2+1 </p2+1 </p2 </td><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1,c1) D(p1,c1)</td><td>T T T T T T T T T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 4 4 4 5</td></p3<p1></p1<p></p1<p></p1>	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1-1,c1) D(p1-1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3)	p1 <p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p3 ANY p1-1&gt;p3-1 p1-1&gt;p3-1 p1-1&gt;p3 p1-1&gt;p3 p1-1&gt;p3 p1-1&gt;p3</p3-1>	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) D(p1,c1) D(p1+1,c1) NULL D(p1,c1) D(p1,c1) D(p1,c1)	D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)	D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2+1,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1<p2+1 p1+1=p2+1 p1+1=p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2</p2+1 </p2+1 </p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1,c1) D(p1,c1)	T T T T T T T T T T T T T T T T T T T	3 4 4 4 4 4 4 4 4 4 4 5
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p3<p2<p3<p="">p3<p2<p3<p>p3<p2<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3<p3<p>p3p3<p3<p>p3<p3<p>p3p3<p3<p>p3p3p3p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<pp>p3<p< td=""><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) NULL D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3)</td><td>p1<p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p1&gt;p3 ANY p1-1&gt;p3-1 p1-1&gt;p3-1 p1-1&gt;p3 p1-1&gt;p3 p1-1&gt;p3 p1-1&gt;p3 p1-1=p3 p1-1&gt;p3</p3-1></td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1+1,c1) NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2+1 p1+1=p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1</p2+1 </p2+1 </p2+1 </p2+1 </p2 </td><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)</td><td>T T T T T T T T T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 4 5 5</td></p<></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p2<p3<p></p2<p3<p></p1></p2></p3<p1></p1>	D(p1,c1) 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D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)	T T T T T T T T T T T T T T T T T T T	3 4 4 4 4 4 4 4 4 5 5
D(p2,c2) I(p3,c3)	p2=p3 <p1 p1="p3&lt;p2" p1<p2="p3" p1<p2<p3="" p1<p3<p2="" p2="p3&lt;p1" p2<p1+p3="" p2<p3<p1="" p3<p1="p2" p3<p1+p2="" p3<p1<p2="" p3<p2<p3="" 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p1+1=p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+2+1 p1<p2< td=""><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)</td><td>T T T T T T T T T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 4 5 5</td></p2<></p2+1 </p2+1 </p2+1 </p2+1 </p2+1 </p2 </td></p<></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></pp></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p3<p></p1>	D(p1,c1) 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td=""><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)</td><td>T T T T T T T T T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 4 5 5</td></p2<></p2+1 </p2+1 </p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)	T T T T T T T T T T T T T T T T T T T	3 4 4 4 4 4 4 4 4 5 5
D(p2,c2) I(p3,c3) D(p1,c1)	p2=p3 <p1 p1="p3&lt;p2" p1<p2="p3" p1<p2<p="" p1<p2<p3="" p1<p3<p2="" p2<p1="p3" p2<p1<p3="" p2<p3<p1="" p3<p1="p2" p3<p1<p2="" p3<p2="">p2<p3<p1 p2="p3&lt;p1" p3<p2<p3<p="">p1<p2 p2="p3&lt;p1" p2<p3<p1="" p3<p2<p3<p="">p2<p1 p2="p3&lt;p1" 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p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1=p2</p2+1 </p2+1 </p2+1 </p2+1 </p2 </td><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)</td><td>T T T T T T T T T T T T T T T T T T T</td><td>3 3 4 4 4 4 4 4 4 4 4 5 5 5 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D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)	T T T T T T T T T T T T T T T T T T T	3 3 4 4 4 4 4 4 4 4 4 5 5 5 5
