

CS & IT ENGINEERING

Database Management System

Transaction & Concurrency Control



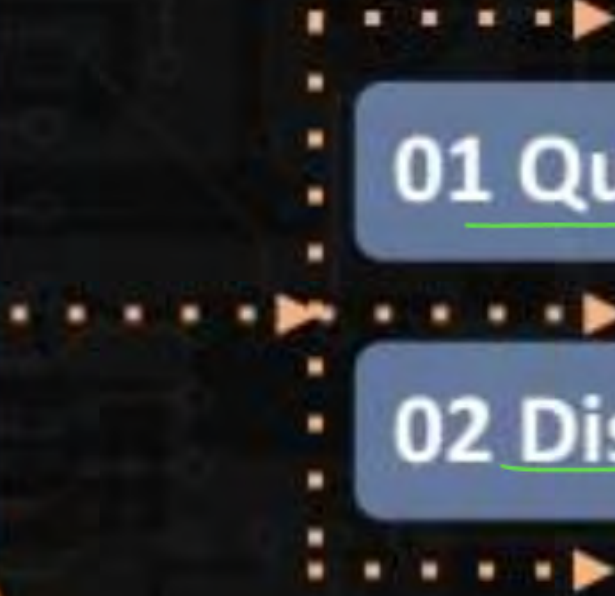
DPP – 01 Discussion Notes



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TOPICS TO BE COVERED



01 Question

02 Discussion

Q.1



Two operations are called conflicting operations, if they satisfy which of the below conditions:

[NAT]

- I: They work on same data item.
- II: Both the operations belong to different transactions.
- III: There exists ^{at least} at most one write operation.

The number of conditions satisfied for conflicting operations is/are 2.

Data Item(Q)

Conflict operation

T_i	T_j
$R(Q)$	$W(Q)$
$W(Q)$	$R(Q)$
$W(Q)$	$W(Q)$

$(i \neq j)$

Conflict Instruction

2

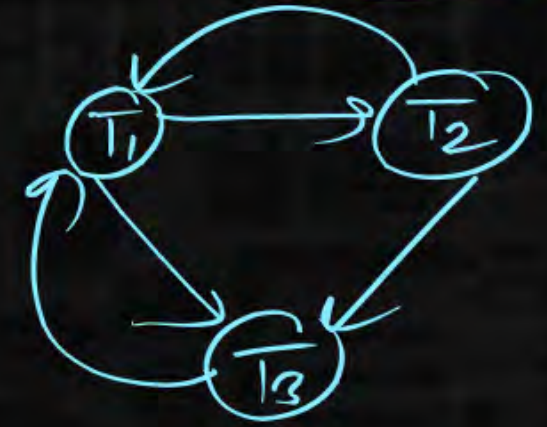
Ans

Q.2

Consider the following schedule S:

T ₁	T ₂	T ₃
R(x)		
	W(x)	
		R(x)
W(x)		W(x)

[MSQ]



Cycle Not Conflict

Choose the correct statements from the following for above schedule S.

S is a conflict serializable schedule.

S is a view serializable schedule.

S is a serializable schedule.

None of the above.

T ₁	T ₂	T ₃
R(x) W(x)		
	W(x)	
		R(x) W(x)

$\text{Ans } (R) \leq (r)$

$\langle T_1 T_2 T_3 \rangle$

- ✓ ① Initial Read
- ✓ ② Final Write
- ✓ ③ Update - Read (Write - Read)

A schedule is serializable either if it is conflict
Serializable (or) view serializable (or) Both.

Conflict Serializable

Testing → Precedence graph method

$G: V, E$

V : Set of Transaction

E : Edge (Arc) from Any $T_i \rightarrow T_j$ if any one of the condition hold

T_i execute		T_j execute
Read(Q)	before	Write(Q)
Write(Q)	before	Read(Q)
Write(Q)	before	Write(Q)

If Precedence Graph Contains Any Cycle then Schedule
is Not Conflict Serializable

View Serializable

for each Data Item

- ① Initial Read
 - ② final Write
 - ③ Updated-Read (Write-Read)
- } Same

3! = 6 Serial Schedule

$\langle T_1 \ T_2 \ T_3 \rangle$

X $\langle T_1 \ T_3 \ T_2 \rangle$

$\langle T_2 \ T_1 \ T_3 \rangle$

X $\langle T_2 \ T_3 \ T_1 \rangle$

$\langle T_3 \ T_1 \ T_2 \rangle$

$\langle T_3 \ T_2 \ T_1 \rangle$

Dummy

Q.3

For the given schedule S below, the number of conflict pairs is/are:

