

task

1. delimiter #
create trigger tri1 after insert on t1 for each row
begin insert into t2(id, name) values (new.id, new.name); end #
2. create trigger tri2 after delete on t1 for each row before delete from t2 where id = old.id; end #
3. create trigger tri3 after insert on t1 for each row begin insert into t3(id, name, event) values (new.id, new.name, 'insert'); end #
4. create trigger tri4 after delete on t1 for each row begin insert into t3(id, name, event) values (old.id, old.name, 'delete'); end #
5. create trigger tri5 after update on t1 for each row begin insert into t3(id, name, event) values (old.id, old.name, 'update'); insert into t3(id, name, event) values (new.id, new.name, 'update'); end #
6. alter table t2 add foreign key (id) references t1(id);
7. create trigger tri6 before delete on t1 for each row begin delete from t2 where id = old.id; end #

$x=1000$

T_1

T_2

Read(x)

$x = x + 100$

if transaction Write(x)

fails here,
the update
will be lost
and hence

x will be
1000.

Read(x)

$x = x + 300$

Write(x)

<Transaction, Variable, Old Value, New Value>

< T_1 , Start>

< T_1 , x , 1000, 1100>

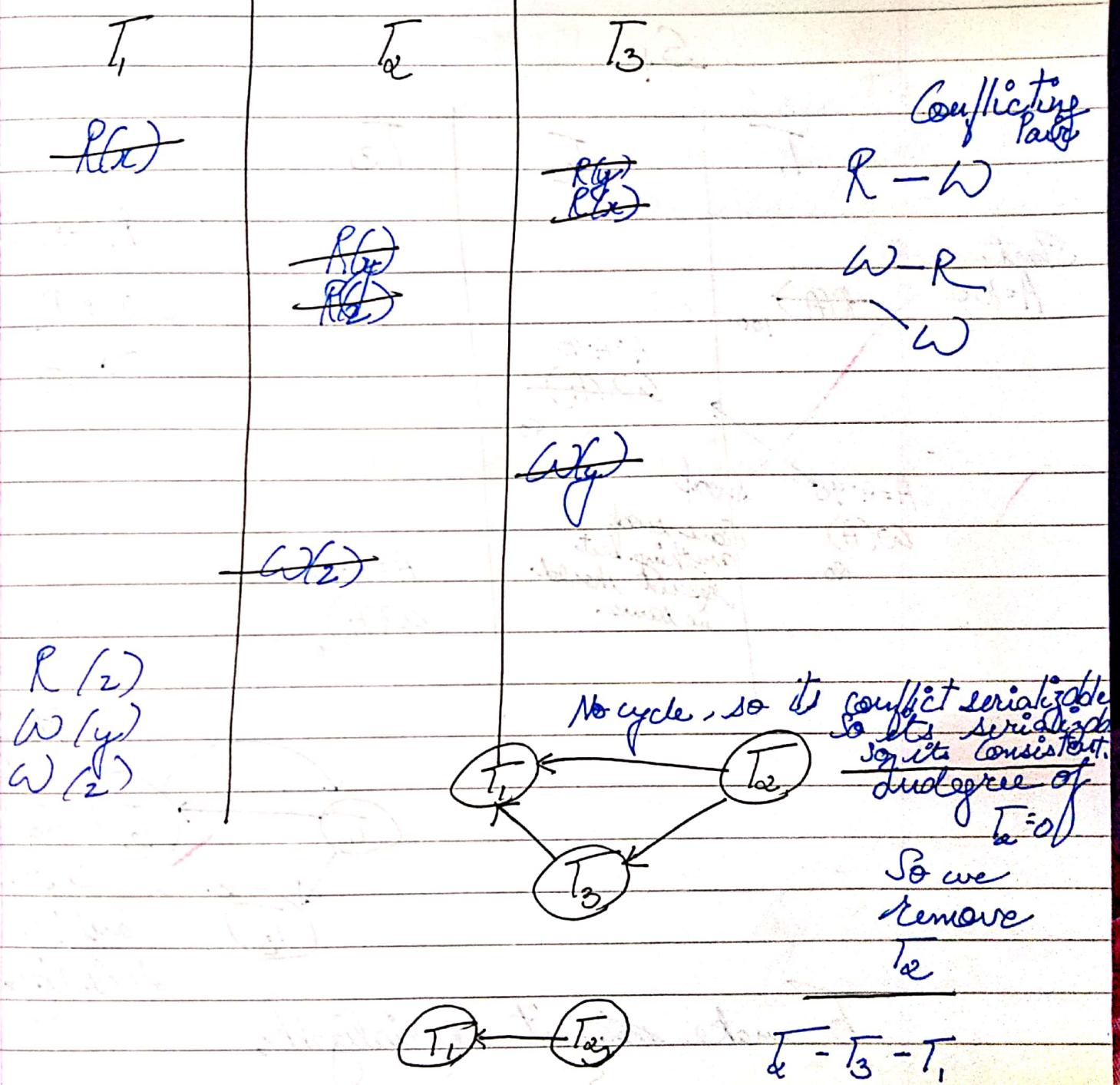
< T_1 , Commit> - means changes written to the disk

