

Computer Science & IT

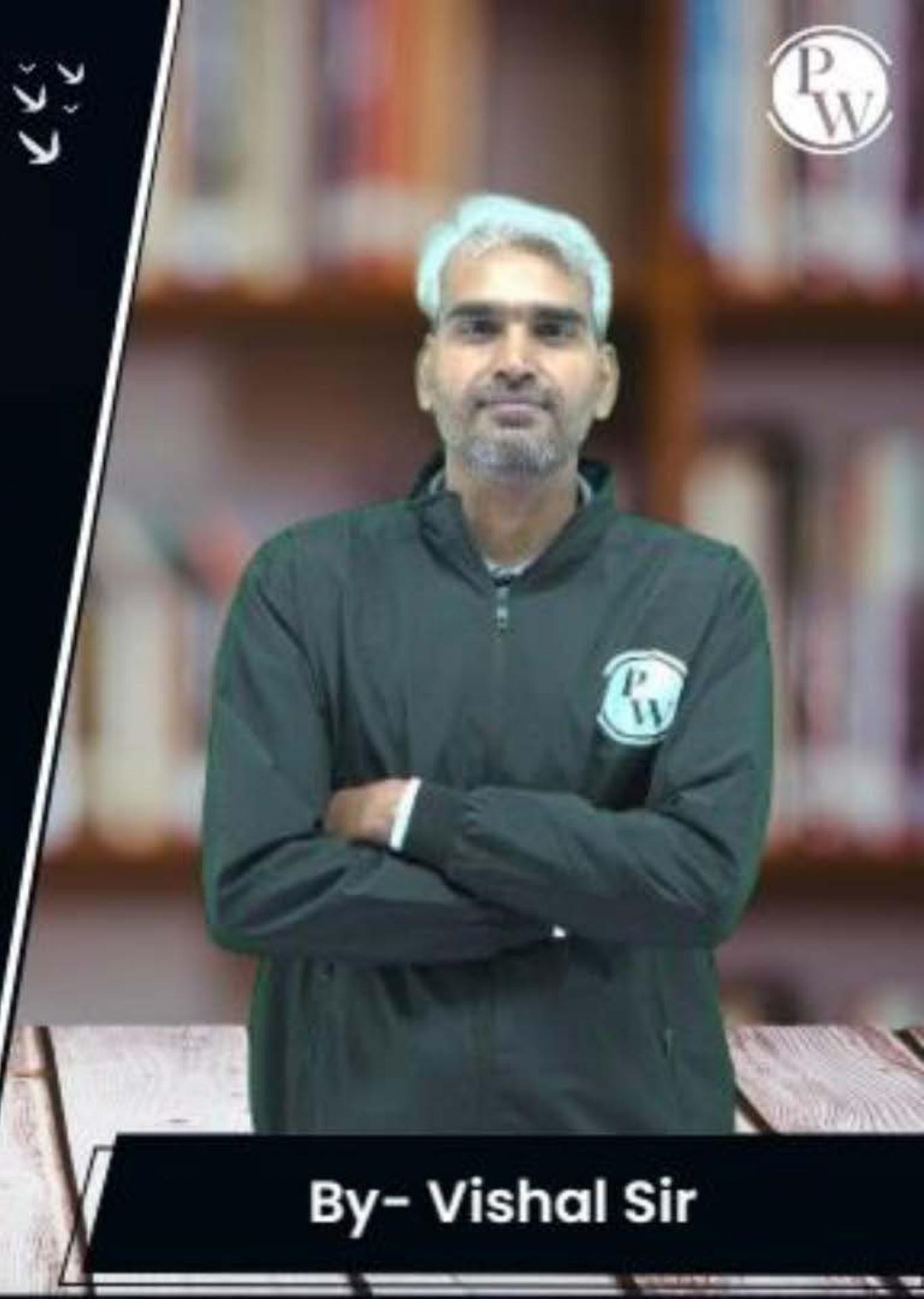
Database Management System



Transaction & concurrency control

Lecture No. 06

By- Vishal Sir



Recap of Previous Lecture



- Topic** Cascading rollback problem
- Topic** Cascadeless rollback recoverable schedule
- Topic** Strict recoverable schedule
- Topic** Conflicting and non-conflicting pairs of operations
- Topic** Conflict serializable schedule

Topics to be Covered



- * **Topic** Conflict serializable schedule
- * **Topic** View serializable schedule





Topic : Classification of schedule

Classification based on
Recoverability

- ① Irrecoverable schedule
- ② Recoverable schedule
- ③ Cascadedess rollback recoverable schedule
- ④ Strict recoverable schedule

Classification based on
Serializability

- ① Conflict serializable schedule
- ② View serializable schedule

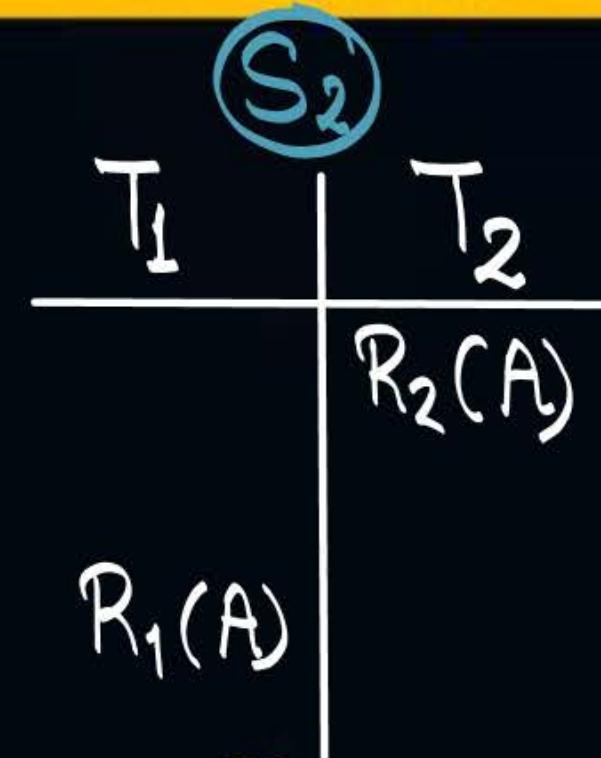
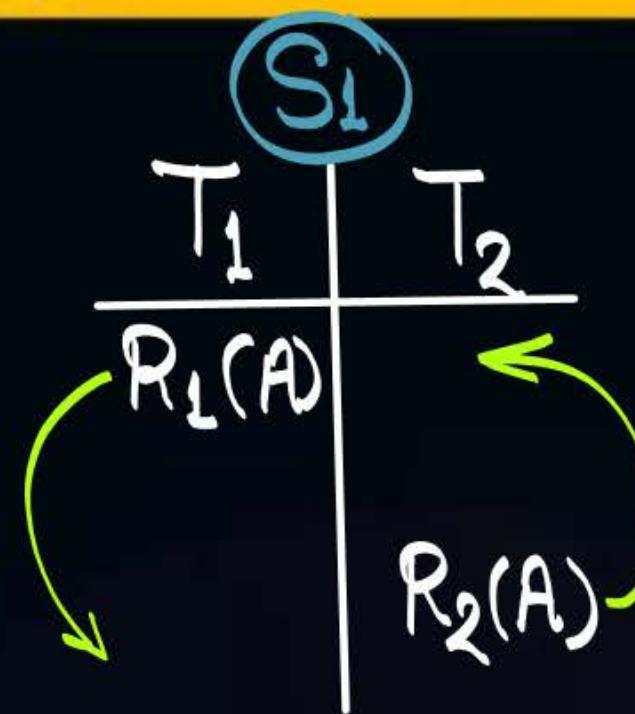
Conflict Serializable Schedule



Topic : Conflicting and non-conflicting operations



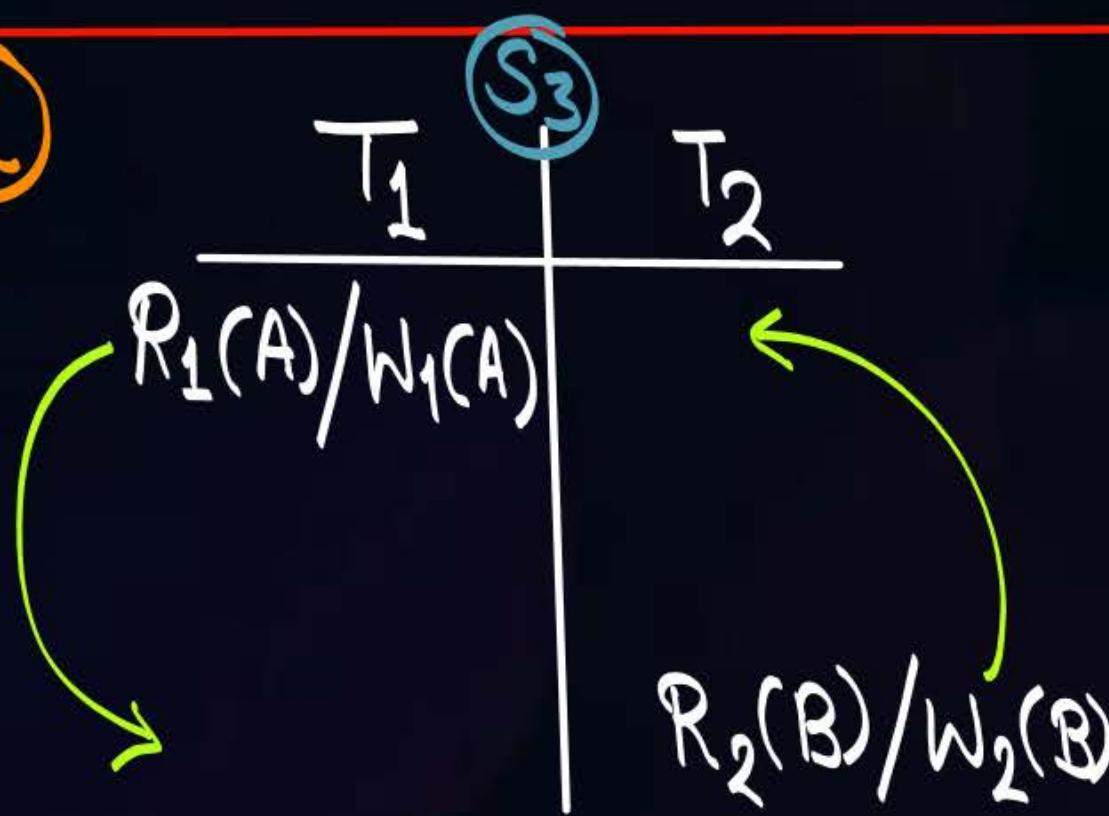
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$$S_1 \equiv S_2$$

$\because R_i(A) \& R_j(A)$
are non-conflicting
operation

2



$$S_3 \equiv S_4$$

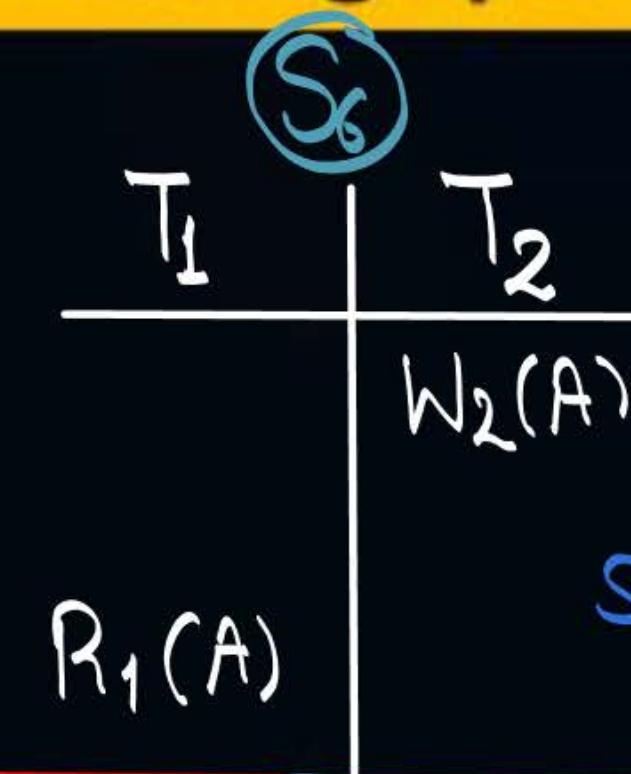
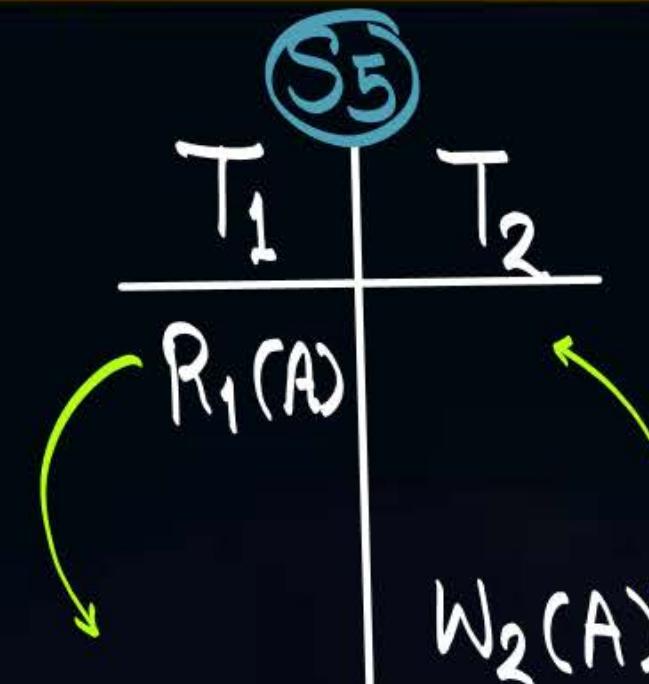
$\because R_i(A)/W_i(A)$ is
non-conflicting
with $R_j(B)/W_j(B)$