D(p2,c2) I(p3,c3) D(p1,c1) D(p2,c2)	p2=p3 <p1 p1="p3&lt;p2" p1<p2="p3" p1<p2<p="" p1<p2<p3="" p1<p3<p2="" p2="p3&lt;p1" p2<p1<p3="" p2<p3<p1="" p3<p1="p2" p3<p1<p2="">p3<p2=p3<p1 p1="p2=p3&lt;/td" p1<p2<p3="" p2="p3&lt;p1"><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3)</td><td>p1<p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p3 aNY p1-1&gt;p3-1 p1-1&gt;p3 p1-1&gt;p3</p3-1></td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1+1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2)</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2+1 p1+1=p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1</p2+1 </p2+1 </p2+1 </p2+1 </p2 </td><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) NULL NULL NULL</td><td>T T T T T T T T T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 5 5 5 5</td></p2=p3<p1></p1>	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3) I (p3-1,c3)	p1 <p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p3 aNY p1-1&gt;p3-1 p1-1&gt;p3 p1-1&gt;p3</p3-1>	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1+1,c1) D(p1+1,c1) D(p1,c1)	D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1)	D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2+1,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2+1 p1+1=p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1</p2+1 </p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) NULL NULL NULL	T T T T T T T T T T T T T T T T T T T	3 4 4 4 4 4 4 4 5 5 5 5
D(p2,c2) I(p3,c3) D(p1,c1)	p2=p3 <p1 p1="p2" p1<p2="p3&lt;/td" p1<p2<p3="" p1<p3<p2="" p2="p3&lt;p1" p2<p1="p3" p2<p1<p3="" p2<p3<p1="" p3<p1="p2" p3<p1<p2="" p3<p2="p3&lt;p1"><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1)</td><td>I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) D (p3-1,c3) NULL D (p3-1,c3)</td><td>p1<p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p3 ANY p1-1&gt;p3-1 p1-1&gt;p3 p1-1&gt;p3</p3-1></td><td>D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1,c1) D(p1,c1)</td><td>D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1+1,c1)</td><td>D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) NULL NULL</td><td>p1<p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2+1 p1+1=p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1<p2 p1=p2 ANY ANY</p2 </p2 </p2+1 </p2+1 </p2+1 </p2 </td><td>NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)</td><td>T T T T T T T T T T T T T T T T T T T</td><td>3 4 4 4 4 4 4 4 5 5 5 5 5</td></p1>	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) D (p3-1,c3) NULL D (p3-1,c3)	p1 <p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p3 ANY p1-1&gt;p3-1 p1-1&gt;p3 p1-1&gt;p3</p3-1>	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1-1,c1) D(p1-1,c1) D(p1-1,c1) D(p1,c1)	D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1)	D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) NULL NULL	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1<p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2+1 p1+1=p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1<p2 p1=p2 ANY ANY</p2 </p2 </p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)	T T T T T T T T T T T T T T T T T T T	3 4 4 4 4 4 4 4 5 5 5 5 5
D(p2,c2) I(p3,c3) D(p1,c1) D(p2,c2)	p2=p3 <p1 p1="p2&lt;p3" p1<p2="p3" p1<p2<p3="" p2="p3&lt;p1" p2<p1="p3" p2<p1<p="" p2<p1<p3="" p2<p3<p1="" p3<p1="p2" p3<p1<p2="">p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3<p1<p>p3</p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1<p></p1>	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1,c1) D(p1-1,c1)	I (p3-1,c3) I (p3-1,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3,c3) I (p3-1,c3) D (p3-1,c3) NULL D (p3-1,c3)	p1 <p3-1 any="" p1="" p1-1="p3-1" p1-1<p3-1="" p1<p3="">p3 ANY p1-1&gt;p3-1 p1-1&gt;p3 p1-1&gt;p3</p3-1>	D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1-1,c1) D(p1,c1) NULL NULL NULL NULL D(p1,c1) D(p1,c1) NULL NULL D(p1,c1) D(p1,c1) NULL NULL D(p1,c1) D(p1,c1)	D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1,c1) D(p1,c1) D(p1,c1) D(p1,c1)	D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2,c2) D(p2,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) D(p2+1,c2) NULL D(p2,c2)	p1 <p2 p1=p2 p1+1=p2+1 p1<p2+1 p1<p2+1 p1+1<p2+1 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2 p1+1&gt;p2+1 p1+1=p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1 p1+1&gt;p2+1</p2+1 </p2+1 </p2+1 </p2 	NULL NULL D(p1,c1) D(p1,c1) D(p1+1,c1) D(p1-1,c1) D(p1+1,c1) D(p1,c1)	T T T T T T T T T T T T T T T T T T T	3 4 4 4 4 4 4 4 4 5 5 5 5