< T_2 , Start>

< T_2 , x , 1100, 1400>

< T_2 , Commit>

14 Oct '19:



S_1

T_1	S_2	T_3
<p>Start $A=100$</p> <p>$R(A)$</p> <p>$A=A-40$</p> <p>$w(A)$</p>	<p>100</p> <p>$A=A-40$</p> <p>$w(A)$</p>	<p>60</p> <p>$A=A-20$</p> <p>$w(A)$</p>

$\xrightarrow{\text{swap}}$

can swap
anything but
result should
be same.

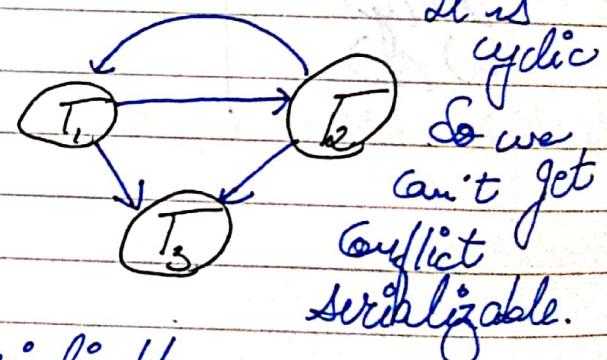
$R \rightarrow \omega$

$\omega \rightarrow R$

$\rightarrow \omega$

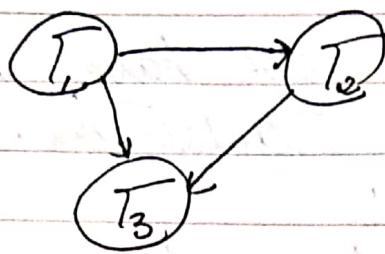
$A=A-20$

$w(A)$



To make it serializable,

T_1	S_2	T_3
<p>$A=100$</p> <p>$R(A)$</p> <p>$A=A-40$</p> <p>$w(A)$</p>	<p>100</p> <p>$A=A-40$</p> <p>$w(A)$</p>	<p>60</p> <p>$A=A-20$</p> <p>$w(A)$</p>



Indegree $T_1 = 0$

No loops.

So, serializable and consistent



S_1 and S_2 are view equivalent.