Topic : Conflicting and non-conflicting operations

P
W

③

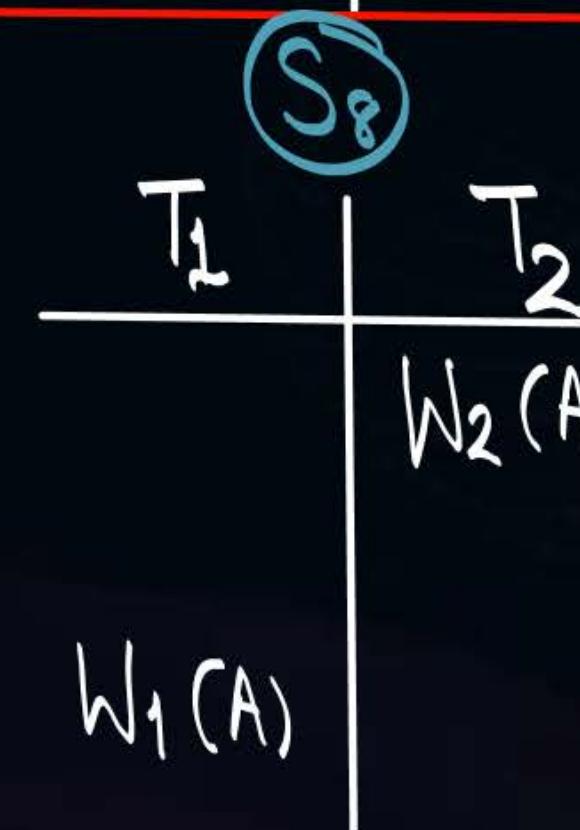
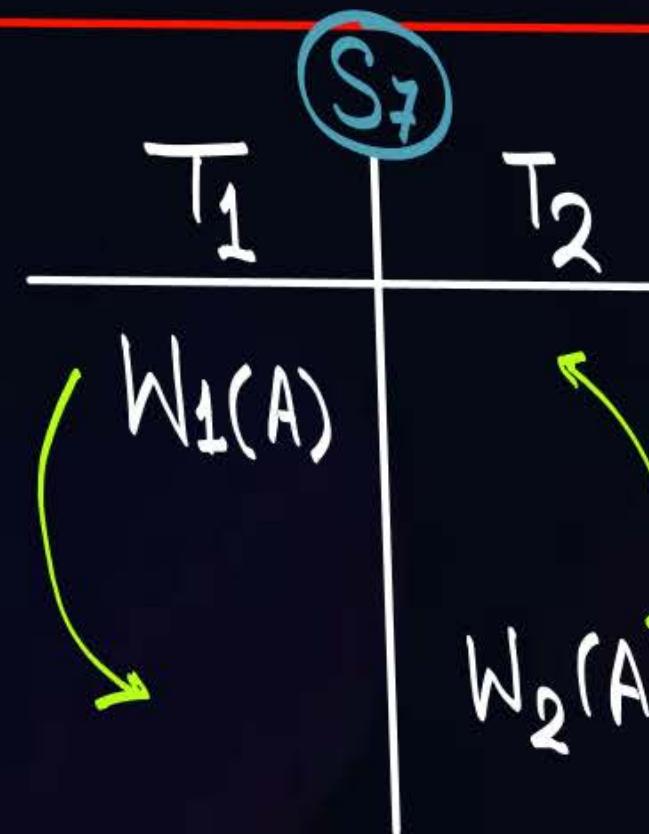


$$S_5 \not\equiv S_6$$

R_i(A) & W_j(A)
are Conflicting opn

Similarly, W_i(A) & R_j(A)
are also Conflicting opn

④



$$S_7 \not\equiv S_8$$

∴ W_i(A) & W_j(A)
are Conflicting opn



Topic : Conflicting and non-conflicting operations



Conflicting Operations : Two operations are called as conflicting operations if all the following conditions hold true for them -

- Both the operations belong to different transactions.
- Both the operations are on the same data item
- At least one of the two operations is a write operation

We Can Never
Swap the
Position of two
Operations within
Same transaction



Topic : Conflicting and non-conflicting operations



- ★ Non-Conflicting Operations : Two operations are non-conflicting if and operations only if
 - Both the operations are on different data items
or
 - Both the operations are read operations

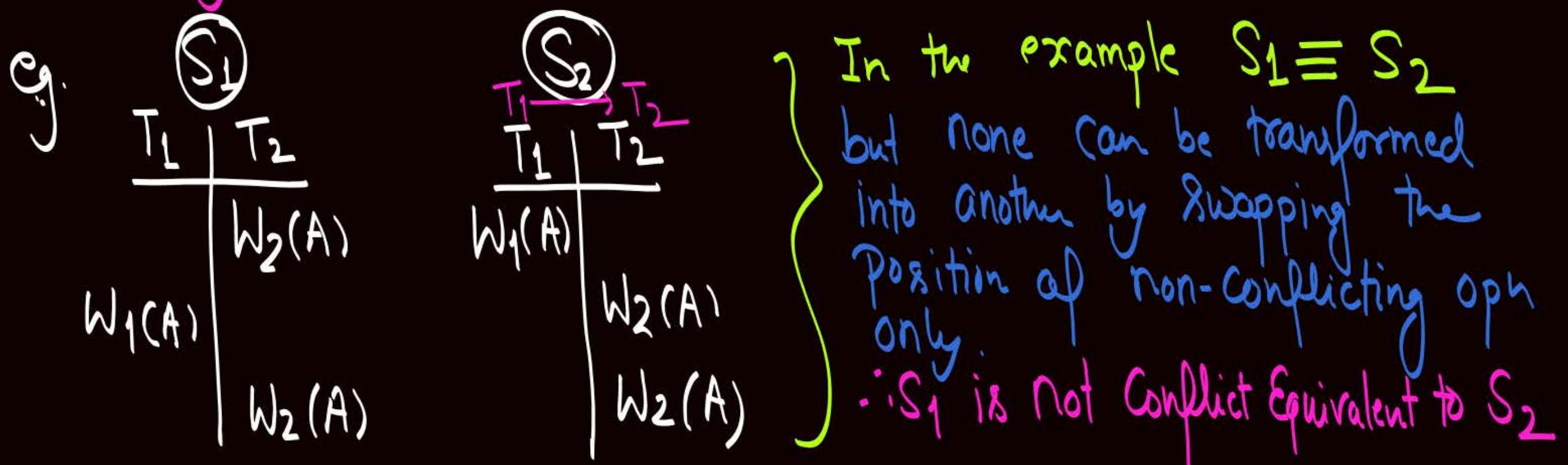


Topic : Conflict equivalent schedule

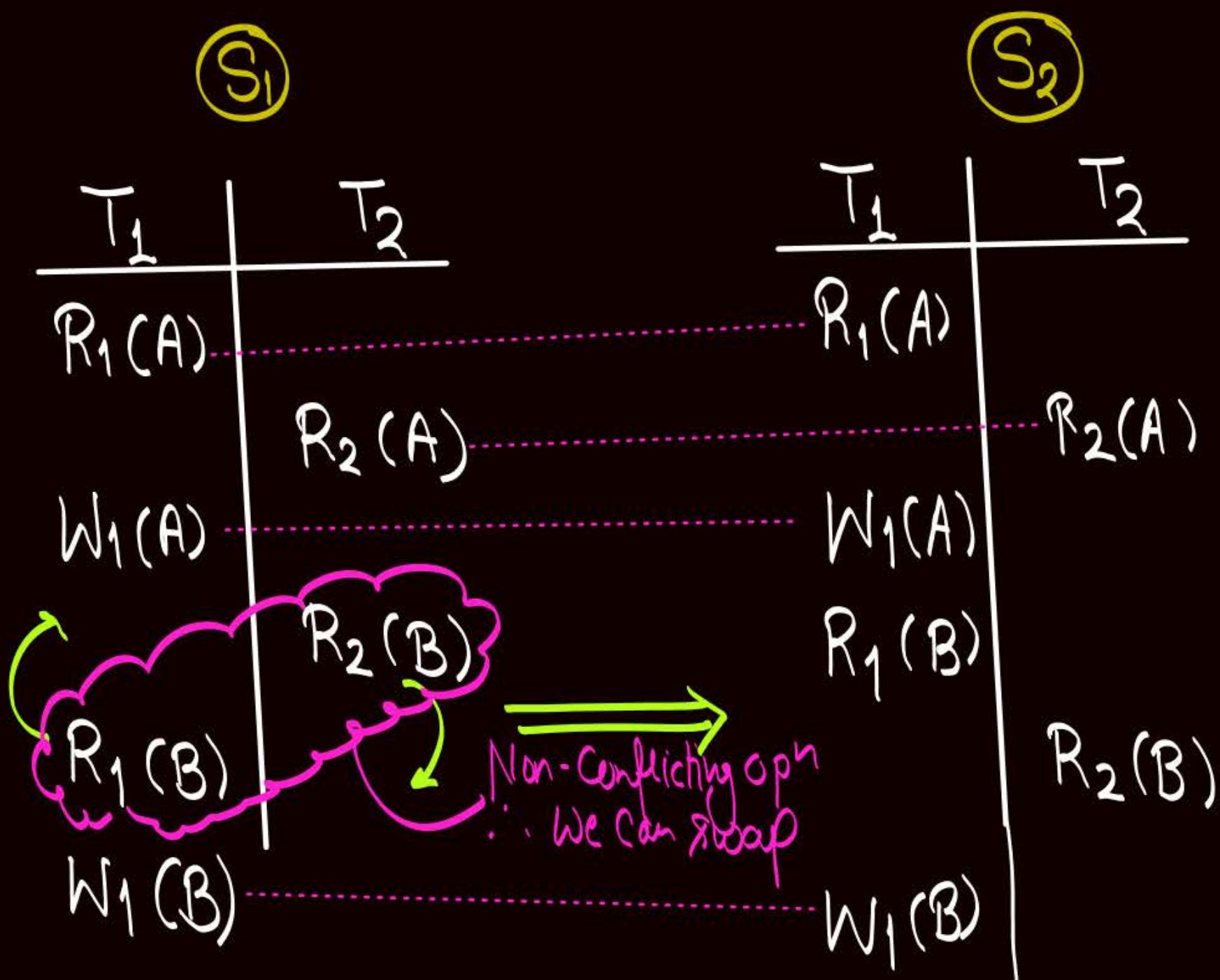
- Consider two schedules $\underline{S_i}$ and $\underline{S_j}$,
If one can be transformed into another by swapping the position
of some of the non-conflicting operations in it, then schedule S_i
and S_j are called conflict equivalent schedule.