### E. IP2 Verification Framework and Results

In this section, the IP2 verification framework and verification results (generated by OTX) are given in full detail. Columns in the IP2 framework are explained below:

- 1.  $O_1$ ,  $O_2$ ,  $O_2$ : given  $O_1$  and  $O_2$  operation type permutations.  $O_2$  is the inverse of  $O_2$ .
- PR: given position relationships among O<sub>1</sub> and O<sub>2</sub> for each operation type permutation.
   IP2-Equation O<sub>1</sub><sup>O2,IO2</sup> = O<sub>1</sub>: solving the IP2 equation.
- - 1)  $O_1^{02} = T(O_1, O_2)$ : deriving  $O_1^{02}$  by consulting the TM according to operation types and position relationships among  $O_1$  and  $O_2$ .
  - 2) **Derived PR** $(O_1^{O2},!O_2)$ : deriving position relationships between the transformed operations  $O_1^{O2}$ and inverse operation !O<sub>2</sub>, according to the Position Relation Derivation Matrix (PRDM) shown in APPENDIX B.
  - 3)  $O_1^{O2,!O2} = T(O_1^{O2},!O_2)$ : deriving  $O_1^{O2,!O2}$  according to the operation types of  $O_1$  and  $!O_2$  and the derived position relationships by consulting the TM.
- 4. VR: verification results. A confirmation case is indicated as T (True); a violation case is indicated as F (False). In the IP2 verification, Case 6 and Case 11 are indicated as F.
- 5. **#:** verification case number.

From the verification results, we can see that there are two IP2-violation cases (Case 6 and Case 11) among a total of 12 verification cases. Case 6 has the following operation types and position relationships:  $O_1 = I(p_1, c_1)$  and  $O_2 = D(p_2, c_2)$ , where  $(p_1 - 1) = p_2$ . This case gives a general description of the scenariobased undo puzzles in Figure 3(a), where the document state S = "axb",  $O_1 = I(2,y)$  and  $O_2 = D(1,x)$ , and  $((p_1 = 2) - 1) = (p_2 = 1)$ . Case 6 can be converted into an IP2-confirmation case by changing the priority to  $priority(O_1) < priority(O_2)$ , but Case 5, which is an IP2-confirmation case under  $priority(O_1) > 1$  $priority(O_2)$ , will be turned to an IP2-violation case. In other words, no priority between these two operations is able to make both Case 5 and Case 6 comply with IP2.

Case 11 has the following operation types and position relationships:  $O_1 = D(p_1, c_1)$  and  $O_2 = D(p_2, c_2)$ , where  $p_1 = p_2$ . This case gives a general description of the scenario-based undo puzzle in Figure 3(b), where the document state S = ``axb'',  $O_1 = D(1,x)$  and  $O_2 = D(1,x)$ , and  $(p_1 = 1) = (p_2 = 1)$ . Case 11 is always an IP2-violation case no matter which priority we are using.

€ OTX IP2 V	erification Fra	mework (Priority Setting: 01>02)			-	
0	Original PR(O <sub>1</sub> ,O <sub>2</sub> )	IP2-Equation: 01 02,102 = 01				
102		$O_1^{O2} = T(O_1, O_2)$	Derived PR(0 <sub>1</sub> ,!0 <sub>2</sub> )	o <sub>1</sub> 02, 102 = T (o <sub>1</sub> 02, 10 <sub>2</sub> )	R	#
I (p1,c1)	p1 <p2< td=""><td>I(p1,c1)</td><td>p1<p2< td=""><td>I(p1,c1)</td><td>Т</td><td>1</td></p2<></td></p2<>	I(p1,c1)	p1 <p2< td=""><td>I(p1,c1)</td><td>Т</td><td>1</td></p2<>	I(p1,c1)	Т	1
I (p2,c2)	p1=p2	I(p1,c1)	p1=p2	I(p1,c1)	Т	2
D(p2,c2)	p1>p2	I(p1+1,c1)	p1+1>p2	I(p1,c1)	Т	3
	p1 <p2< td=""><td>I(p1,c1)</td><td>p1<p2< td=""><td>I(p1,c1)</td><td>Т</td><td>4</td></p2<></td></p2<>	I(p1,c1)	p1 <p2< td=""><td>I(p1,c1)</td><td>Т</td><td>4</td></p2<>	I(p1,c1)	Т	4
I(p1,c1)	p1=p2	I(p1,c1)	p1=p2	I(p1,c1)	T	5
D(p2,c2) I(p2,c2)	p1>p2	I(p1-1,c1)	p1-1>p2	I(p1,c1)	Т	6
1 (p2 / C2 /			p1-1=p2	I(p1-1,c1)	F	6
D(p1,c1)	p1 <p2< td=""><td>D(p1,c1)</td><td>p1<p2< td=""><td>D(p1,c1)</td><td>Т</td><td>7</td></p2<></td></p2<>	D(p1,c1)	p1 <p2< td=""><td>D(p1,c1)</td><td>Т</td><td>7</td></p2<>	D(p1,c1)	Т	7
I (p2,c2)	p1=p2	D(p1+1,c1)	p1+1>p2	D(p1,c1)	Т	8
D(p2,c2)	p1>p2	D(p1+1,c1)	p1+1>p2	D(p1,c1)	Т	9
	p1 <p2< td=""><td>D(p1,c1)</td><td>p1<p2< td=""><td>D(p1,c1)</td><td>Т</td><td>10</td></p2<></td></p2<>	D(p1,c1)	p1 <p2< td=""><td>D(p1,c1)</td><td>Т</td><td>10</td></p2<>	D(p1,c1)	Т	10
D(p1,c1)	p1=p2	NULL	ANY	NULL	$\boldsymbol{F}$	11
D(p2,c2) I(p2,c2)	p1>p2	D(p1-1,c1)	p1-1>p2	D(p1,c1)	т	12
(pz,02)			p1-1=p2	D(p1,c1)	Т	12
PR: Position Relat	ionship VR: Verifi	ication Result #: Case Number				

