

CS143: Database Systems

Homework #7

1. Consider the following schedule:

$$w_3(A)r_1(A)c_3w_1(B)c_1r_2(B)w_2(C)r_4(B)c_2c_4$$

- (a) Is it a serial schedule?
- (b) Is the schedule conflict serializable? If so, what are all the equivalent serial schedules?
- (c) Is the schedule recoverable? If not, can we make it recoverable by moving a single commit operation to a different position?
- (d) Is the schedule cascadeless? If not, can we make it cascadeless by moving a single commit operation to a different position?

ANSWER:

- (a) No! It's NOT a serial schedule because there's a interleaving between transactions.
- (b) Yes! It's conflict serializable.
 - i. switch: $r_1(A), c_3$
 - ii. switch: $r_4(B), c_2$
 - iii. results: $w_3(A)c_3r_1(A)w_1(B)c_1r_2(B)w_2(C)c_2r_4(B)c_4$
- (c) Yes! It's recoverable
 - i. A - $w_3(A)$ is in front of $r_1(A)$, and c_3 is in front of c_1 .
 - ii. B - $w_1(B)$ is in front of $r_2(B)$, and c_1 is in front of c_2 .
B - $w_1(B)$ is in front of $r_4(B)$, and c_1 is in front of c_4 .
- (d) No. We need to move c_3 to the second position to make it cascadeless.

2. Consider the following two transactions.

T1 : UPDATE SET salary = salary + 100 FROM Employee WHERE name = Tony
T2 : UPDATE SET salary = salary - 300 FROM Employee WHERE name = Tony

Assume that the current salary of Tony is 1000. What are the possible salary values of Tony if T_1 's isolation level is **READ UNCOMMITTED** and T_2 's isolation level is **REPEATABLE READ**?

ANSWER:

No tuples are inserted, so we do not have to worry about phantom. No transactions read the same tuple twice, so we do not need to worry about non-repeatable read, either. Given the absence of these two problems, T2 is equivalent to serializable because repeatable read does not allow dirty read. Therefore, all T2's actions will essentially be executed as a "single unit". T1 does not "protect" the value it reads, so the reading and writing may appear separately. Therefore, possible schedules are:

- $r_2(A)w_2(A)r_1(A)w_1(A)$
- $r_1(A)r_2(A)w_2(A)w_1(A)$
- $r_1(A)w_1(A)r_2(A)w_2(A)$

For the first and third schedules, the final value is 800. For the second schedule, the final value is 1100.