[NAT]

S:

T_1	T_2	T_3
$R(x)$		
	$R(x)$	
		$R(x)$
$W(y)$		
	$W(y)$	
		$W(y)$

Ans(3)

Conflict Operation
Same Data Item

T_i T_j

$R(A)$ $W(A)$

$W(A)$ $R(A)$

$W(A)$ $W(A)$

$W_1(y) - W_2(y)$

$W_1(y) - W_3(y)$

$W_2(y) - W_3(y)$

② $y: T_1 \rightarrow T_2$
 $T_1 \rightarrow T_3$
 $T_2 \rightarrow T_3$

3 conflict operation

Q.4



Suppose many concurrent transactions are made to run over the same data set and the 2nd transaction updates the database before the 1st transaction is finished or completed its execution then which one among the following property is violated and the database is no longer consistent?

[MCQ]

A.

Durability

☒ B.

Isolation

C.

Atomicity

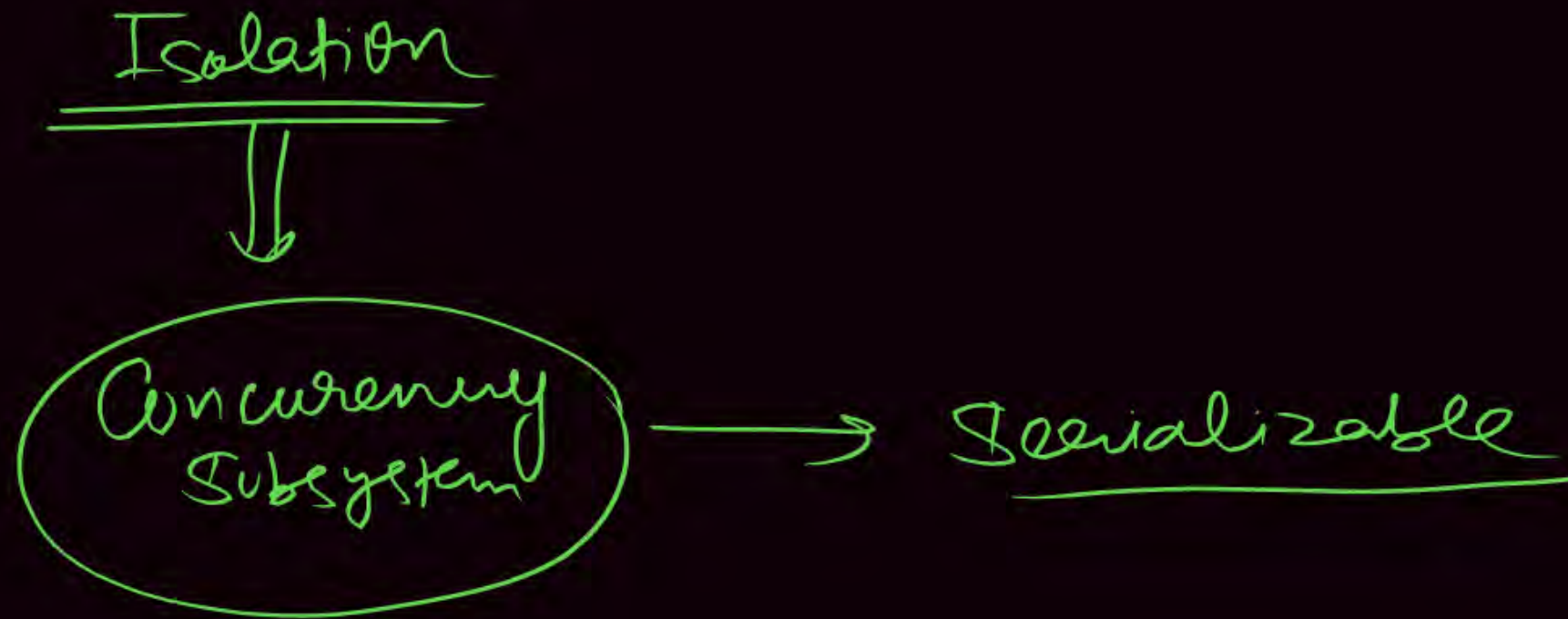
D.