Note:-

If two schedules are Conflict Equivalent then they are Equivalent schedules, but if two schedules are Equivalent then they need not be Conflict Equivalent

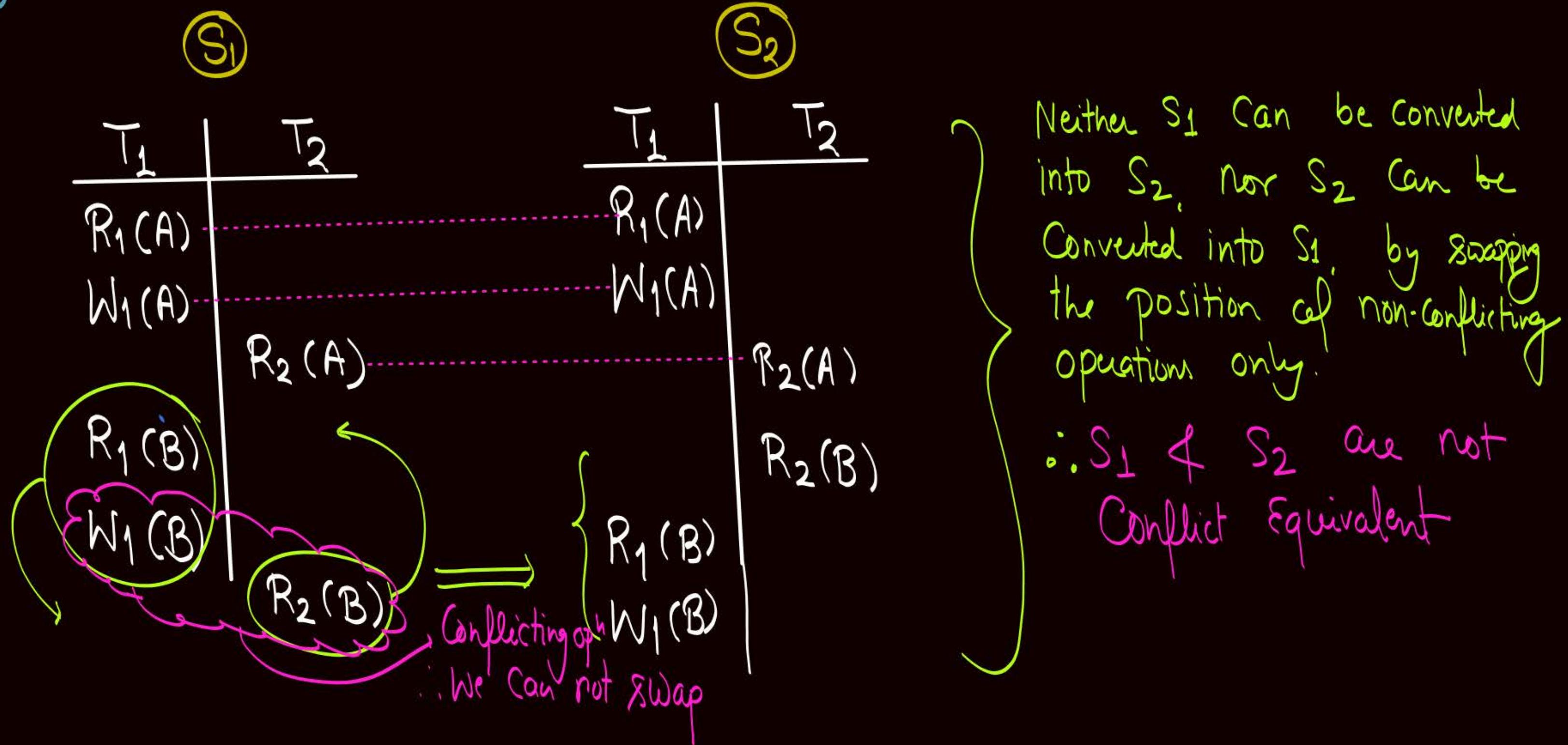


eg: Consider two Schedules S_1 & S_2



- S_1 can be converted into S_2 , by swapping the position of some of the non-conflicting operations,
- ∴ S_1 is conflict equivalent to S_2

eg: Consider two Schedules S_1 & S_2

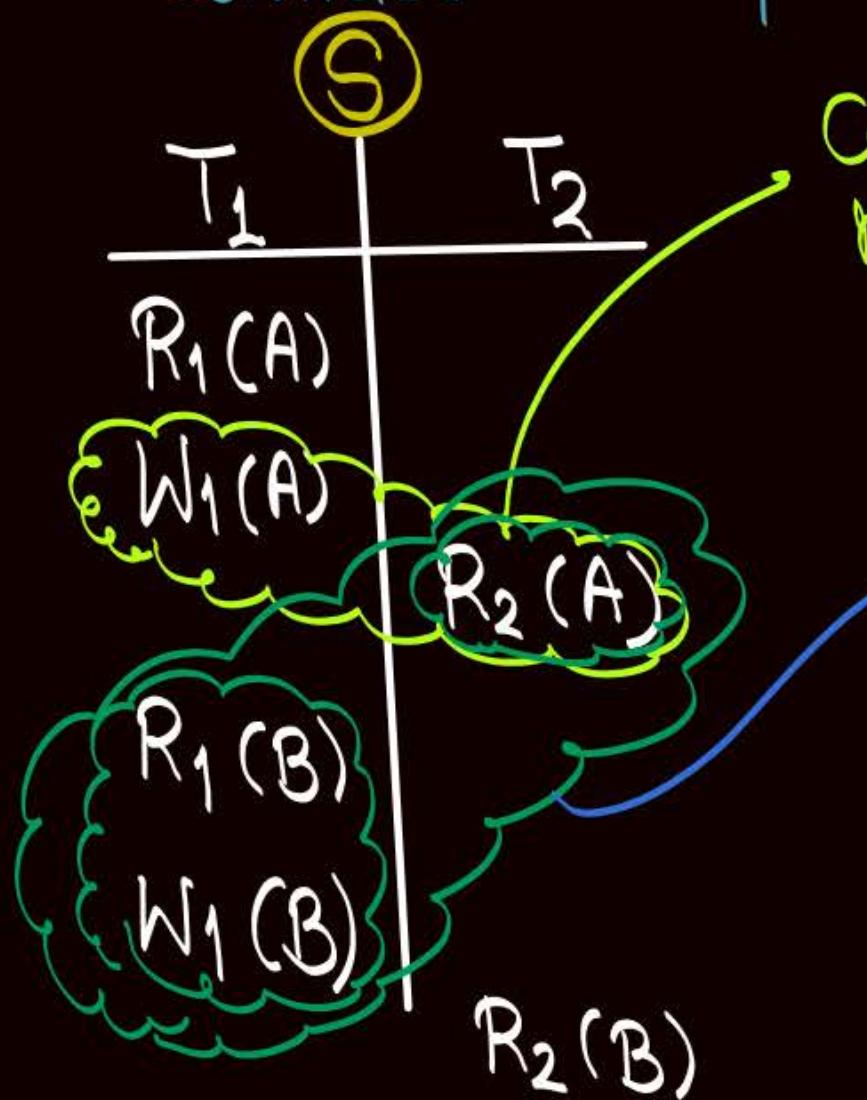




Topic : Conflict serializable schedule

- * If a given schedule can be converted into a serial schedule by swapping the positions of some of its non-conflicting operations, then it is called a conflict serializable schedule.
- * If given schedule is conflict equivalent to at least one of the serial schedule , then given schedule is conflict serializable schedule.

eg: Consider the following schedule 'S'



Check, whether the schedule 'S' is conflict serializable schedule or not?

Conflicting ∵ $R_2(A)$ can not be moved above $W_1(A)$,

Hence 'S' is not Conflict

Equivalent to serial schedule $T_2 \rightarrow T_1$

$R_2(A)$ is non-conflicting with

$R_1(B)$ as well as $W_1(B)$

∴ it can be moved down

And schedule will become

serial schedule $T_1 \rightarrow T_2$

i.e. Schedule 'S' is conflict

Equivalent to at least one

serial schedule.

