GATE

CS & DA

Database Management System

DPP: 1

Transaction and Concurrency Control

Q1 How many serial schedules can be formed with 4 transactions?

Q2 How many concurrent schedules can be formed with 3 transactions having 4, 3 & 2 operations respectively?

Q3 Consider the following schedule
S: $R_1(A)$; $R_3(A)$; $R_2(A)$; $W_1(B)$; $R_2(B)$; $R_3(A)$; $W_2(C)$; $R_3(C)$ over the transactions T1, T2 & T3.
If transaction T_1 fails just after R_3 (C) by transaction T_3, then which transactions need to be rolled back along with T_1?
(A) T_2
(B) T_3
(C) Both T_2 & T_3
(D) None

Q4 Consider the following transactions:
T_1: W_1 (A); W_1 (B); R_1 (C); C_1;
T_2: W_2 (B); R_2 (B); C_2:
How many schedules of T_1 & T_2 are irrecoverable?

Q5 Two schedules S_1 and S_2 are called conflict equivalent if S_1 can be derived from S_2 by a sequence of swaps of non-conflicting operations.
Consider the two statements:
I → If two schedule are conflict equivalent , then their precedence graphs are identical.
II → If two schedules involve same set of transactions, and their precedence graphs are identical. Then they are conflict equivalent,
(A) Both I & II are correct
(B) Only I is correct
(C) Only II is correct
(D) Neither I nor II is correct

Q6 Which of the following schedules is/are irrecoverable.
(A) $R_1(A)$, R_2 (C), $R_1(C)$, $R_3(A)$, $R_3(B)$, $W_1(A)$, C_1, W_3 (B), C_3, $R_2(B)$, $W_2(C)$, $W_2(B)$, C_2
(B) $R_1(A)$, R_2 (C), $R_1(C)$, $R_3(A)$, $R_3(B)$, $W_1(A)$, $W_3(B)$, $R_2(B)$, $W_2(C)$, $W_2(B)$, C_1, C_2, C_3
(C) $R_1(A)$, R_2 (C), $R_3(A)$, R_1 (C), $R_2(B)$, R_3 (B), $W_1(A)$, C_1, $W_2(C)$, $W_3(B)$, $W_2(B)$, C_3, C_2
(D) All are recoverable

Q7 Which of the following schedules is/are conflict serializable?
(A) $R_1(x)$, $W_1(y)$, $R_2(y)$, $W_2(z)$, $R_3(z)$, $W_3(x)$
(B) $W_3(x)$, $R_1(x)$, $W_1(y)$, $R_2(y)$, $W_2(z)$, $R_3(z)$
(C) $R_1(x)$, $R_2(x)$, $W_1(y)$, $W_2(y)$, $R_1(y)$, $R_2(y)$, $W_2(z)$
(D) $R_1(x)$, R_2 (x), $R_1(y)$, $R_2(y)$, $R_3(x)$, $W_1(x)$,$W_2(y)$

Q8 Consider the following schedule S.

S

T_1	T_2	T_3
$R_1(x)$		
	$R_2(x)$	
		$R_3(y)$
$W_1(x)$		
	$R_2(z)$	
	$R_2(y)$	
	$W_2(y)$	
$W_1(z)$		

Schedule S is conflict equivalent to which of the following serial schedule.
(A) T1 → T3 → T2
(B) T3 → T1 → T2
(C) T3 → T2 → T1
(D) T2 → T1 → T3

Q9 Consider the following schedule S.

S

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

Which of the following options is/are correct?

(A) The schedule is conflict serializable schedule

(B) The schedule is view serializable schedule

(C) T2 → T1 → T3 is conflict equivalent serial schedule to S.

(D) T2 → T1 → T3 is view equivalent serial schedule to S.

Q10 Consider the following schedule S.