Consistency

When we execute Two (or) More Transaction Concurrently then Isolation Come into the Picture.

↓
Inconsistent (Bcz operating on Same Data Item Concurrently).

Ans (B)



Q.5

Consider the following T_1 and T_2 transactions:

$P = 0$ and $Q = 0$;

T_1 : Read(P);
Read(Q);
If $P = 0$ then $Q = Q + 10$;
write (Q);

T_2 : Read(Q);
Read(P);
If $P = 0$ then $P = P + 15$;
write (P);

The non-serial interleaving of T_1 and T_2 for concurrent execution leads to?
Serializable Schedule

☒ A.

☒ B.

☒ C.

☐ D.

Schedule which is not conflict serializable schedule.

A conflict serializable.

None of these.

Initial Read
P: T_1 & T_2
Q: T_1 & T_2

T_1	T_2
<u>R(P)</u>	
	<u>R(Q)</u>
	<u>R(P)</u>
	<u>W(P)</u>
<u>R(Q)</u>	
<u>W(Q)</u>	



Not View

Not Serializable

Ans(B)

View

T_1	T_2
<u>R(P)</u>	
<u>R(Q)</u>	
<u>W(Q)</u>	
	<u>R(Q)</u>
	<u>R(P)</u>
	<u>W(P)</u>

$\langle T_1, T_2 \rangle$

[MCQ]

T_1	T_2
	<u>R(Q)</u>
	<u>R(P)</u>
	<u>W(P)</u>
<u>R(P)</u>	
<u>R(Q)</u>	
<u>W(Q)</u>	

$\langle T_2, T_1 \rangle$

X (1) Initial Read
Not View

Q.6



Consider the following statements:

S_1 : If a schedule is view serializable then it may not be conflict serializable.

S_2 : If a schedule is conflict serializable then it is also view serializable schedule.

[MCQ]

A.

Only S_1 is true

B.

Only S_2 is true

☒ C.

Both S_1 & S_2 are true

D.

Neither S_1 nor S_2 is true

Ans [C]

S_1

T_1	T_2	T_3
$r(Q)$	$w(Q)$	
$w(Q)$		$w(Q)$

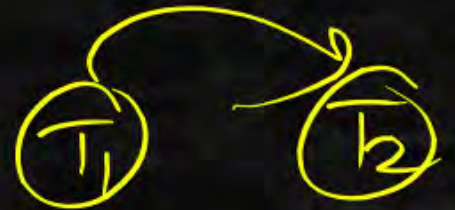


T_2 & T_3
Blind write

View ✓
 $\langle T_1 T_2 T_3 \rangle$

Cycle Not Conflict But this is View serializable $\langle T_1 T_2 T_3 \rangle$

T_1	T_2
$R(A)$ $w(A)$	$R(A)$ $w(A)$
$R(B)$ $w(B)$	$R(B)$ $w(B)$



Conflict serializable

$\langle T_1 T_2 \rangle$

&

View serializable

$\langle T_1 T_2 \rangle$

Q.7

Consider the following log which consists of transactions T_1 , T_2 and T_3 :



