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Assignment - 3

Q:-1 Findout whether S_1 is conflict Serializable

$T_1 - R_1(A), W_1(A), R_1(B), W_1(B)$

$T_2 - R_2(A), W_2(A), R_2(B), W_2(B)$

$S_1 - R_2(A), W_2(A), R_1(A), W_1(A), R_1(B), W_1(B), R_2(B), W_2(B)$

Sol:- A schedule is a process to line-up transactions and execute them one by one.

Let us put the given schedule in the transaction

T_1	T_2
	$R_2(A)$
	$W_2(A)$
$R_1(A)$	
$W_1(A)$	
$R_1(B)$	
$W_1(B)$	
	$R_2(B)$
	$W_2(B)$

Rules to identify conflict

Read \rightarrow Read no conflicting

Read \rightarrow Write

Write \rightarrow Read } conflicting

Write \rightarrow Write }

Two operation can be declared as conflicting if

- ① They belong to different transaction
- ② They operate on the same data items
- ③ At-least one of them is write operation

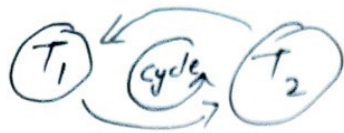
So, Conflicting Pairs

$W_2(A), R_1(A)$
 $W_2(A), W_1(A)$
 $R_2(A), W_1(A)$
 $R_1(B), W_2(A)$
 $W_1(B), R_2(B)$
 $W_1(B), W_2(B)$

Non-Conflicting Pairs

$R_2(A), W_2(A)$
 $R_1(B), R_2(A)$
 $R_2(A), R_1(A)$

Using these conflicting pair, let's draw the precedence graph.



As, in this precedence graph we observed a cycle between T_1 & T_2
So, there is no conflict serializable.

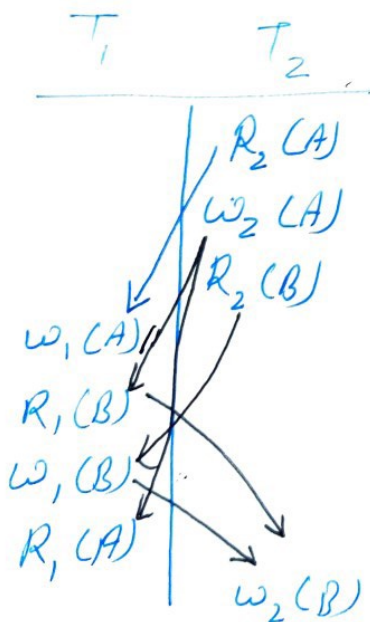
Q.2 Find out both the schedule are conflict Equivalent

$S_1: R_2(A), W_2(A), R_2(B), W_1(A), R_1(B), W_1(B), R_1(A), W_2(B)$

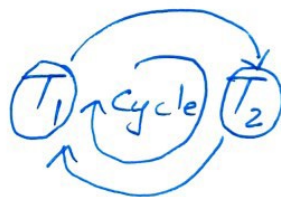
$S_2: R_2(A), W_2(A), R_2(B), W_2(B), R_1(B), W_1(B), R_1(A), W_1(A)$

Ans To declare the schedules, conflict Equivalent, the following conditions must be followed.

- ① Both schedule must form a cyclic Precedence graph
- ② Schedule must follow same serializable order
- ③ One schedule can be transformed to another by swapping non-conflicting operations.



Precedence Graph

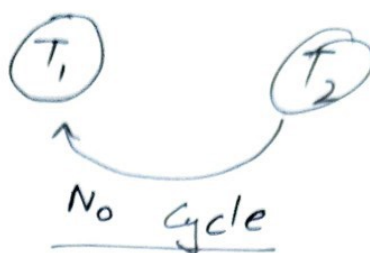


In this precedence graph, we observed that there is a cycle, so schedule ' S_1 ' is not conflicting schedule.

S₂ Schedule Transaction

T ₁	T ₂
	R ₂ (A)
	W ₂ (A)
	R ₂ (B)
	W ₂ (B)
R ₁ (B)	
W ₁ (B)	
R ₁ (A)	
W ₁ (A)	

Precedence Graph



Based on the precedence graph S₂ Schedule can be declared as conflict serializable. Its precedence graph is not cyclic.

Lets try to validate if we can transform S₂ schedule from S₁ Schedule by swapping non-conflicting operation.

S₁ R₂(A) W₂(A) R₂(B) W₁(B) R₁(B) W₁(B) R₁(A) W₂(B)

Swapping R₁(A) W₂(B)

S₁₂ R₂(A) W₂(A) R₂(B) W₁(B) R₁(B) W₁(B) W₂(B) R₁(A)

So, when we move again non-conflicting pair then we may get original S₁. Thus a cyclic will form when we keep swapping.

We can not transform S₁ into S₂ by swapping, non-conflicting pair.

Hence S₁ & S₂ schedule are "NOT CONFLICT EQUIVALENT."

Q₂ Find if S₁ & S₂ are conflict Serializable Schedule.

S₁: R₁(x) R₁(y) R₂(x) R₂(y) W₂(y) W₁(x)

S₂: R₁(x) R₂(x) R₂(y) W₂(y) R₁(x) W₁(x)

Ans. Let us check the S₁ schedule Transaction

T_1	T_2
$R_1(x)$	
$R_1(y)$	
	$R_2(x)$
	$R_2(y)$
	$W_2(y)$
$W_1(x)$	

Based on the conflicted transaction we can draw following precedence graph.



In this precedence graph, we observed a cycle. So we can say S_1 is not conflict Serializable.

Now, check for S_2 schedule

T_1	T_2
	$R_2(x)$
	$R_2(y)$
	$W_2(y)$
$R_1(x)$	
$W_1(x)$	

Based on the conflicted transaction, we can draw following precedence graph.



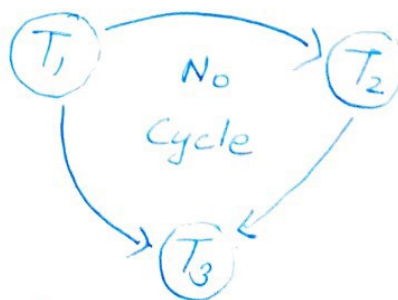
So, we can declare S_2 is conflict Serializable.

Q4:- Find out whether S_1 is conflict serializable schedule.
 $S_1: R_1(x) R_3(y) W_1(x) W_2(y) R_3(x) W_2(x)$

Ans:-

T_1	T_2	T_3
$R_1(x)$		$R_3(y)$
$W_1(x)$	$W_2(y)$	$R_3(x)$
	$W_2(x)$	

So, Based on this, we can draw following Precedence Graph



So, There is no cycle. Hence S_1 schedule is conflict serializable acycle.