Hence 'S' is a Conflict serializable

Schedule And Conflict Equivalent

Serial Schedule is $T_1 \rightarrow T_2$

Two serial schedules are possible over the transactions of schedule S

$$\text{i.e. } T_1 \rightarrow T_2 = \frac{T_1}{T_2}$$

$R_1(A)$	T_2
$W_1(A)$	
$R_1(B)$	
$W_1(B)$	

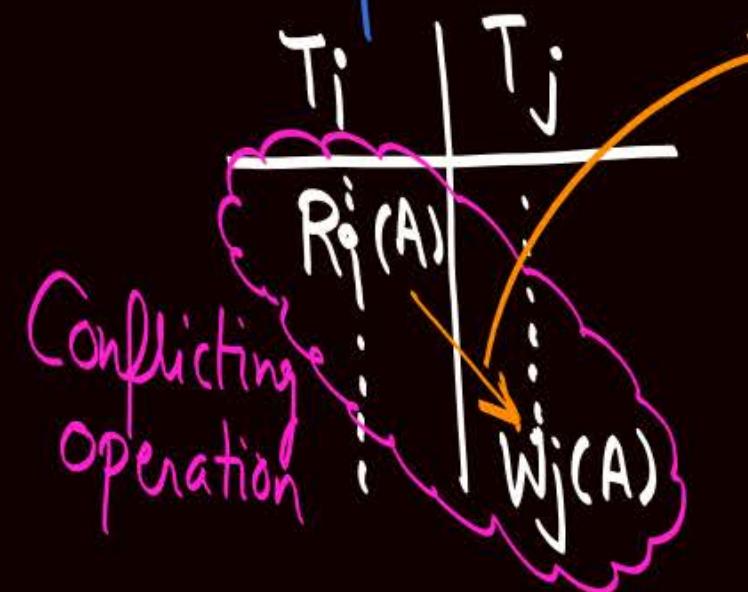
$R_2(A)$	T_1
$R_2(B)$	

$$+ \\ T_2 \rightarrow T_1 = \frac{T_2}{T_1}$$

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

Note

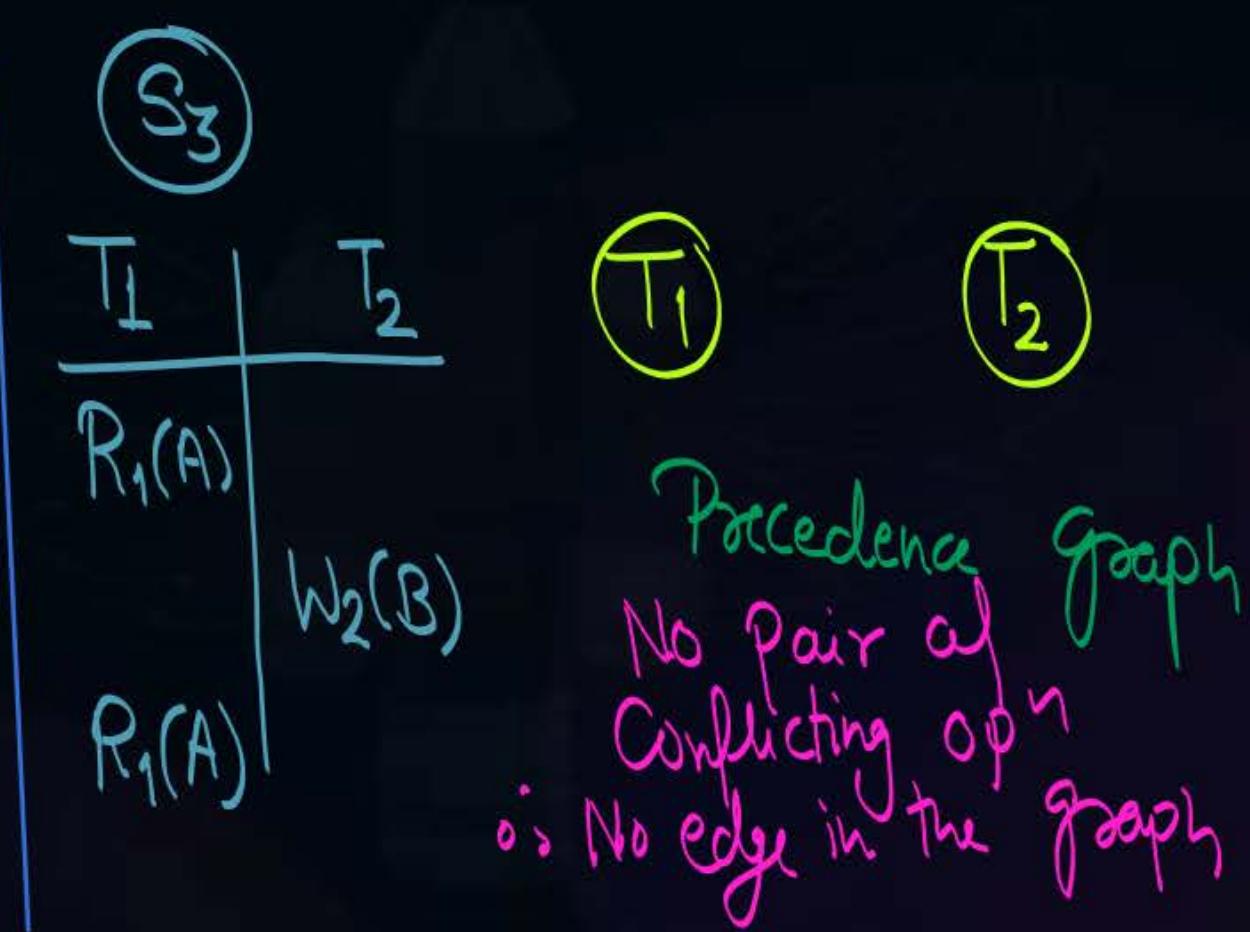
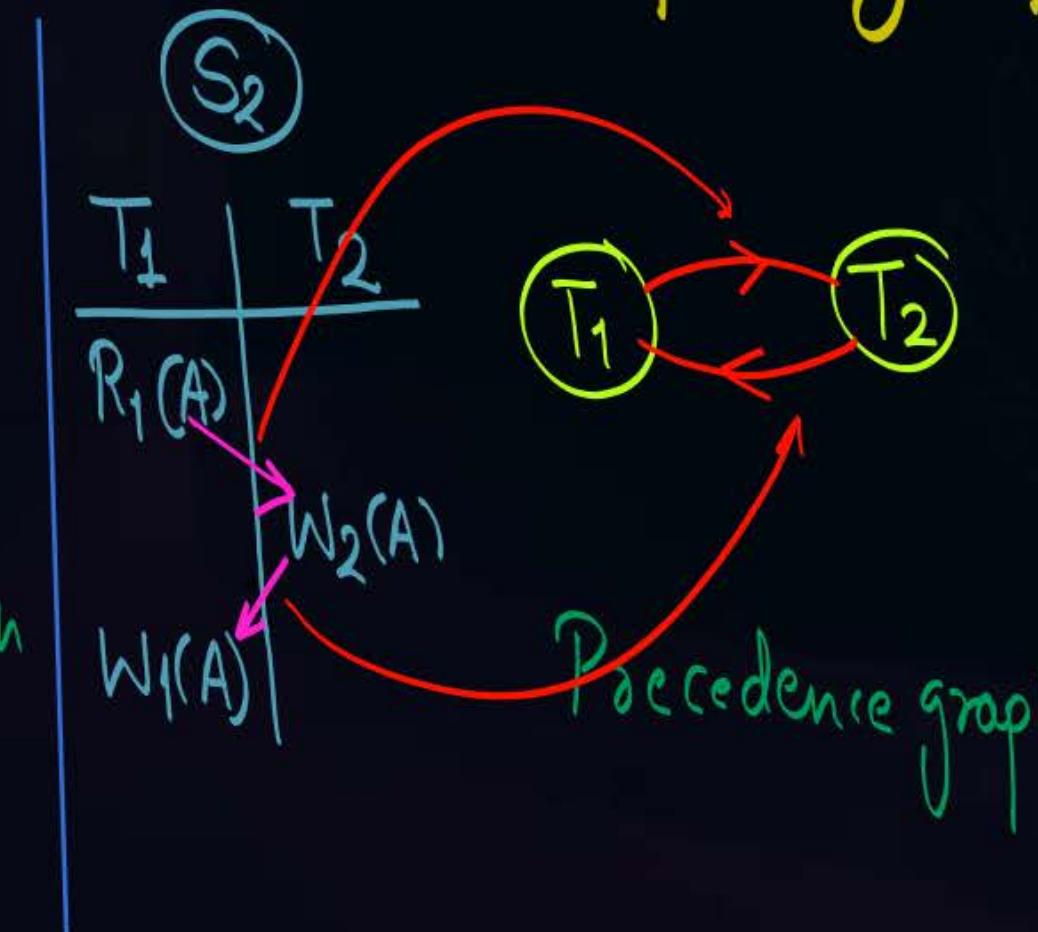
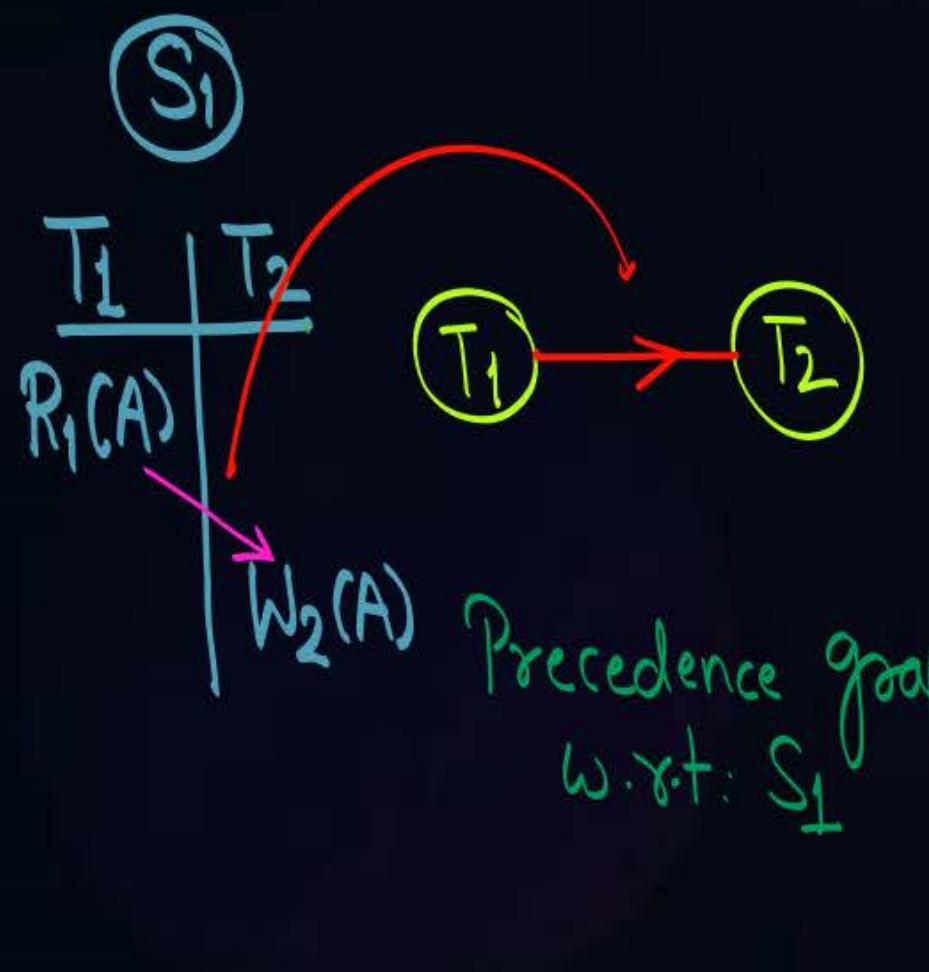
- ① If schedule S is a Conflict Serializable Schedule, then it is guaranteed that schedule S is a Serializable Schedule
- ② If schedule S is not a Conflict Serializable Schedule, then schedule S may or may not be a Serializable Schedule
- ③ Conflicting pairs of operations will define the precedence order in which transactions must execute in an equivalent serial schedule



Precedence is T_i then T_j
o. If there is any serial schedule which is Conflict Equivalent to given schedule, then in that serial schedule T_i must execute before T_j

Topic : Precedence graph

Precedence graph $G = (V, E)$ is a directed graph.
 where set of vertices V = Set of all transactions of the schedule
 set of edges E = Set of directed edges based on
 Precedence order defined by pairs of
 conflicting operations





Topic : Testing condition for conflict serializable schedule



- ① If precedence graph is acyclic, then given schedule is Conflict serializable schedule (hence serializable), and Conflict equivalent serial schedules can be given by "Topological Order" of Precedence graph.
- ② If Precedence graph is Cyclic, then given schedule is not a conflict serializable schedule, (it may or may not be serializable)



Topic : Topological order

Let $G_1 = (V, E)$ be an acyclic precedence graph

Step-1:- Visit a vertex $v \in G_1$, such that in-degree of vertex $v = 0$.
And after visiting the vertex ' v ' delete vertex ' v ' from graph G_1 .

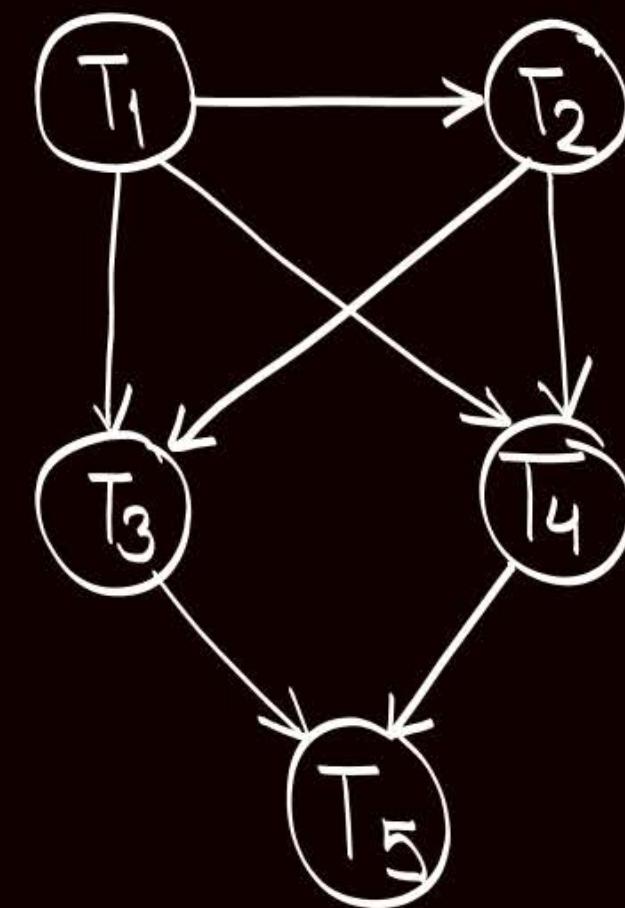
{Indegree : No. of Edges incoming to vertex v }

Step-2:- Repeat "step-1" until graph becomes empty { i.e. When there is no vertex in the graph }

The order in which vertices of precedence graph G_1 can be visited is called topological ordering w.r.t. given Precedence graph

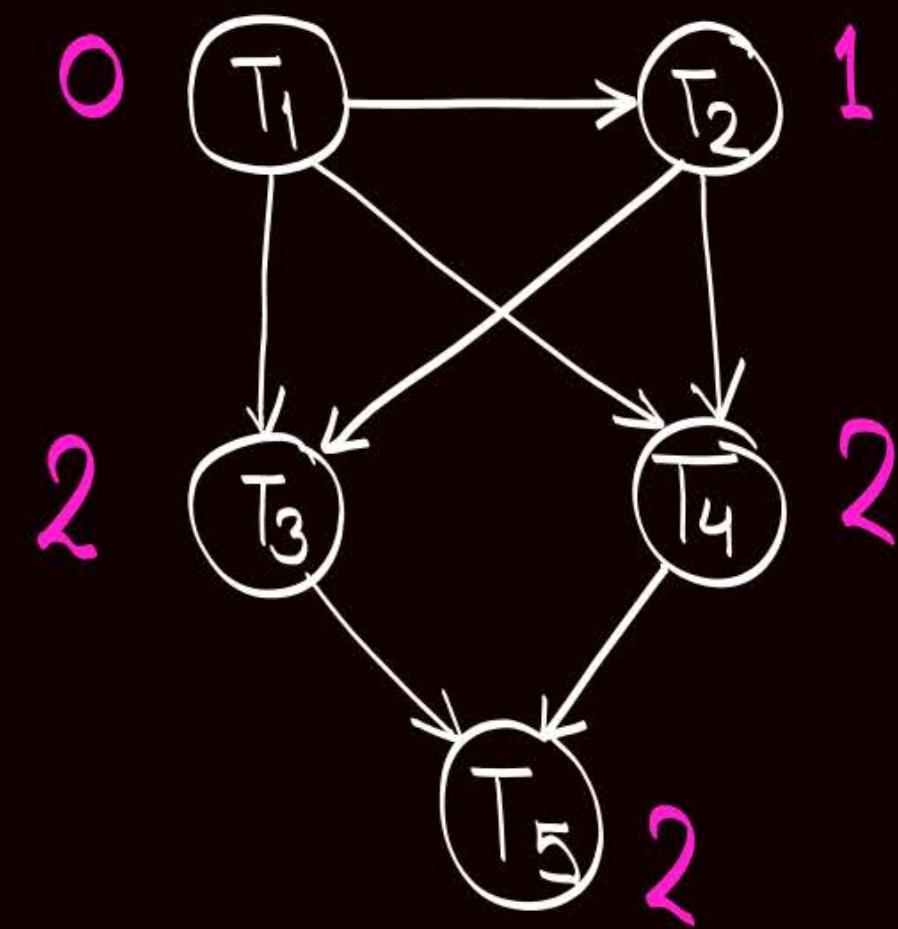
There may be more than one topological ordering for the given precedence graph