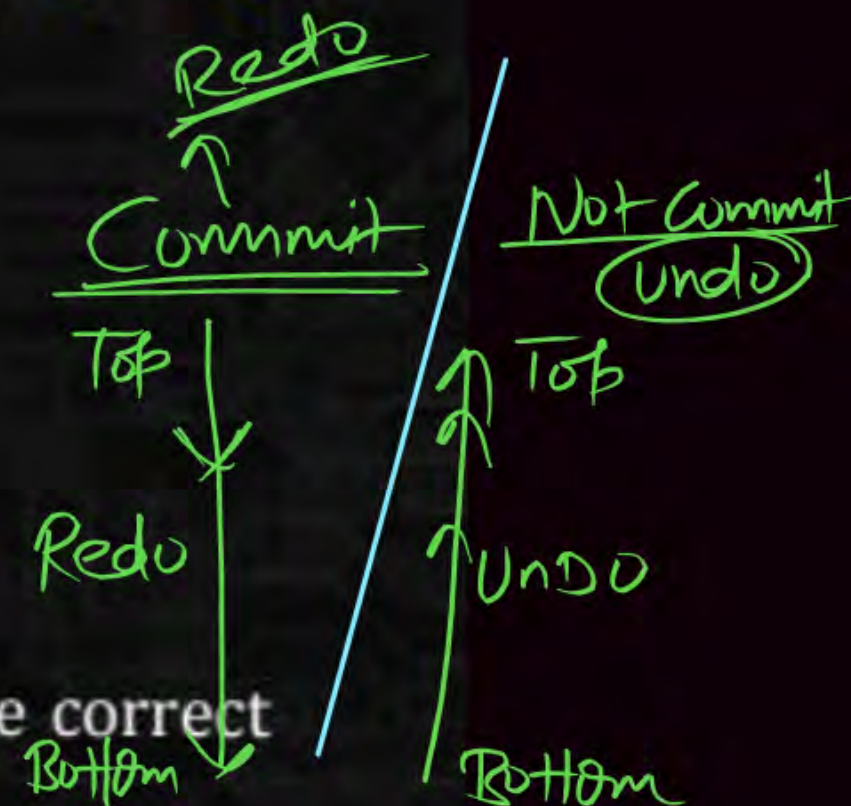
Step	Details of log
1	< T_1 Start>
2	< T_1 , A, 200, 300>
3	< T_1 , A, 600, 500>
4	< T_2 start>
5	< T_1 commit>
6	< T_2 , B, 600, 400>
7	< T_2 commit>
8	< T_3 start>
9	< T_3 , A, 600, 100>

[MCQ]

T_1 Commit
 T_2 Commit

Redo list (T_1 T_2)

Undo list (T_3)



If a crash occurs just after step 9. Which of the following is the correct way for recovery?

Ans [C]

- A. Undo (T_3) then Undo (T_1) then Redo (T_2)
- B. Redo (T_3) then Undo (T_1) then Undo (T_2)
- C. Undo (T_3) then Redo (T_1) then Redo (T_2)
- D. None of these.