S: $R_1(A)$, $W_2(B)$, $R_2(C)$, $W_3(B)$, $W_2(A)$, $W_1(A)$, $R_3(B)$, $R_1(A)$, $R_2(C)$, $R_3(C)$, $W_2(C)$, C_1, C_3, C_2,

Schedule S suffers from which of the following problems?

(A) Irrecoverability

(B) Cascading Roll back

(C) Lost update problem

(D) RW Problem

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Answer Key

Q1	24	Q6	(B)
Q2	1260	Q7	(A)
Q3	(C)	Q8	(C)
Q4	6	Q9	(B, D)
Q5	(B)	Q10	(C, D)

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Hints & Solutions

Q1 Text Solution:

No of serial schedules = 4! = 24

Q2 Text Solution:

No of concurrent schedules = $\frac{9!}{4!\ 3!\ 2!} = 1260$

Q3 Text Solution:

$W_1(B) \rightarrow R_2(B)$

Uncommited dirty read by T_2

So, T_2 rollbacks.

$W_2(C) \rightarrow R_3(C)$

Uncommited dirty read by T_3

So, T_3 roll backs.

Q4 Text Solution:

$W_1(B) \rightarrow R_2(B)$

Uncommited dirty read by T_2

Before this $W_1(A)$ and $W_2(B)$ can be ordered in 2 ways.

Now for remaining part there are 3 possibilities :

$W_1(B)$ $R_1(C)$ C_1

(i) $W_1(B)$ $\boxed{R_2(B) \quad C_2}$ $R_1(c)$ C_1

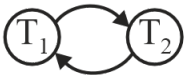
(ii) $W_1(B)$ $\boxed{R_2(B)}$ $R_1(c)$ $\boxed{C_2}$ C_1

(iii) $W_1(B)$ $R_1(c)$ $\boxed{R_2(B) \quad C_2}$ C_1

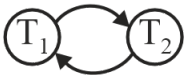
$2 \times 3 = 6$

Q5 Text Solution:

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



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



Same set of transactions,

Same precedence graph,

But not conflict equivalent, as one can not be converted into another.

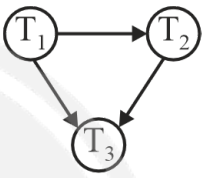
Hence, statement II is incorrect.

Q6 Text Solution:

In option B we have $W_3(B) \rightarrow R_2(B)$, so T2 is doing uncommitted dirty read operation and thus it should commit after T3.

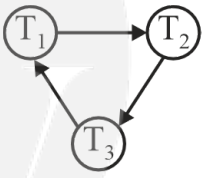
Q7 Text Solution:

(a)



No cycle

(b)

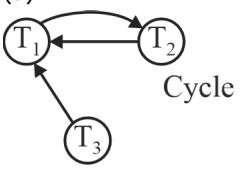


Cycle

(c)

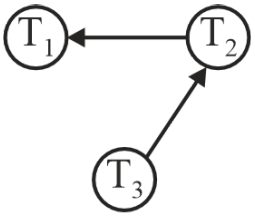
Cycle

(d)



Cycle

Q8 Text Solution:



Q9 Text Solution:

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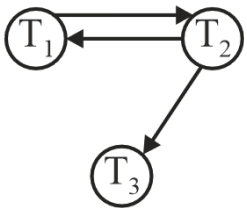

Cycle

Not conflict serializable

Initial read

B: T_2

Updated read

$T_2 \rightarrow T_1$

$T_2 \rightarrow T_3$

Final write

B : T_3

$T_2 \rightarrow T_1 \rightarrow T_3$ is a view equivalent serial schedule to S.

Q10 Text Solution:

T_1	T_2	T_3
R(A)		
	W(B)	
	R(C)	
	W(A)	W(B)
W(A)		
R(A)		R(B)
	R(C)	
	W(C)	R(C)
C_1		C_3
	C_2	

(c) W_2 (A) → W_1 (A)

(d) R_3 (C) → W_2 (C)