H.W.: Consider the following precedence graph w.r.t. some schedule "S"



Identify all topological ordering w.r.t. given Precedence graph

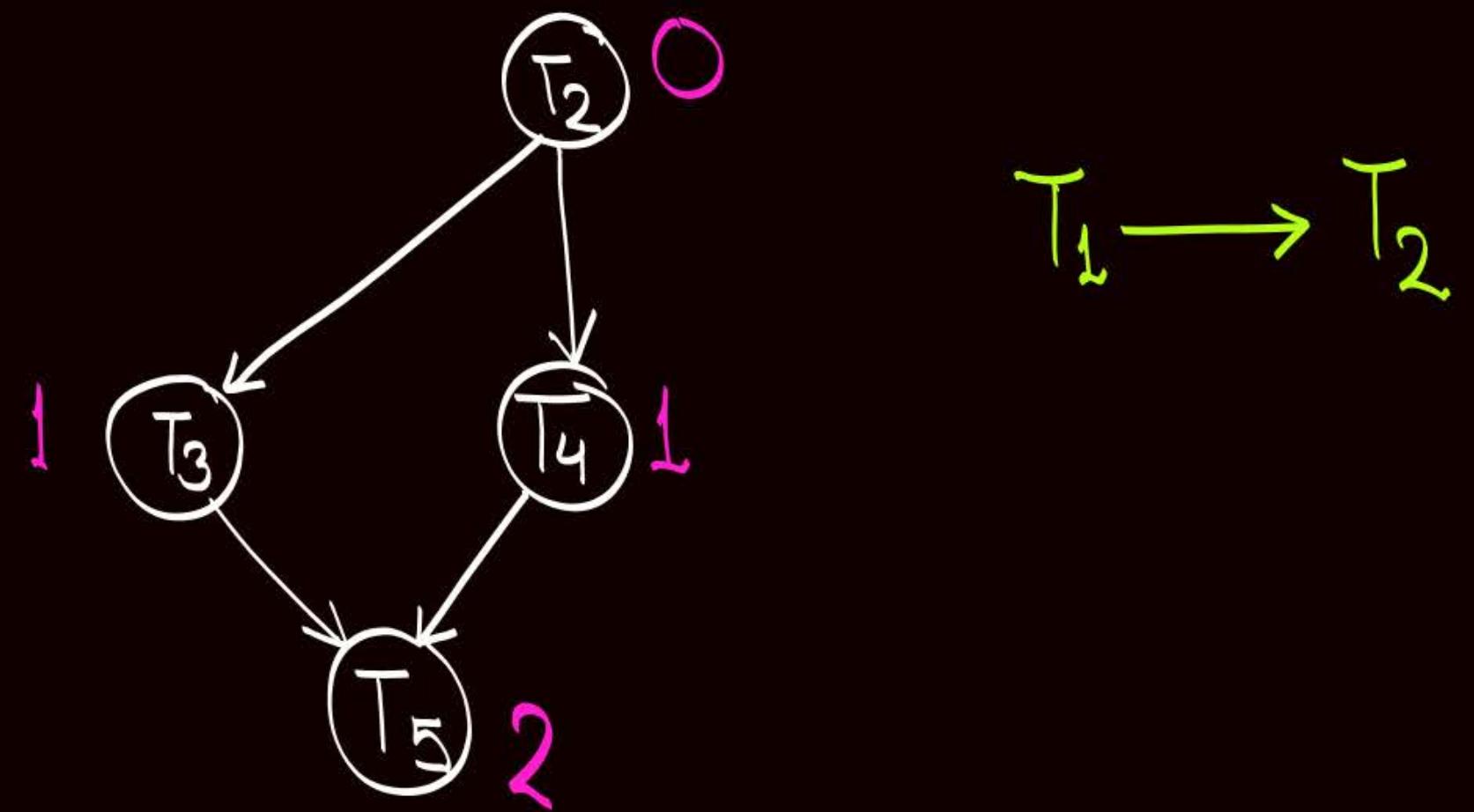
H.W.: Consider the following precedence graph w.r.t. some schedule "S"



$T_1 \rightarrow$

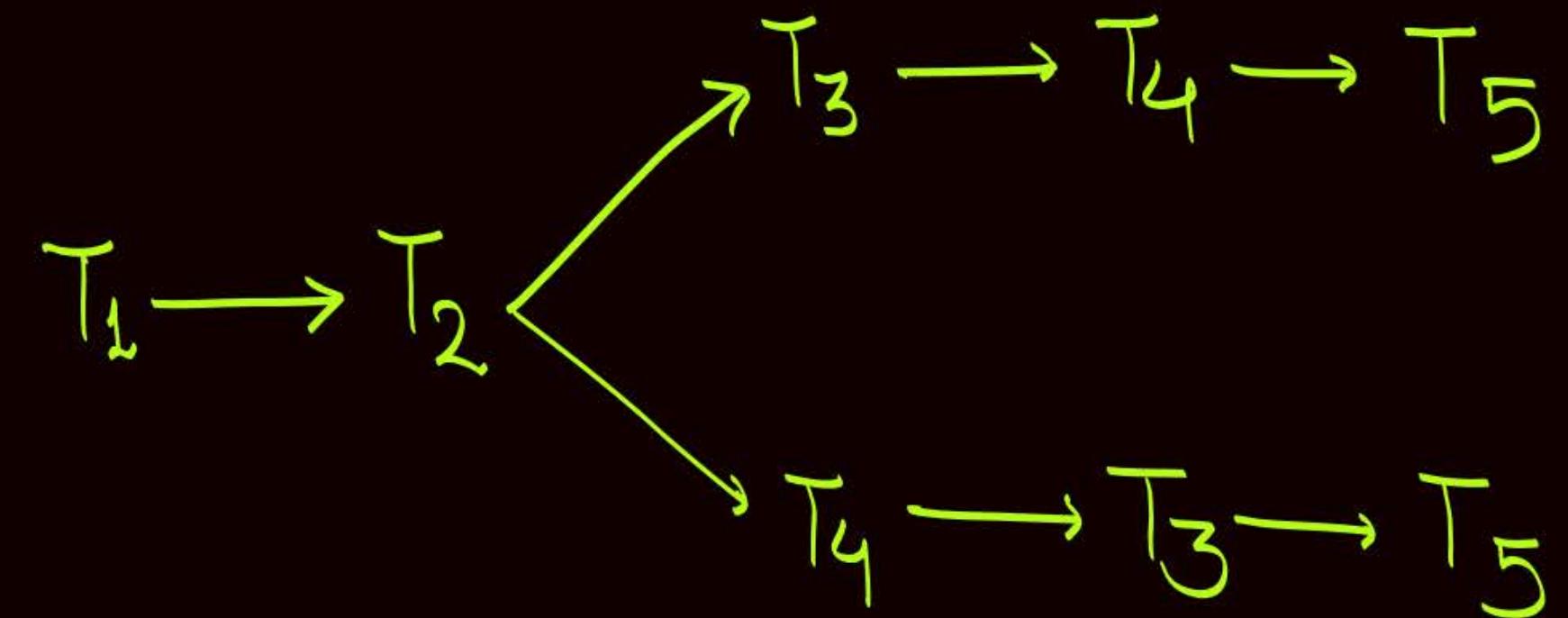
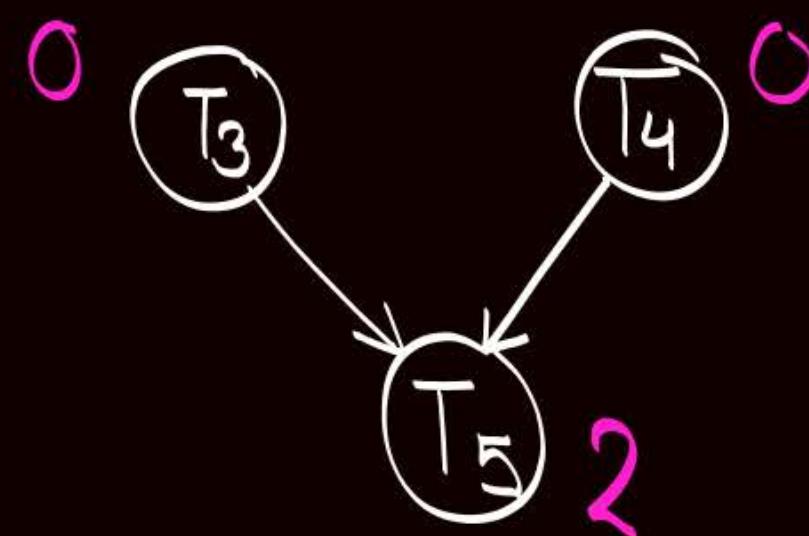
Identify all topological ordering w.r.t. given Precedence graph

H.W.: Consider the following precedence graph w.r.t. some schedule "S"



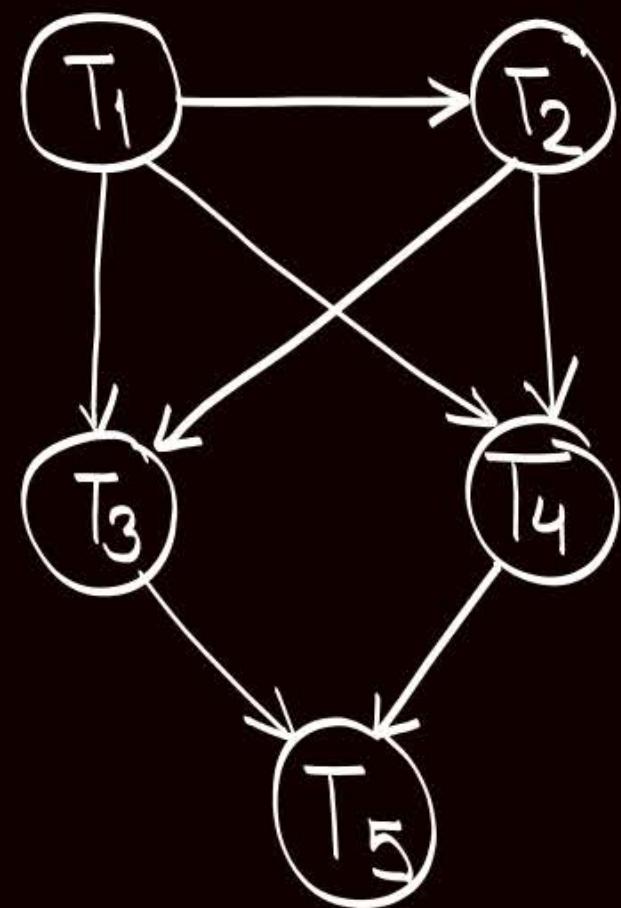
Identify all topological
ordering w.r.t. given
Precedence graph

H.W.: Consider the following precedence graph w.r.t. some schedule "S"



Identify all topological ordering w.r.t. given Precedence graph

H.W.: Consider the following precedence graph w.r.t. some schedule "S"



Identify all topological ordering w.r.t. given Precedence graph

There are two topological order w.r.t given Precedence graph.

