	Course:	Advance Database Concepts	Course Code:	CS4064
	Program:	BS (Computer Science)	Semester:	Spring 2023
	Date:	Tue 21-Feb-2023	Total Marks:	15
	Section:	BCS-6A		
	Roll No:			
	Quiz:	1 (CCT)		

Q. Consider the following schedule of actions, listed in the order they are submitted to the DBMS:

$$S:\ r_1(X),\ w_2(X),\ w_1(X),\ r_3(X),\ c_1,\ c_2,\ c_3.$$

For each of the following concurrency control mechanisms, describe how the concurrency control mechanism handles the schedule. Assume that the timestamp of transaction T_i is i. For lock-based concurrency control mechanisms, add lock and unlock requests to the above schedule of actions as per the locking protocol. The DBMS processes actions in the order shown. If a transaction is blocked, assume that all its actions are queued until it is resumed; the DBMS continues with the next action (according to the listed schedule) of an unblocked transaction.

1. Rigorous 2PL with timestamps used for deadlock detection (Use wait-for-graph to deal with deadlock)
2. Strict Timestamp Ordering (Assume T1 < T2 < T3)
3. Validation Concurrency Control Technique (Use defer the validation until a later time when the conflicting transactions have finished)

2/+

1 —

T_1	T_2	T_3
$rl_1(X)$		
$r_1(X)$		
	$wl_2(X)$	
	wait for T_1	
$wl_1(X)$ upgrade lock		
		$rl_3(X)$ wait for T_1
$w_1(X)$		
c_1		
$ul_1(X)$ --→	$w_2(X)$ wakeup call	
	c_2	
	$ul_2(X)$	
		$r(X)_3$ wakeup call
		c_3

2 - (STRICT TO)

T_1	T_2	T_3	XWR	XRD
$r_1(x)$				$\{T_1\}$
	$w_2(x)$		$\{T_2\}$	
$w_1(x)$ abort				
restarts later				
		$r_3(x)$ waits for T_2		
	c_2	$\downarrow$ wakeup call		
		$r_3(x)$		$\{T_3\}$
		c_3		

3- T₁:

BV: True (As there are no overlapping transactions

$$FV: \underbrace{\{x\}}_{T1\,(WS)} \cap \underbrace{\{x\}}_{T2,\,T3(RS)} \neq \phi \text{ fails}_{(delay)}$$

T2: BV: True

$$FV: \underbrace{\{x\}}_{T2(WS)} \cap \underbrace{\{x\}}_{T1/T3\,(RS)} \neq \phi \text{ fails}$$

T3: BV: True

$$FV: \underbrace{\{\ \}}_{T3\,(WS)} \cap \underbrace{\{x\}}_{T1/T2\,(RS)} = \phi \text{ True}$$

↳ T3 successfully completed.

But revalidations for T1 ∧ T2:

$$T1: BV: \underbrace{\{x\}}_{T1\,(WS)} \cap \underbrace{\{\ \}}_{T3\,(WS)} = \phi \text{ True}$$
$$FV: \{x\} \cap \underbrace{\{\ \}}_{T2\,(RS)} = \phi \text{ True}$$

T1 completed successfully

$$T2: BV: \underbrace{\{\ \}}_{T2(RS)} \cap \underbrace{\{x\}}_{T1/T2\,(WS)} = \phi \text{ True}$$
$$FV: \underbrace{\{x\}}_{T2\,(WS)} \cap \{\ \} = \phi \text{ True}$$

No active are present

T2 completed successfully