Q1

① S1: let $A = 0$, $B = 0$

$R_1(A) \rightarrow A = 0$

$R_1(B) \rightarrow B = 0$

$W_1(B) \rightarrow B = 1$

$R_2(A) \rightarrow A = 0$

$W_1(A) \rightarrow A = 1$

$W_2(A) \rightarrow A = 2$

$R_2(B) \rightarrow B = 1$

$R_3(A) \rightarrow A = 2$

$W_3(A) \rightarrow A = 3$

$W_2(B) \rightarrow B = 1$

S2: let $x = 0$ & $y = 0$

$R_1(x) - x = 0$

$R_2(y) - y = 0$

$W_1(x) - x = 1$

$R_2(y) - y = 0$

$W_2(y) - y = 1$

$R_3(x) - x = 1$

$W_3(x) - x = 2$

$W_1(y) - y = 1$

S3: let $x = 0$

$R_1(x) - x = 0$

$W_2(x) - x = 2$

$W_1(x) - x = 1$

S4: Let $A \rightarrow 0$, $B \rightarrow 0$

$R_4(A) \rightarrow A = 0$

$R_2(A) \rightarrow A = 0$

$R_3(A) \rightarrow A = 0$

$W_1(B) \rightarrow B = 1$

$W_2(A)$ — $A = 1$
$R_3(B)$ — $B = 1$
$W_2(B)$ — $B = 0$

Not Equivalent

2> S1: Order of conflict
$R_1(A)$, $R_1(B)$, $R_2(A)$, $R_2(B)$, $W_1(B)$, $W_1(A)$, $W_2(A)$, $W_3(A)$, $W_2(B)$

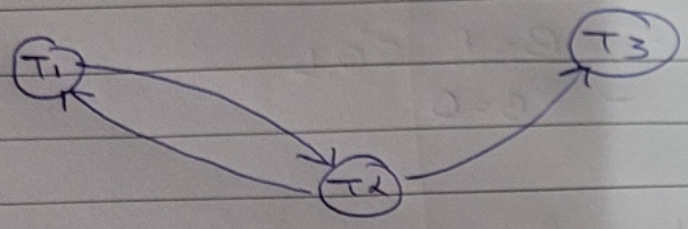
S2: $R_1(x)$, $R_1(y)$, $R_2(y)$, $W_1(x)$, $W_3(x)$, $W_2(y)$, $W_1(y)$

S3: $R_1(x)$, $W_2(x)$, $W_1(x)$

S4: $R_4(A)$, $R_2(A)$, $R_3(A)$, $R_3(B)$, $W_1(B)$, $W_2(A)$, $W_2(B)$

3> S1

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

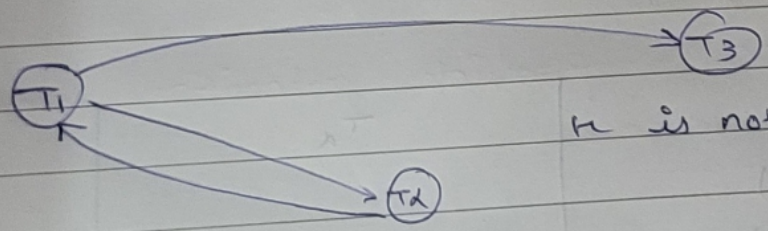


Cycle found

H is Not conflict Serializable

S2

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

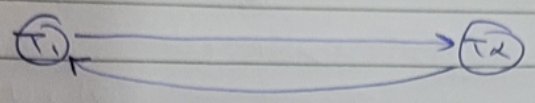


cycle found

H is not conflict ~~non~~ Serializ

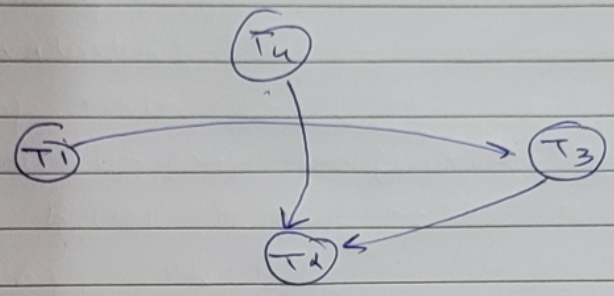
S3

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



cycle found
Non serializable

54



No cycle
HS conflict serialized

Q2

Transaction T1:

logfile for Immidiate Update

2023-07-16 12:05:07 PST: T1: Read P
2023-07-16 12:05:08 PST: T1: write P=100
2023-07-16 12:05:08 PST: T1: Commit

logfile for deferred update

2023-07-16 12:05:07 : T1 : Read P
2023-07-16 12:05:08 : T1 ; Write P=100
2023-07-16 12:05:09 : T1 : Commit

Transaction T2

logfile for Immediate update

2023-07-16 12:05:10 : T2 : Read Q
2023-07-16 12:05:11 PST: T2 : write Q=200
2023-07-16 12:05:12 PST: T2: Commit

logfile for deferred Update

2023-07-16 12:05:10 PST : Read Q
2023-07-16 12:05:11 PST : write Q=200
2023-07-16 12:05:12 PST : Commit

Q3

①

T1	T2	T3
Read (x): 200		
x = x - 150 : 50		
write(x) : 50		
	Read (X) : 50	
	Temp = 0.1 * X : 5	
	X = X - temp : 45	
	write (X) : 45	
		Read (Z) : 20
		Z = Z + 30 : 70
		Write(Z) : 70
Read (Z) : 70		
Z = Z x 2 : 140		
Write(Z) : 140		
	Read (Y) : 10	
	Temp = 2 x Y : 20	
	Y = Y + temp : 30	
	write (Y) : 30	
		Read (Y) : 30
		Y = Y x Y : 900
		write (Y)
Read (Y) : 900		
Y = $\sqrt{Y}$: 30		
write (Y) : 30		

(11)

① Strict two phase locking
Previous transactions T1, T2 & T3 followed by two phase policy

Here A transaction can release a shared lock after the lock point but it cannot release any exclusive lock until the transaction commits

⇒ Advantage
1) Guarentees Serializability
2) Simple to implement
3) Ensure strict data consistancy

⇒ Limitation
1) may lead to unnecessary blocking of transaction reducing concurrency
2) Possibility of deadlock

② Rigorous Two-phase locking
Rigourous 2PL is an extension of strict 2PL where all lock are held until the transaction commits (or) aborts, including both read & write locks

Advantages
① Prevents cascading aborts
② Guarentees strict data consistancy & serializibility

Limitation
May lead to increased locking overhead

Q4

Advantages of NO SQL

① Scalability
NO SQL database are designed to handle large amounts of data and can easily scale horizontally by adding more servers to the database cluster

② Flexibility
NO SQL database offer flexible data models allowing for easy schema modification.

③ Performance
NO SQL database optimize for specific use case providing high read & write throughput

④ Availiability
NO SQL ~~provide~~ prioritize high availiability & fault tolerance.

Limitations of NO SQL

① NoSQL - Databases generally lack the complex Querying functionality of relational databases.

② Lack of ACID transactions.