those are

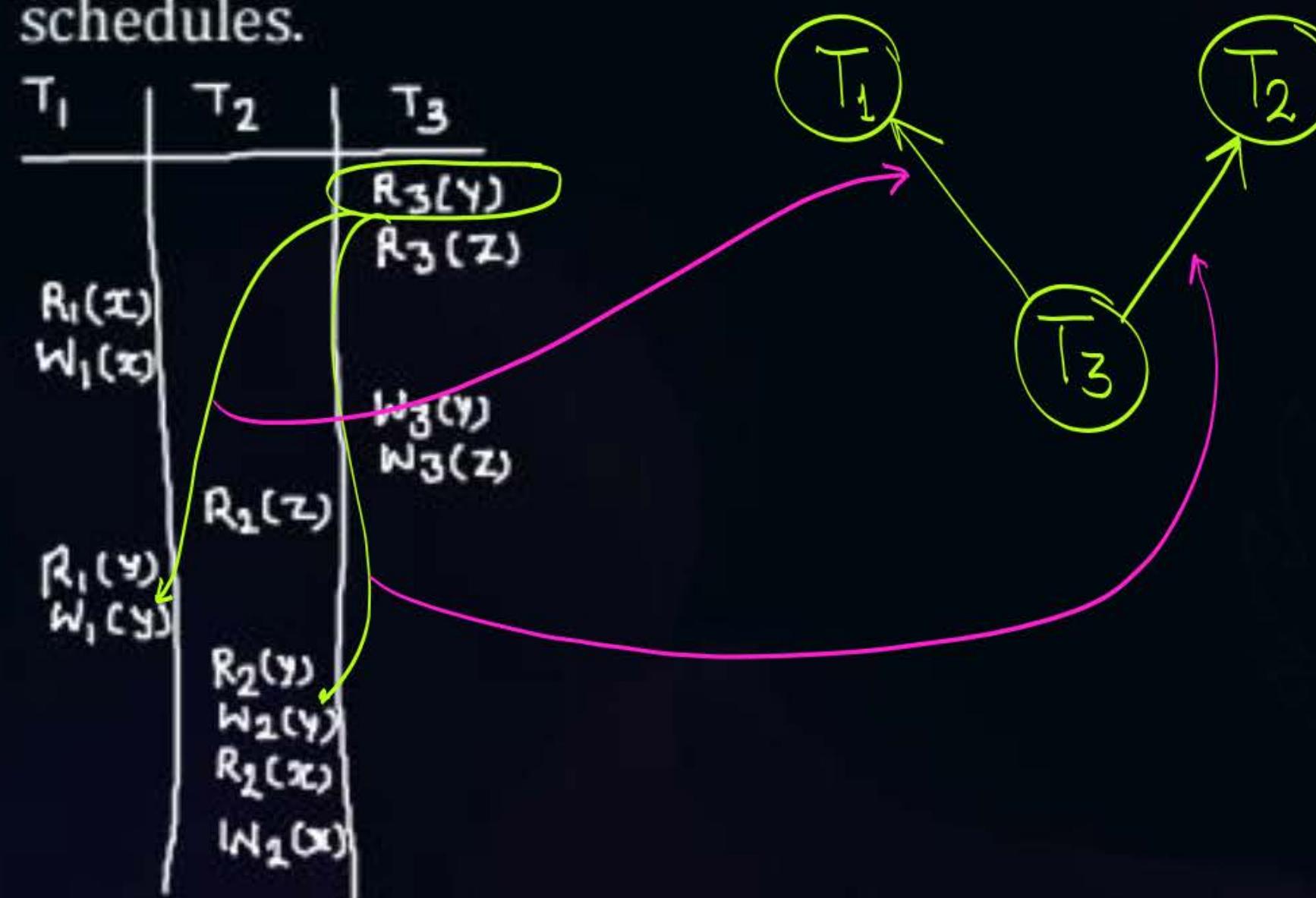
- $T_1 \rightarrow T_2 \rightarrow T_3 \rightarrow T_4 \rightarrow T_5$
- & $T_1 \rightarrow T_2 \rightarrow T_4 \rightarrow T_3 \rightarrow T_5$

Schedule w.r.t. which the precedence graph is constructed will be conflict equivalent to two serial schedules

- $T_1 \rightarrow T_2 \rightarrow T_3 \rightarrow T_4 \rightarrow T_5$
- & $T_1 \rightarrow T_2 \rightarrow T_4 \rightarrow T_3 \rightarrow T_5$

#Q. Check whether the schedule is conflict serializable schedule or not?

If conflict serializable schedule then identify all conflict equivalent serial schedules.

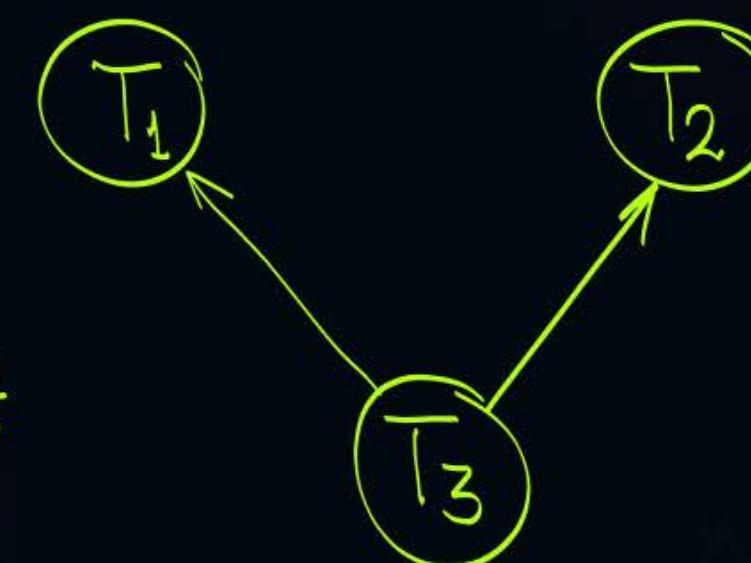


#Q. Check whether the schedule is conflict serializable schedule or not?

If conflict serializable schedule then identify all conflict equivalent serial schedules.

T_1	T_2	T_3
		$R_3(y)$
		$R_3(z)$
$R_1(x)$		
$W_1(x)$		
		$W_3(y)$
		$W_3(z)$
	$R_2(z)$	
$R_1(y)$		
$W_1(y)$		
	$R_2(y)$	
	$W_2(y)$	
	$R_2(x)$	
	$W_2(x)$	

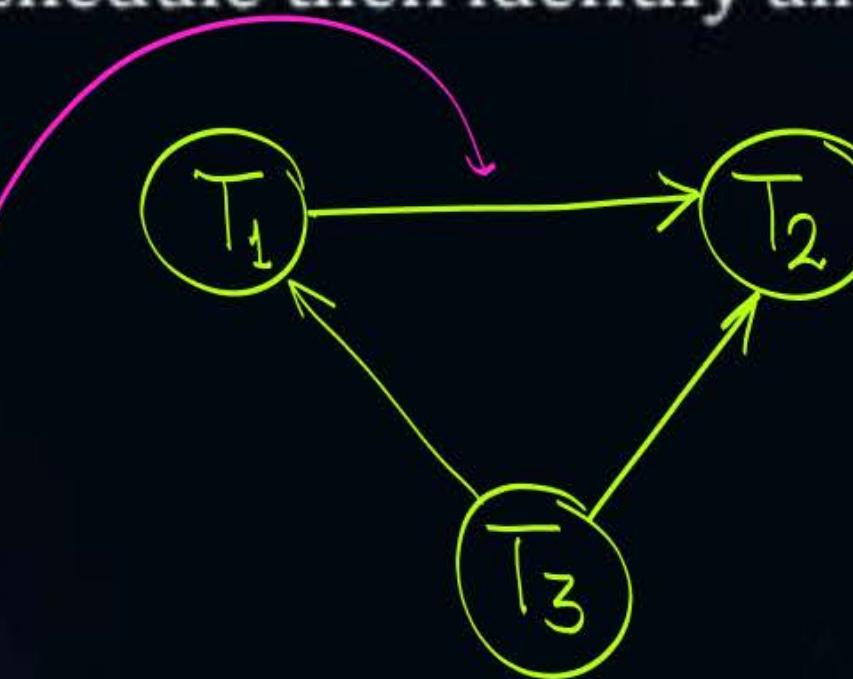
NO Conflict



#Q. Check whether the schedule is conflict serializable schedule or not?

If conflict serializable schedule then identify all conflict equivalent serial schedules.

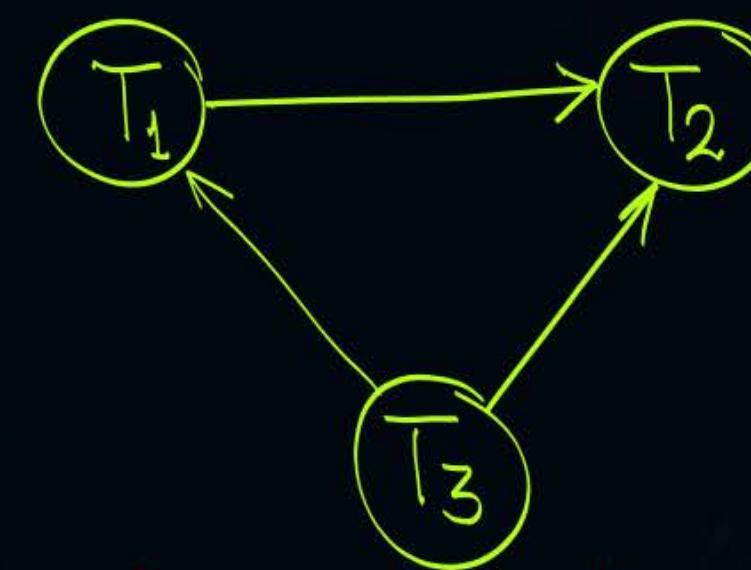
T_1	T_2	T_3
$R_1(x)$		$R_3(y)$
$W_1(x)$		$R_3(z)$
	$R_2(z)$	$W_3(y)$
$R_1(y)$	$W_1(y)$	$W_3(z)$
	$R_2(y)$	
	$W_2(y)$	
	$R_2(x)$	
	$IN_2(x)$	



#Q. Check whether the schedule is conflict serializable schedule or not?

If conflict serializable schedule then identify all conflict equivalent serial schedules.

T_1	T_2	T_3
		$R_3(y)$ $R_3(z)$
$R_1(x)$ $W_1(x)$		$W_3(y)$ $W_3(z)$
	$R_2(z)$	
$R_1(y)$ $W_1(y)$	$R_2(y)$ $W_2(y)$ $R_2(x)$ $W_2(x)$	



Topological order

$$T_3 \rightarrow T_1 \rightarrow T_2$$

Acyclic precedence graph

∴ Schedule is a

Conflict Serializable Schedule

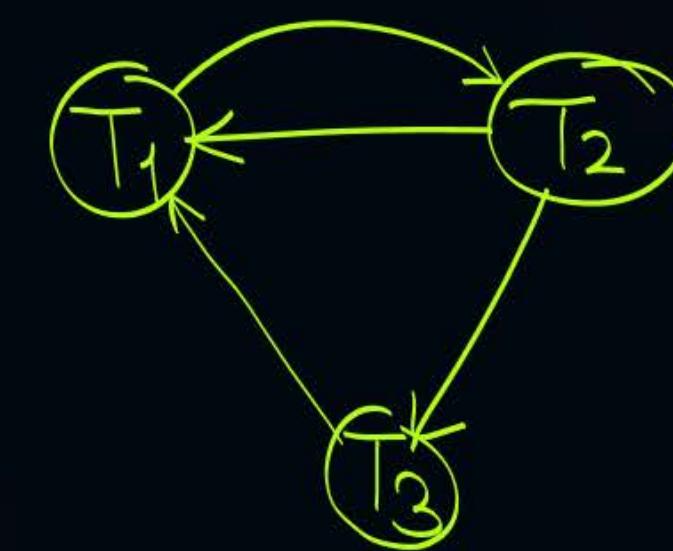
{ Conflict Equivalent Serial Schedule is

$$T_3 \rightarrow T_1 \rightarrow T_2$$

#Q. Check whether the schedule is conflict serializable schedule or not?

If conflict serializable schedule then identify all conflict equivalent serial schedules.

T_1	T_2	T_3
$R_1(B)$	$R_2(A)$	
	$W_2(A)$	
		$R_3(A)$
$W_1(B)$		
$W_1(A)$		
	$R_2(B)$	
	$W_2(B)$	



Cyclic

∴ Not a C.S.S.

#Q. Check whether the schedule is conflict serializable schedule or not?

If conflict serializable schedule then identify all conflict equivalent serial schedules.