Q.8

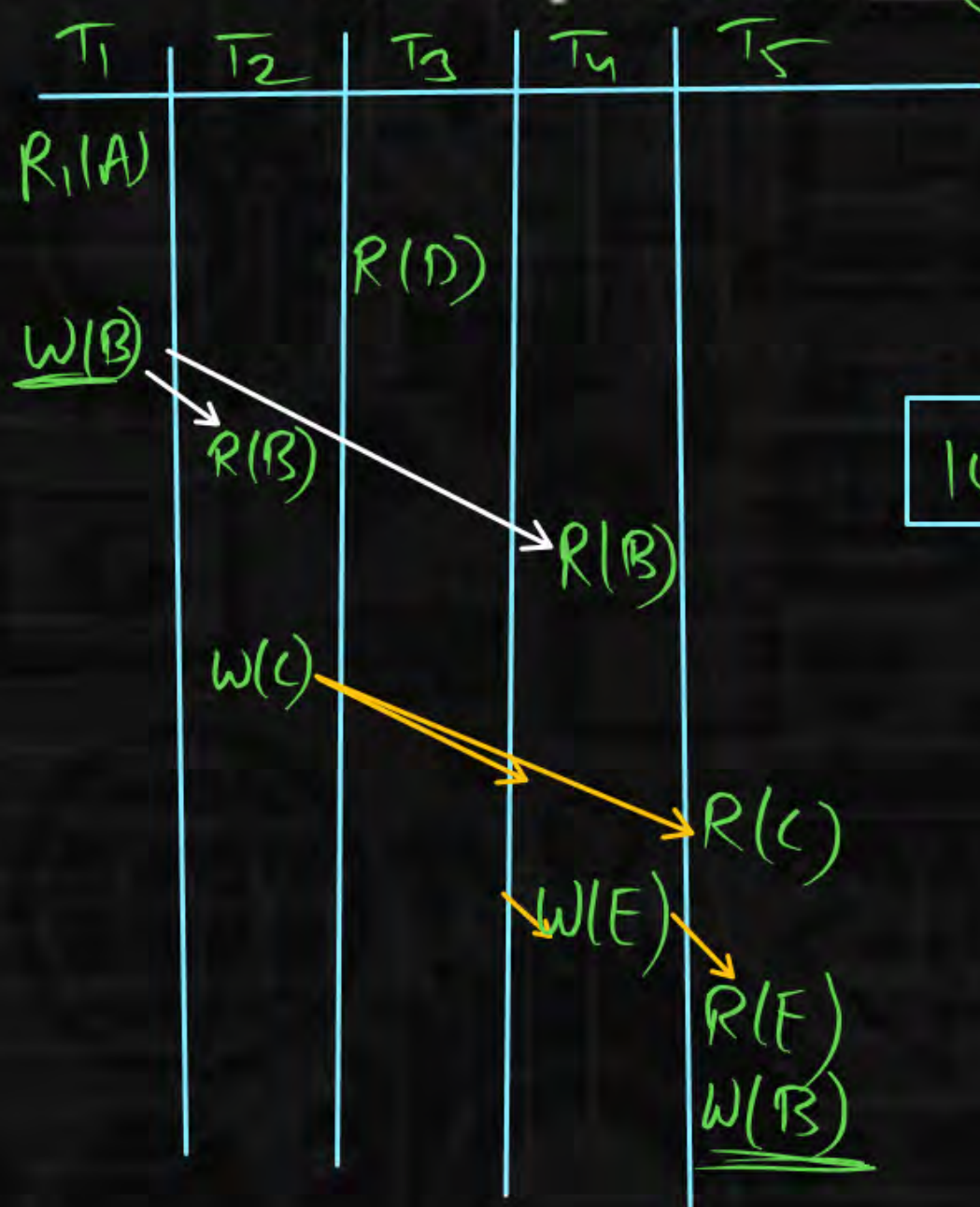


Consider the following schedule

S: $R_1(A)$, $R_3(D)$, $W_1(B)$, $R_2(B)$, $R_4(B)$, $W_2(C)$, $R_5(C)$, $W_4(E)$, $R_5(E)$, $W_5(B)$

How many serial schedules are possible which will be view equal to S? 10.

[NAT]



10 Ans

① Initial Read

A: T_1 D: T_3

② Final Write

On B: T_5 ($T_1 \rightarrow T_5$)

③ Updated Read (Write Read)

B: $W_1(B) \rightarrow R_2(B)$: $T_1 \rightarrow T_2$

$W_1(B) \rightarrow R_4(B)$: $T_1 \rightarrow T_4$

C: $W_2(C) \rightarrow R_5(C)$: $T_2 \rightarrow T_5$

E: $W_4(E) \rightarrow R_5(E)$: $T_4 \rightarrow T_5$

Q.8



Consider the following schedule

S: $R_1(A)$, $R_3(D)$, $W_1(B)$, $R_2(B)$, $R_4(B)$, $W_2(C)$, $R_5(C)$, $W_4(E)$, $R_5(E)$, $W_5(B)$

How many serial schedules are possible which will be view equal to S? _____.

[NAT]

T_1	T_2	T_3	T_4	T_5
$R_1(A)$				
<u>$W_1(B)$</u>		$R_3(D)$		
	$R_2(B)$		$R_4(B)$	
	$W_2(C)$			$R_5(C)$
			$W_4(E)$	$R_5(E)$
				<u>$W_5(B)$</u>

$T_1 \rightarrow T_2 \rightarrow T_5$
 T_4 Appears before (comes before T_5) & T_1 comes before T_4

So

$T_1 \quad T_4 \quad T_2 \quad T_5$

$T_1 \quad T_2 \quad T_4 \quad T_5$

③ Updated Read (write Read)