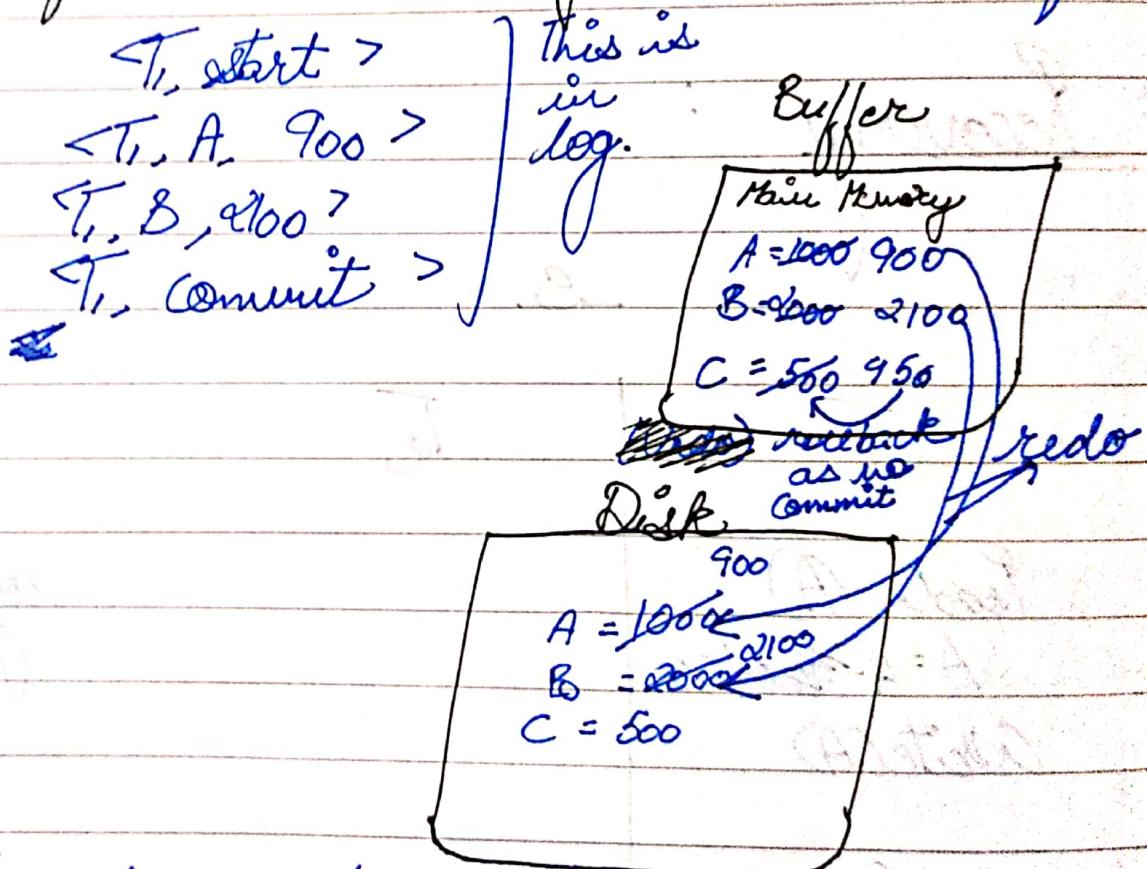
Recovery

T_1	T_2	Immediate Database Recovery
$A = 1000$		
$B = 2000$	Read(A)	$\log \rightarrow$ Transaction Name
$C = 500$	$A = A - 100 / 100$	\rightarrow Variable Name
	Write(A)	\rightarrow Old Value
		\rightarrow New Value
Read(B)		$<T_1, start>$
$B = B + 100$		$<T_1, A, 1000, 900>$
Write(B)		$<T_1, B, 2000, 2100>$
	Read(C)	$<T_1, commit>$
	$C = C - 50$	$<T_2, start>$
	Write(C)	$<T_2, C, 500, 450>$
		$<T_2, commit>$

Timestamp Repairs

- In log - if we have both commit and start for a transaction, we do redo.
- If only start and no commit for a transaction, we do undo.
- This is called as immediate Database Recovery.

In deferred data recovery : Changes after Commit



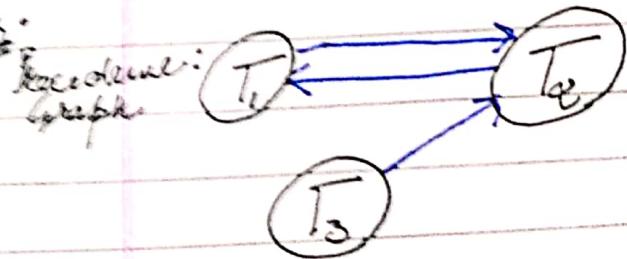
No undo, only redo
 (as we are not storing old value here)