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

T ₁	T ₂	T ₃
R ₁ (A)		W ₃ (B)
W ₁ (B)		

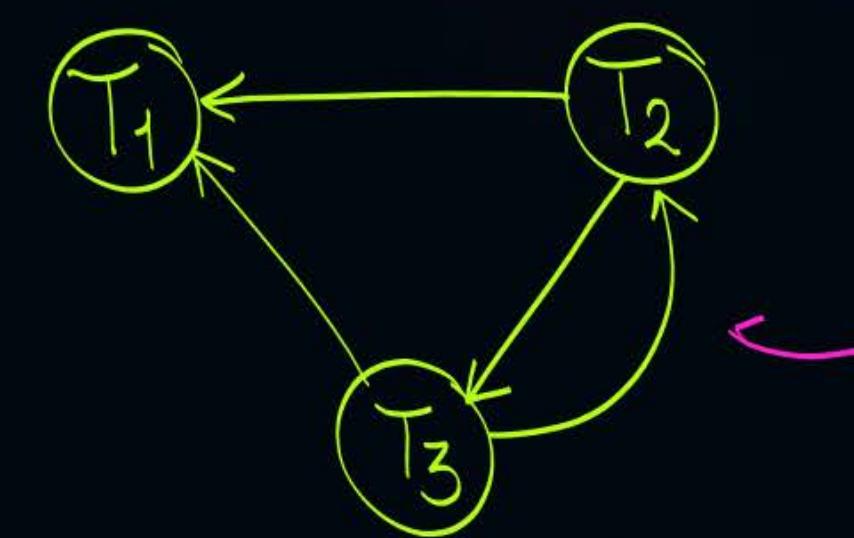
T₁	T₂	T₃

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#Q. Check whether the schedule is conflict serializable schedule or not?

If conflict serializable schedule then identify all conflict equivalent serial schedules.

T_1	T_2	T_3
	$R_2(z)$	
	$R_1(y)$	
	$W_2(y)$	
		$R_3(y)$
		$R_3(z)$
$R_1(x)$		
$W_1(x)$		
		$W_3(y)$
		$W_3(z)$
	$R_2(z)$	
$R_1(y)$		
$W_1(y)$		

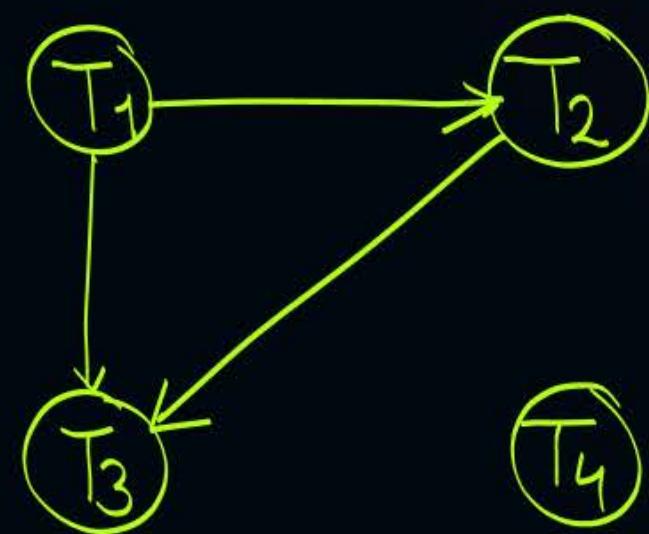


Cyclic
∴ Not a C.S.S.

#Q. Check whether the schedule is conflict serializable schedule or not?

If conflict serializable schedule then identify all conflict equivalent serial schedules.

T_1	T_2	T_3	T_4
$R_1(A)$			
	$R_2(A)$		
		$R_3(A)$	
			$R_4(A)$
$W_1(B)$			
	$W_2(B)$		
		$W_3(B)$	
			$W_4(B)$



Ayclic
is Conflict Serializable
Schedule

Conflict equivalent
Serial schedules are

$T_1 \rightarrow T_2 \rightarrow T_3 \rightarrow T_4$

$T_1 \rightarrow T_2 \rightarrow T_4 \rightarrow T_3$

$T_1 \rightarrow T_4 \rightarrow T_2 \rightarrow T_3$

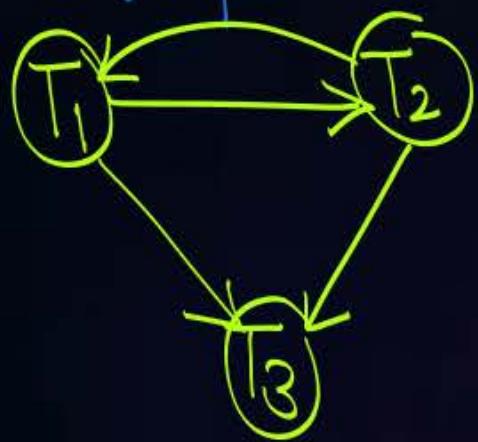
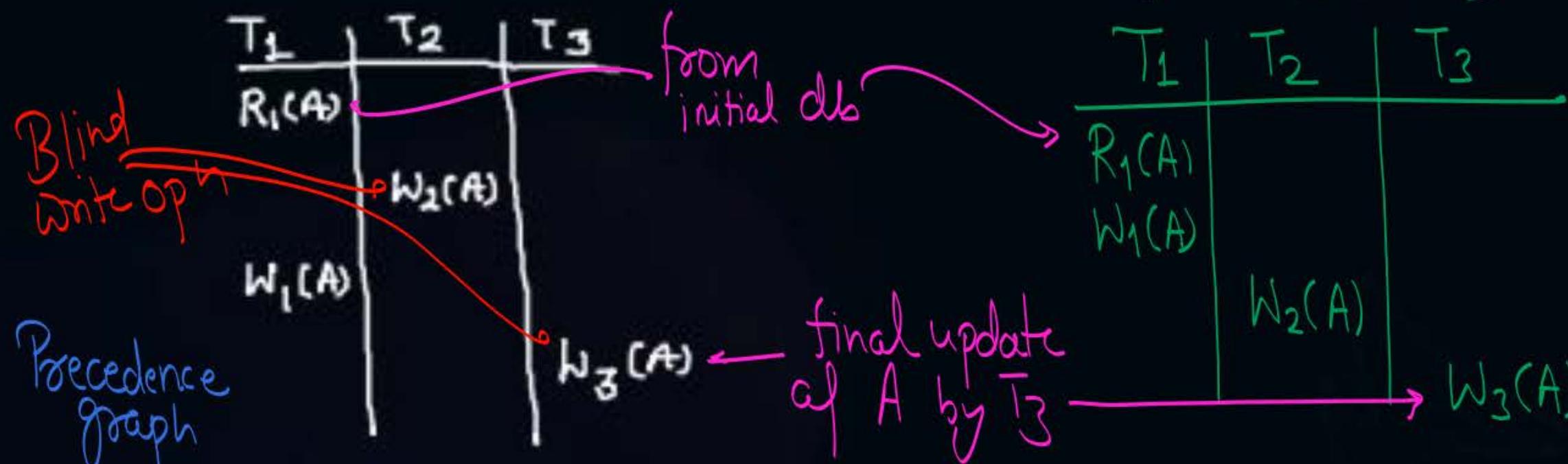
$T_4 \rightarrow T_1 \rightarrow T_2 \rightarrow T_3$

#Q. Check whether the schedule is conflict serializable schedule or not?

If not conflict serializable then check where the schedule is serializable schedule or not?

Consider the serial schedule

$$\bar{T}_1 \rightarrow \bar{T}_2 \rightarrow \bar{T}_3$$



Cycle

\therefore Not a C.S.S.

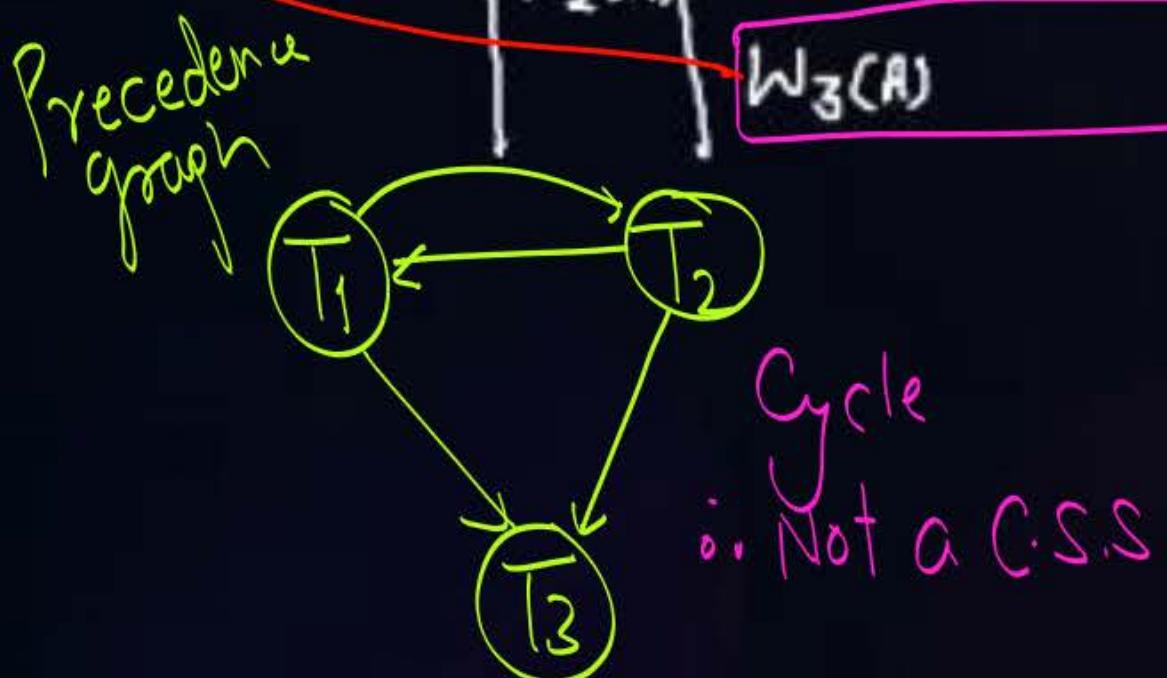
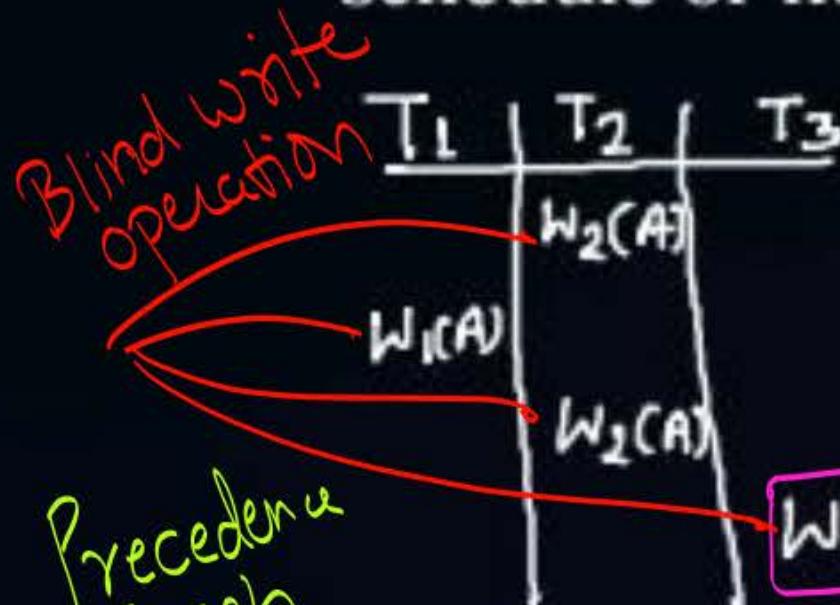
but given schedule is equivalent to serial schedule $\bar{T}_1 \rightarrow \bar{T}_2 \rightarrow \bar{T}_3$

Hence, given schedule is a serializable schedule.

#Q. Check whether the schedule is conflict serializable schedule or not?

If not conflict serializable then check where the schedule is serializable

schedule or not?