B: $W_1(B) \rightarrow R_2(B)$: $T_1 \rightarrow T_2$ ✓

$W_1(B) - R_4(B)$: $T_1 \rightarrow T_4$ ✓

C: $W_2(C) - R_5(C)$: $T_2 \rightarrow T_5$ ✓

E: $W_4(E) - R_5(E)$: $T_4 \rightarrow T_5$ ✓

Q.8

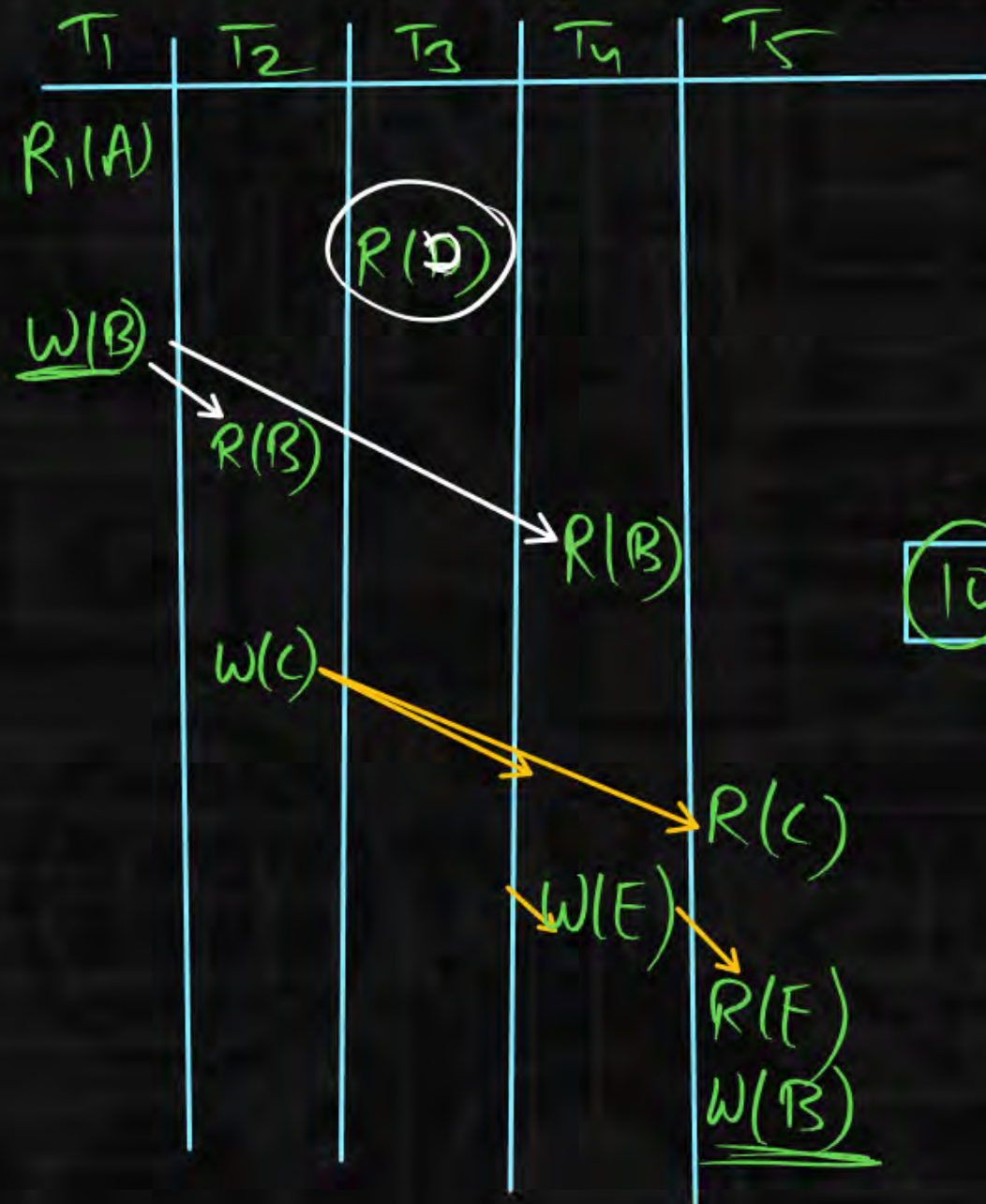


Consider the following schedule

S: $R_1(A)$, $R_3(D)$, $W_1(B)$, $R_2(B)$, $R_4(B)$, $W_2(C)$, $R_5(C)$, $W_4(E)$, $R_5(E)$, $W_5(B)$

How many serial schedules are possible which will be view equal to S? _____.

[NAT]



T_4 Appears before (comes before T_5) & T_1 comes before T_4

So - T_1 - T_4 - T_2 - T_5 -
 - T_1 - T_2 - T_4 - T_5 -

10

T_3 Can be placed Any where

$\uparrow T_1 \uparrow T_4 \uparrow T_2 \uparrow T_5 \uparrow = 5$

$\uparrow T_1 \uparrow T_2 \uparrow T_4 \uparrow T_5 \uparrow = 5$

10

View equivalence

On Each Data Item

- ① Initial Read
- ② final Write
- ③ Updated Read
(Write - Read)

