Branch : CSE & IT   Batch : English

Database Management System
Transaction and Concurrency Control

DPP-01

[NAT]

1. Two operations are called conflicting operations, if they satisfy which of the below conditions:
   I: They work on same data item.
   II: Both the operations belong to different transactions.
   III: There exists at most one write operation.
   The number of conditions satisfied for conflicting operations is/are _____.

[MSQ]

2. Consider the following schedule S:

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

Choose the correct statements from the following for above schedule S.
   (a) S is a conflict serializable schedule.
   (b) S is a view serializable schedule.
   (c) S is a serializable schedule.
   (d) None of the above.

[NAT]

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

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

[MCQ]

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.
   (a) Durability   (b) Isolation
   (c) Atomicity   (d) Consistency

[MCQ]

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 (B);
   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
   (a) Serializable Schedule
   (b) Schedule which is not conflict serializable schedule.
   (c) A conflict serializable.
   (d) None of these.

[MCQ]

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.
   (a) Only S_1 is true
   (b) Only S_2 is true
   (c) Both S_1 & S_2 are true
   (c) Neither S_1 nor S_2 is true

[MCQ]

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>

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

(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.

[NAT]

8. Consider the following schedule

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

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

Answer Key

1. (2)
2. (b, c)
3. (3)
4. (b)
5. (b)
6. (c)
7. (c)
8. (10)

Hints & Solutions

1. (2)

Two operations are called conflicting if the below conditions:

I: They work on same data item.

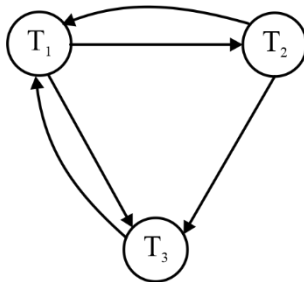II: Both the operations belong to different transactions.

III: There exists one write operation.

Therefore, only two statements are correct.

2. (b, c)

If a schedule S is either conflict serializable or view serializable or both then it is serializable.

I: Checking conflict serializability using precedence graph.

Cycle exists in the precedence graph; therefore, the schedule is not conflict serializable.

II: Checking for view serializability.

Since there is a cycle in the precedence graph and also there exists a blind write by transaction T2 on data item x, so it may or may not be view serializable.

Case 1: Initial read on data item x: $T_1 \rightarrow T_3$

Case 2: Updated write on data item x: $T_2 \rightarrow T_3$

Case 3: Final write on data item x: T_3

By above three cases we can say the serial order:

$T_1 \rightarrow T_2 \rightarrow T_3$

Thus, the schedule S is view serializable and hence serializable.

3. (3)

The conflicting pairs are:

$w_1(y) \rightarrow w_2(y)$

$w_1(y) \rightarrow w_3(y)$

$w_2(y) \rightarrow w_3(y)$

only 3 conflict pairs exist in the given schedule.

4. (b)

Isolation allows the multiple transaction to occur at the same time without impacting each other's execution. The property which first violated is Isolation that result in loss of consistency or result will be incorrect.

5. (b)

T_1:	R(A)	T_2:	R(B)
	R(B)		R(A)
	W(B)		W(A)

$T_1 \rightarrow T_2$: .... W(B) R(B).......

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

- There is no possibility of non-serial schedule which becomes serializable by T_2 followed by T_1 and T_1 followed by T_2

- A serial schedule is always serializable but it is asking about the non-serial schedule.

Hence, option (b) is correct.

6. (c)

S_1**(true):** If a schedule is view serializable then it may not be conflict serializable.

S_2**(true):** If a schedule is conflict serializable then it is also view serializable schedule

7. (c)

- T_1 and T_2 are committed. So, T_1 and T_2 will perform Redo.

- T_3 is not committed. So, T_3 will Perform Undo.

Hence, option (c) is correct.

8. (10)

Given schedule			View Equal
Final Write:			$T_1 \rightarrow T_5$
$B \Rightarrow T_1$	T_5		No restriction
$C \Rightarrow T_2$			
Initial Read:			-
Data item	IR	Write	-
A	T_1	-	

D	T$_3$	-	
Updated Read:			T$_1 \rightarrow$ T$_2$
W$_1$(B) $\rightarrow$ R$_2$(B)			T$_1 \rightarrow$ T$_4$
W$_1$(B) $\rightarrow$ R$_4$(B)			T$_2 \rightarrow$ T$_5$
W$_2$(C) $\rightarrow$ R$_5$(C)			T$_4 \rightarrow$ T$_5$
W$_4$(E) $\rightarrow$ R$_5$(E)			

T$_1 \rightarrow$ T$_2 \rightarrow$ T$_5$

T$_4$ must be before T$_5$ and T$_1$ must be before T$_4$

- T$_1$ T$_4$ T$_2$ T$_5$
- T$_1$ T$_2$ T$_4$ T$_5$

T$_3$ can be anywhere there is no any restriction.

Total possibilities = 5 + 5 = 10

Hence, (10) is correct.