$\overline{T_1} \rightarrow \overline{T_2} \rightarrow \overline{T_3}$		
T_1	T_2	T_3
$W_1(A)$		
	$W_2(A)$	
	$W_2(A)$	
		$W_3(A)$

$\overline{T_2} \rightarrow \overline{T_1} \rightarrow \overline{T_3}$		
T_1	T_2	T_3
	$W_2(A)$	
	$W_2(A)$	
$W_1(A)$		
		$W_3(A)$

given schedule is equivalent to two serial schedules,

$$\left. \begin{array}{l} \overline{T_1} \rightarrow \overline{T_2} \rightarrow \overline{T_3} \\ \overline{T_2} \rightarrow \overline{T_1} \rightarrow \overline{T_3} \end{array} \right\}$$

given schedule is a serializable schedule

- Note:-
- ① If schedule is not a Conflict serializable schedule, but a serializable schedule, then at least one blind write opn will exist in that schedule
 - ② If a schedule is not a Conflict serializable schedule and a blind write opn exists in the schedule, then also schedule may be a non-serializable schedule
 - ③ If schedule is not a CSS, and no blind write opn exists in the schedule, then schedule can never be a serializable schedule

Note:

Conflict serializability Cond'n is an "if - then" Cond'n,

i.e., ① If Conflict serializable , then Serializable

but converse of the statement need not be true

i.e A Serializable Schedule may or

may not be a Conflict Serializable Schedule.

Note: - + There are many serializable schedules that are not covered by the definition of Conflict serializability.

∴ We define "View serializability"

* View Serializability Cond'n is if and only if Cond'n.

i.e., Schedule is View Serializable Schedule

if and only if

Schedule is a Serializable Schedule

View Serializable Schedule



Topic : View serializable schedule



If given schedule is view equivalent to at least one of the serial schedule , then it is called a **view serializable schedule**.



Topic : View equivalent condition



Consider two schedules S1 and S2

Schedules S1 and S2 are called view equivalent if the following three conditions hold true for them –

- **Condition-01 :** For each data item X, if transaction T_i reads X from the initial database in schedule S1, then in schedule S2 also, T_i must perform the same read of X from the initial database.

Thumb Rule

- “Initial readers must be same for all the data items”.



Topic : View equivalent condition



Condition-02 :

If transaction T_i reads the value of data item X updated by the transaction T_j in schedule S_1 , then in schedule S_2 also, transaction T_i must read the value of data item X updated by the transaction T_j .

Thumb Rule

- ❑ “Write-read sequence must be same.”.



Topic : View equivalent condition



Condition-03 :

For each data item X, if X is finally updated by transaction T_i in schedule S1, then in schedule S2 also, X must be finally updated by transaction T_i .

Thumb Rule

- ❑ “Final writers must be same for all the data items”.

+ For two schedules to be view equivalent all three
Conditions must hold true

① Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

S_1		
T_1	T_2	T_3
$w_1(A)$		
	$r_2(B)$	
	$r_2(A)$	
	$w_2(B)$	
$w_1(B)$		$w_3(B)$

Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

S_1

① Identify the constraints w.r.t. Read from initial DB

T_1	T_2	T_3	Data item	Transaction that reads the dataitem from initial DB	Other transactions that writes that dataitem	Constraints w.r.t. view equivalent serial schedule
$w_1(A)$			A	No	T_1	No constraint
	$R_2(B)$ $R_2(A)$ $w_2(B)$		B	T_2	T_1, T_3	$T_2 \rightarrow (T_1, T_3) =$ $\quad\quad\quad T_2 \rightarrow T_1$ $\quad\quad\quad T_2 \rightarrow T_3$
$w_1(B)$			$w_3(B)$			

Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

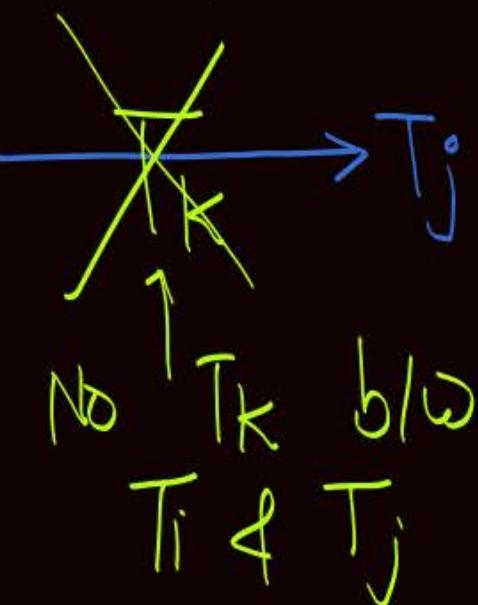
S_1		
T_1	T_2	T_3
$W_1(A)$		
	$R_2(B)$	
	$R_2(A)$	
	$W_2(B)$	
$W_1(B)$		
		$W_3(B)$

② Identify the Constraints w.r.t. Write-read sequence

Concept: Let transaction T_i updates the dataitem X in the given schedule and transaction T_j reads the value of X updated by transaction T_i , also assume that T_k is some other transaction in the schedule which also update the dataitem ' X ', then in a view equivalent serial schedule,

① T_i must execute before T_j i.e. $T_i \rightarrow T_j$

and ② No T_k should be allowed to execute b/w T_i & T_j



Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

S_1		
T_1	T_2	T_3
$W_1(A)$		
	$R_2(B)$	
	$R_2(A)$	
	$W_2(B)$	
$W_4(B)$		$W_3(B)$

② Identify the constraints wrt. Write-read sequence

Data item	Constraint wrt Write-read sequence
A	$\left\{ \begin{array}{l} T_1 \text{ writes } A \text{ & } T_2 \text{ reads the value update by } T_1 \\ \text{No other writer of } A \end{array} \right. \Rightarrow \begin{array}{l} T_1 \rightarrow T_2 \\ \text{Final Constraint } T_1 \rightarrow T_2 \end{array}$
B	No Write-Read Sequence ∴ No Constraint

① Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

S_1			Data item	Transaction with the final update of dataitem	Other transactions that update the dataitem	Constraints w.r.t Equivalent Serial Schedule
T_1	T_2	T_3				
$w_1(A)$			A :	T_1	NO	No Constraint
$r_2(B)$	$r_2(A)$			T_3	T_1, T_2	$(T_1, T_2) \rightarrow T_3 \equiv$ $T_1 \rightarrow T_3$ $T_2 \rightarrow T_3$
$w_1(B)$			β			
			$w_3(B)$			

Note :- Once we have identified the constraints w.r.t. all three conditions construct the dependency graph w.r.t. overall constraints.

- If dependency graph is cyclic then schedule is not a view serializable schedule, and hence the schedule is a non-serializable schedule.
- If dependency graph is acyclic then schedule is a view serializable schedule, and hence the schedule is a serializable schedule.

① Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

S_1		
T_1	T_2	T_3
$w_1(A)$		
	$r_2(B)$	
	$r_2(A)$	
	$w_2(B)$	
$w_1(B)$		$w_3(B)$

→ Set of overall constraints identified

{ w.r.t. Read from initial database :
 { w.r.t. Write-Read Sequence :
 { w.r.t. Final write :

$$\begin{array}{l}
 T_2 \rightarrow T_1 \\
 T_2 \rightarrow T_3 \\
 T_1 \rightarrow T_2 \\
 T_1 \rightarrow T_3 \\
 T_2 \rightarrow T_3
 \end{array}$$

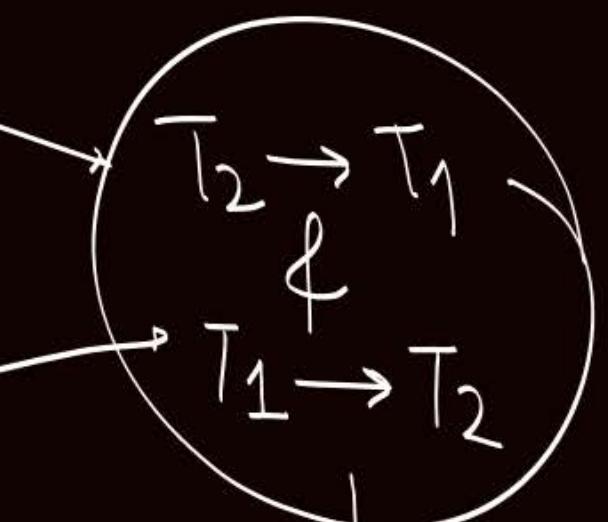
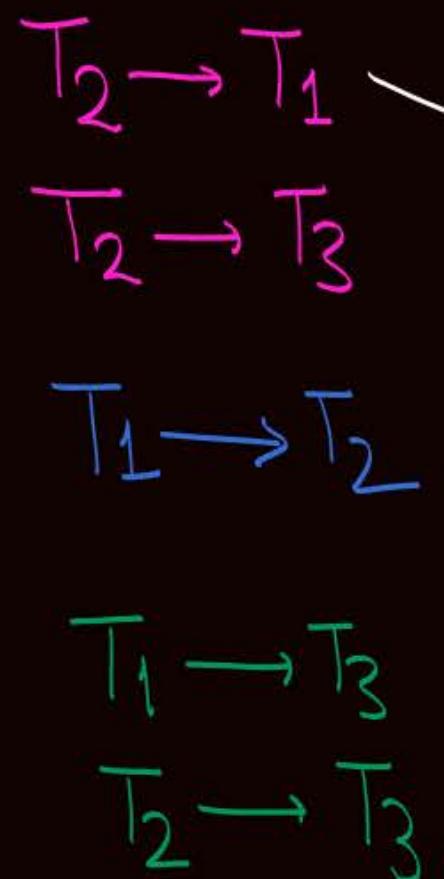
In the overall constraint if we observe the constraints of the type
 $T_i \rightarrow T_j$
 $T_j \rightarrow T_i$, then dependency graph is definitely cyclic Schedule is not a View Serializable Schedule

① Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

S_1		
T_1	T_2	T_3
$W_1(A)$		
	$R_2(B)$	
	$R_2(A)$	
	$W_2(B)$	
$W_1(B)$		
		$W_3(B)$

→ Set of overall constraints identified

{ w.r.t. Read from initial database :
 { w.r.t. Write-Read Sequence :
 { w.r.t. Final write :



∴ Cyclic,
Hence not a VoS S.

Hence Not a
Serializable Schedule

② Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

S_2		
T_1	T_2	T_3
$w_1(A)$		
	$r_2(B)$	
	$r_2(A)$	
	$w_2(B)$	
$w_1(B)$		
		$w_3(B)$

Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "View equivalent serial schedules"

S_2

① Identify the constraints w.r.t. Read from initial DB

T_1	T_2	T_3	Data item	Transaction that reads the dataitem from initial DB	Other transactions that writes the dataitem	Constraints w.r.t. view equivalent serial schedule
$w_1(A)$		$R_3(B)$	A	No	—	No constraint
$w_1(B)$	$R_2(B)$ $R_2(A)$	$w_2(B)$	B	$T_2 \rightarrow T_1, T_3$	$T_2 \rightarrow (T_1, T_3) \equiv T_2 \rightarrow T_3 \rightarrow T_1$	$T_2 \rightarrow (T_1, T_3) \equiv T_2 \rightarrow T_3 \rightarrow T_1$
		$w_3(B)$		$T_3 \rightarrow T_1, T_2$	$T_3 \rightarrow (T_1, T_2) \equiv T_3 \rightarrow T_2 \rightarrow T_1$	Cycle Not a V.S.S.

Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

S_2

① Identify the constraints w.r.t. Read from initial DB

T_1	T_2	T_3	Data Item	Transaction that reads the dataitem from initial DB	Other transactions that writes the dataitem	Constraints w.r.t. view equivalent serial schedule
$w_1(A)$		$R_3(B)$				
	$R_2(B)$ $R_2(A)$ $w_2(B)$					
$w_1(B)$			$w_3(B)$			

On Previous Slide

② Identify the constraints w.r.t. Write-Read Seq
(Same as Previous question)

③ Identify the constraints w.r.t. Final-Write (Same as Previous question)

③ Q:- Check whether the following schedule is a view serializable schedule or not, if view serializable schedule then identify all "view equivalent serial schedules"

		S_3
T_1	T_2	
$W_1(A)$		
	$R_2(A)$	
	$W_2(B)$	
$R_1(B)$		

① Constraints w.r.t. read from initial DB: -

A: No constraint ✓

B: No constraint

② Constraints w.r.t. write read reg

A: $T_1 \rightarrow T_2$
(No T_K)

B: $T_2 \rightarrow T_1$
(No T_K)

③ Constraints w.r.t. final write

A: No constraint

B: No constraint

Overall Constraints

$T_1 \rightarrow T_2$
and
 $T_2 \rightarrow T_1$

∴ Cyclic
Hence
Not a V.S.S.
Hence not a
Serializable Schedule



2 mins Summary



Topic

Conflict serializable schedule

Topic

View serializable schedule

THANK - YOU