### F. IP3 Verification Framework and Results

In this section, the IP3 verification framework and verification results (generated by OTX) are given in full detail. Columns in the IP3 framework are explained below:

- 1.  $O_1, O_2, !O_2$ : given  $O_1$  and  $O_2$  operation type permutation.  $!O_2$  is the inverse of  $O_2$ .
- PR: given position relationships among O<sub>1</sub> and O<sub>2</sub> for each operation type permutation.
   IP3-Equation !O<sub>2</sub><sup>OI</sup> = !(O<sub>2</sub><sup>OI</sup>): solving the IP3 equation.
   Derive !O<sub>2</sub><sup>OI</sup>: steps in deriving !O<sub>2</sub><sup>OI</sup>
- - - (1)  $O_1^{O2} = T(O_1, O_2)$ : deriving  $O_1^{O2}$  by consulting the TM according to operation types and position relationships between  $O_1$  and  $O_2$ .
    - (2) **Derived PR** $(O_1^{O2}, !O_2)$ : deriving position relationships between the transformed operations  $O_1^{O_2}$  and  $!O_2$ , according to the Position Relation Derivation Matrix (PRDM) shown in APPENDIX B.
    - (3)  $!O_2^{OI} = T(!O_2, O_2^{OI})$ : deriving  $!O_2^{OI}$  according to the operation types of  $O_1$  and  $!O_2$ , and the derived position relationships by consulting the TM.
  - 2) **Derive**  $!(O_2^{OI})$ : steps in deriving  $!(O_2^{OI})$
- 4. VR: verification results. A confirmation case is indicated as T (True); a violation case is indicated as F (False). In the IP3 verification, Case 6 and Case 11 are indicated as F.
- 5. **#:** verification case number.

Case 6 has the following operation types and position relationships:  $O_1 = I(p_1, c_1)$  and  $O_2 = D(p_2, c_2)$ , where  $p_1 > p_2$ . This case gives a general description of the scenario-based undo puzzles in Figure 3(a), where the document state S = ``axb'',  $O_1 = I(2,y)$  and  $O_2 = D(1,x)$ , and  $((p_1 = 2) - 1) = (p_2 = 1)$ . Case 6 can be converted into an IP3-confirmation case by changing the priority to  $priority(O_1) < priority(O_2)$ , but Case 5, which is an IP2-confirmation case under  $priority(O_1) > priority(O_2)$ , will be turned to an IP3violation case. In other words, no priority between these two operations is able to make both Case 5 and Case 6 comply with IP3.

Case 11 has the following operation types and position relationships:  $O_I = D(p_I, c_I)$  and  $O_2 = D(p_2, c_2)$ , where  $p_1 = p_2$ . This case gives a general description of the scenario-based undo puzzle in Figure 3(b), where the document state S = ``axb'',  $O_1 = D(1,x)$  and  $O_2 = D(1,x)$ , and  $(p_1 = 1) = (p_2 = 1)$ . Case 11 is always an IP3-violation case no matter which priority is used.