Q. Check whether given schedules is conflict serializable or not?

S: $R_1(A), R_2(A), R_1(B), R_2(B), R_3(B), W_1(A),$
 $W_2(B)$

	S		
	T_1	T_2	T_3
$R(A)$			
$R(B)$		$R(A)$	
$R(B)$			$R(B)$
		$R(B)$	
$W(A)$			
$W(B)$			$R(B)$

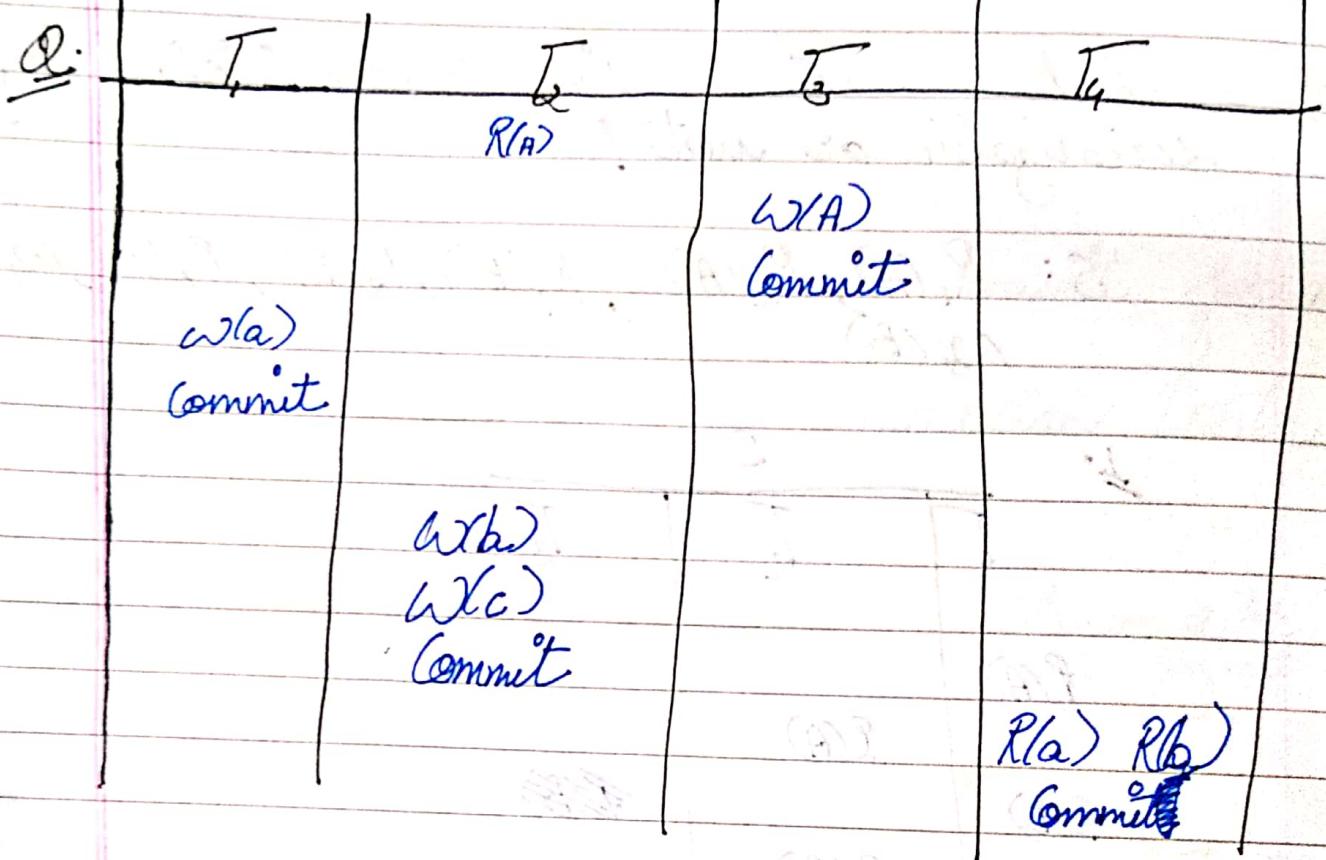
Now check conflict pairs of operation in schedule S.



$$R_1(A) \rightarrow W_1(A) \quad (T_1 \rightarrow T_1)$$

$$R_1(B) \rightarrow W_2(B) \quad (T_1 \rightarrow T_2)$$

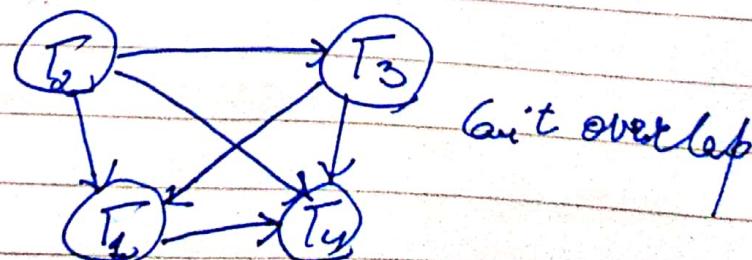
$$R_2(B) \rightarrow W_2(B) \quad (T_3 \rightarrow T_2)$$

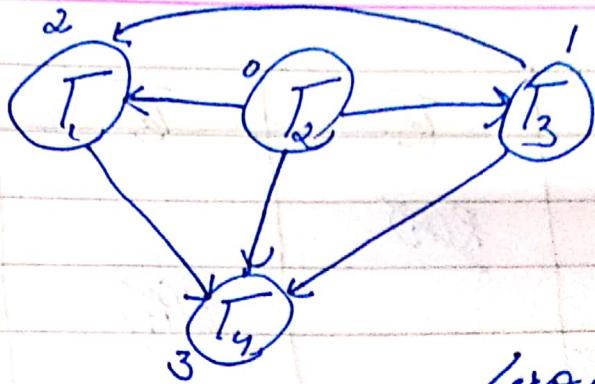


Check conflict pair :

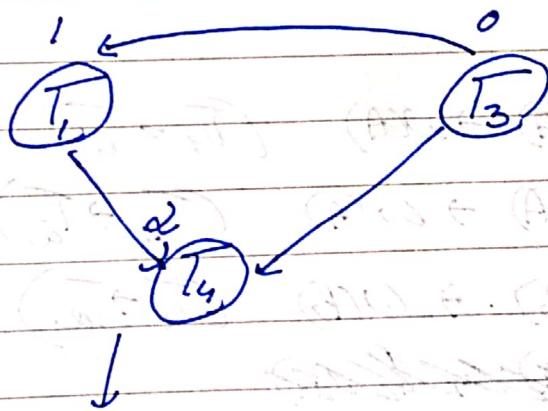
- Conflicting Pair : $R_A \rightarrow w(A)$ ($T_2 \rightarrow T_3$)
 $R_A \rightarrow w(A)$ ($T_a \rightarrow T_1$)
 $w(A) \rightarrow w(A)$ ($T_3 \rightarrow T_1$)
 $w(A) \rightarrow R(A)$ ($T_3 \rightarrow T_4$)
 $w(A) \rightarrow R(A)$ ($T_1 \rightarrow T_4$)
 $w(B) \rightarrow R(B)$ ($T_2 \rightarrow T_4$)