🚣 OTX IP3 '	Verification F	ramework (Priority Se	tting: 01>02)				_	
	Original PR(O <sub>1</sub> ,O <sub>2</sub> )	IP3-Equation: !0 <sub>2</sub> <sup>01</sup> =!(0 <sub>2</sub> <sup>01</sup> )						
0		Derive io		Derive !(0 <sub>2</sub> <sup>01</sup> )			#	
102		$O_1^{O2} = T(O_1, O_2)$	Derived PR(O <sub>1</sub> 02,!O <sub>2</sub> )	!0 <sub>2</sub> =T(!0 <sub>2</sub> ,0 <sub>1</sub> 02)	$O_2^{O1} = T(O_2, O_1)$	! (0201)	R	
I(p1,c1)	p1 <p2< td=""><td>I(p1,c1)</td><td>p1<p2< td=""><td>D(p2+1,c2)</td><td>I(p2+1,c2)</td><td>D(p2+1,c2)</td><td>T</td><td>1</td></p2<></td></p2<>	I(p1,c1)	p1 <p2< td=""><td>D(p2+1,c2)</td><td>I(p2+1,c2)</td><td>D(p2+1,c2)</td><td>T</td><td>1</td></p2<>	D(p2+1,c2)	I(p2+1,c2)	D(p2+1,c2)	T	1
I(p2,c2)	p1=p2	I(p1,c1)	p1=p2	D(p2+1,c2)	I(p2+1,c2)	D(p2+1,c2)	T	2
D(p2,c2)	p1>p2	I(p1+1,c1)	p1+1>p2	D(p2,c2)	I(p2,c2)	D(p2,c2)	T	3
	p1 <p2< td=""><td>I(p1,c1)</td><td>p1<p2< td=""><td>I(p2+1,c2)</td><td>D(p2+1,c2)</td><td>I(p2+1,c2)</td><td>T</td><td>4</td></p2<></td></p2<>	I(p1,c1)	p1 <p2< td=""><td>I(p2+1,c2)</td><td>D(p2+1,c2)</td><td>I(p2+1,c2)</td><td>T</td><td>4</td></p2<>	I(p2+1,c2)	D(p2+1,c2)	I(p2+1,c2)	T	4
I(p1,c1)	p1=p2	I(p1,c1)	p1=p2	I(p2+1,c2)	D(p2+1,c2)	I(p2+1,c2)	T	5
D(p2,c2) I(p2,c2)	p1>p2	I(p1-1,c1)	p1-1>p2	I(p2,c2)	D(p2,c2)	I(p2,c2)	T	6
_ (12 _ , ,			p1-1=p2	I(p2+1,c2)			F	6
D(p1,c1)	p1 <p2< td=""><td>D(p1,c1)</td><td>p1<p2< td=""><td>D(p2-1,c2)</td><td>I(p2-1,c2)</td><td>D(p2-1,c2)</td><td>T</td><td>7</td></p2<></td></p2<>	D(p1,c1)	p1 <p2< td=""><td>D(p2-1,c2)</td><td>I(p2-1,c2)</td><td>D(p2-1,c2)</td><td>T</td><td>7</td></p2<>	D(p2-1,c2)	I(p2-1,c2)	D(p2-1,c2)	T	7
I(p2,c2)	p1=p2	D(p1+1,c1)	p1+1>p2	D(p2,c2)	I(p2,c2)	D(p2,c2)	T	8
D(p2,c2)	p1>p2	D(p1+1,c1)	p1+1>p2	D(p2,c2)	I(p2,c2)	D(p2,c2)	T	9
	p1 <p2< td=""><td>D(p1,c1)</td><td>p1<p2< td=""><td>I(p2-1,c2)</td><td>D(p2-1,c2)</td><td>I(p2-1,c2)</td><td>T</td><td>10</td></p2<></td></p2<>	D(p1,c1)	p1 <p2< td=""><td>I(p2-1,c2)</td><td>D(p2-1,c2)</td><td>I(p2-1,c2)</td><td>T</td><td>10</td></p2<>	I(p2-1,c2)	D(p2-1,c2)	I(p2-1,c2)	T	10
D(p1,c1)	p1=p2	NULL	p1=p2	I(p2,c2)	NULL	NULL	F	11
D(p2,c2) I(p2,c2)	p1>p2	D(p1-1,c1)	p1-1>p2	I(p2,c2)	D(p2,c2)	I(p2,c2)	T	12
_ (22/02/			p1-1=p2	I(p2,c2)			T	12