Procedure:
Graph

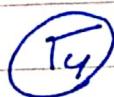


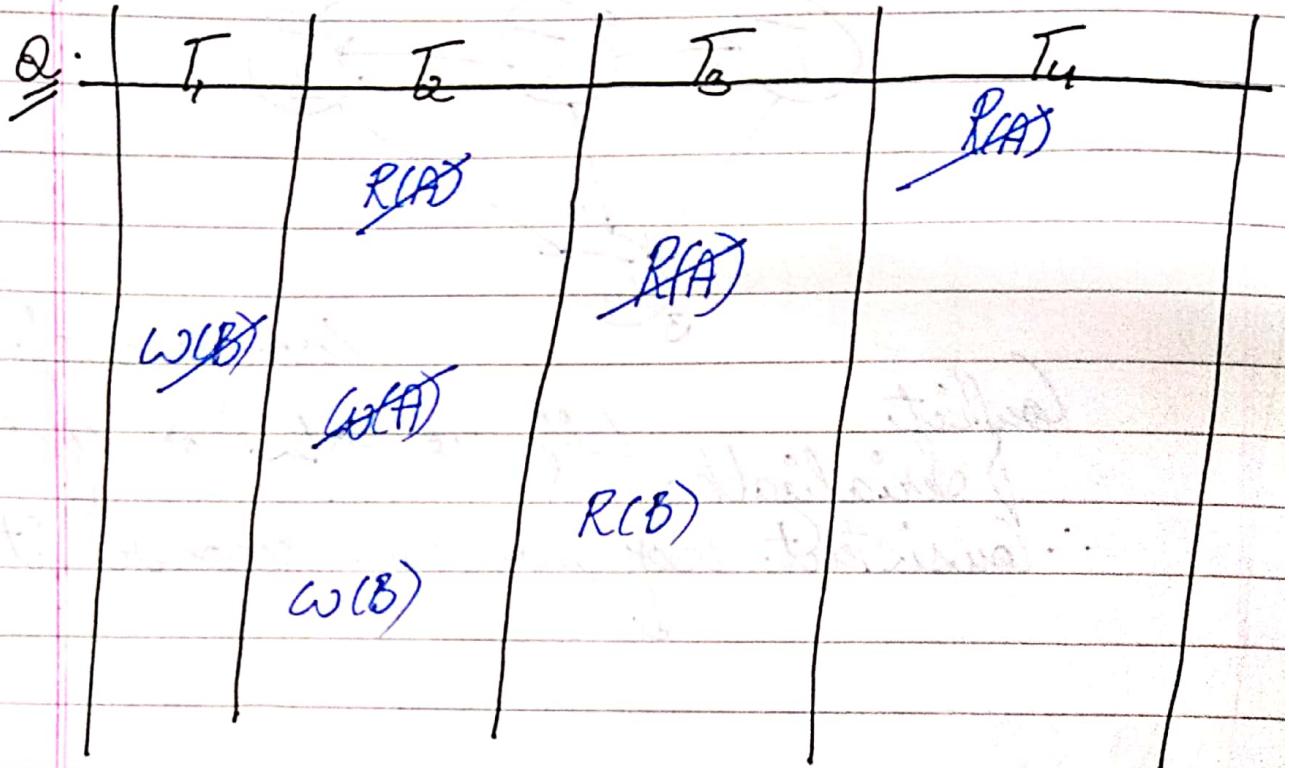


Conflict
Serializable (if no loops or cycles)
Consistent (So, we can recover it)



Order of transaction
 $T_2 - T_3 - T_1 - T_4$





$R(A) \rightarrow W(A)$ ($T_4 \rightarrow T_2$)

$R(A) \rightarrow W(A)$ ($T_3 \rightarrow T_2$)

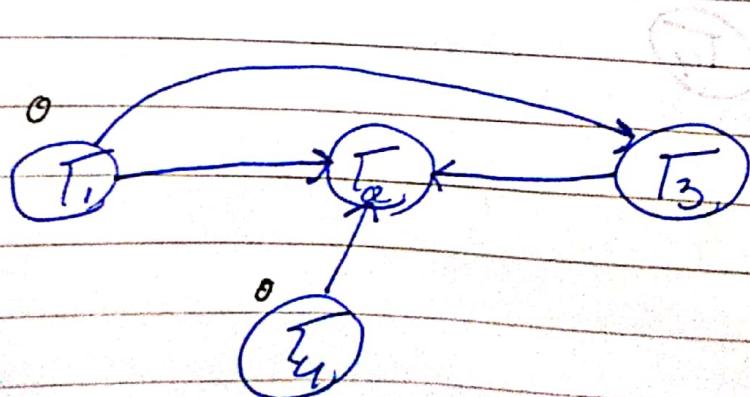
$W(B) \rightarrow W(B)$ ($T_1 \rightarrow T_2$)

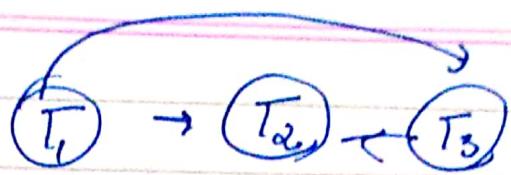
~~$R(A) \rightarrow W(A)$ ($T_4 \rightarrow T_2$)~~

~~$R(A) \rightarrow W(A)$ ($T_3 \rightarrow T_2$)~~

$W(B) \rightarrow R(B)$ ($T_1 \rightarrow T_3$)

$R(B) \rightarrow W(B)$ ($T_3 \rightarrow T_2$)





$\textcircled{1}_2$

$\textcircled{1}_3$

$\textcircled{1}_4 - \textcircled{1}_5$



$T_4 - T_1 - T_3 - T_2$

$\frac{T_1 - T_4 - T_3 - T_2}{T_1 - T_3 - T_4 - T_2}$

Conflict Serializable
and Recovered
3 Eg. Schedule Possible

T_1 T_2 ~~T_3~~

R(A)
 $A = A - 10$

$R(A) \rightarrow W(A) (T_1 \rightarrow T_2)$

$R(A) \rightarrow W(A) (T_2 \rightarrow T_1)$

$W(A) \rightarrow W(A) (T_2 \rightarrow T_1)$

$R(B) \rightarrow W(B)$

R(A)

Temp = 0.2 * A

W(A)

R(B)

Coff

R(B)
 $B = B + 10$
~~W(B)~~

$B = B + T$

$W(B)$