CSC 540 SPRING 2019 HOMEWORK 8 SOLUTIONS

Question 1

Consider the following schedule S:
r1(X), w1(Y), r2(Y), w2(Z), w1(X), c1, w2(X), c2
Tell whether S is serial? serializable? recoverable? ACR (avoids cascading rollback)? Then,
indicate which of the following is TRUE about S?

Correct choices

Correct Choice 1:   S is serializable and S is recoverable
Correct Choice 2:   S is serializable and S does not avoid cascading rollback
Correct Choice 3:   S is not serial and S is recoverable
Correct Choice 4:   S is not serial and S does not avoid cascading rollback

Incorrect choices

Incorrect Choice 1:   S is serializable and S is not recoverable
Incorrect Choice 2:   S is serial and S is not recoverable
Incorrect Choice 3:   S is not serializable and S is not recoverable
Incorrect Choice 4:   S is not serial and S is not recoverable
Incorrect Choice 5:   S is serializable and S avoids cascading rollback
Incorrect Choice 6:   S is not serializable and S avoids cascading rollback
Incorrect Choice 7:   S is serial and S avoids cascading rollback
Incorrect Choice 8:   S is not serial and S avoids cascading rollback
Incorrect Choice 9:   S is not serializable and S is recoverable
Incorrect Choice 10:   S is not serializable and S does not avoid cascading rollback
Incorrect Choice 11:   S is serial and S is recoverable
Incorrect Choice 12:   S is serial and S does not avoid cascading rollback

Question Explanation: First, let us remember the relevant definitions:
Serial = all actions of one transaction occur without intervening actions of another transaction.
Serializable = (conflict) equivalent to a serial schedule. Recoverable = Each transaction
commits after all transactions from which it has read has committed. Avoids Cascading Rollback
= Each transaction reads only data written by committed transactions. The present example is
evidently not serial, but it is serializable. The schedule is equivalent to the serial order in which
T1 precedes T2. The only potential conflicts are that T2 reads Y from T1 and also writes X after
T1 does. The schedule is also recoverable. The only case of write-read is that T2 reads the Y

written by T1. But the latter commits before the former. However, the schedule does not avoid cascading rollback. T2 reads Y from T1 before T1 commits.

Question 2

Which of the following schedules is recoverable, but does not avoid cascading rollback and is not serializable?

Correct choices:

Correct Choice 1:   r1(X), w1(Y), r2(X), r2(Y), w1(X), c1, w2(Y), w2(Z), c2
Correct Choice 2:   r1(X), r2(Y), w1(Y), w1(Z), r2(Z), c1, w2(X), w2(Z), c2
Correct Choice 3:   r1(Y), w1(X), r2(X), w2(Z), r2(Y), w1(Z), c1, w2(Y), c2

Incorrect choices:

Incorrect Choice 1:   r1(X), w1(Z), r2(Y), w1(Y), c1, r2(Z), w2(X), w2(Z), c2
Incorrect Choice 2:   r1(Y), w1(X), r2(Y), w2(Z), w1(Z), c1, w2(X), w2(Y), c2
Incorrect Choice 3:   r1(X), r2(X), w1(Y), w1(X), w1(Z), c1, r2(Y), w2(Z), c2
Incorrect Choice 4:   r2(X), r1(X), w2(Y), r2(Z), r1(Y), w2(Z), c2,w1(X), c1
Incorrect Choice 5:   r1(X), w1(Y), r2(X), r1(Z), r2(Y), w1(Z), c1,w2(X), c2
Incorrect Choice 6:   r2(X), r1(X), w1(Z), r2(Z), r1(Y), w1(Y), c1,w2(X), c2
Incorrect Choice 7:   r1(X), r2(X), w2(Y), r2(Z), r1(Y), w1(X), c1,w2(Z), c2
Incorrect Choice 8:   r1(X), r2(X), w1(Y), r2(Y), r1(Z), w2(X), c2,w1(Z), c1
Incorrect Choice 9:   r2(X), r1(X), w1(Z), r2(Z), w2(X), c2, r1(Y), w1(Y), c1

Question 3

Consider the following schedule of operations:

r1(X), r1(Y), w1(Y), r2(Z), w1(X), r3(X), w3(X), w2(Z)

Which of the following schedules is conflict equivalent to this schedule?

Correct choices:

Correct Choice 1:   r1(X), r1(Y), r2(Z), w1(Y), w1(X), r3(X), w2(Z), w3(X)
Correct Choice 2:   r1(X), r1(Y), r2(Z), w1(Y), w2(Z), w1(X), r3(X), w3(X)
Correct Choice 3:   r1(X), r2(Z), r1(Y), w1(Y), w1(X), r3(X), w2(Z), w3(X)

Question 4

Consider the following transaction schedule:

r1(X), r1(Y), w1(Y), r2(Z), w1(X), r2(Y), r3(X), w2(Y), w3(X), w2(Z)

Which of the following is a TRUE statement about this schedule?

Correct choices:

Correct Choice 1:   The schedule is not serial
Correct Choice 2:   The schedule is conflict serializable
Correct Choice 3:   The schedule is conflict-equivalent to (T1, T2, T3)
Correct Choice 4:   The schedule is conflict-equivalent to (T1, T3, T2)

Incorrect choices:

Incorrect Choice 1:   The schedule is not conflict serializable
Incorrect Choice 2:   The schedule is serial
Incorrect Choice 3:   The schedule is conflict-equivalent to (T2, T3, T1)
Incorrect Choice 4:   The schedule is conflict-equivalent to (T3, T1, T2)
Incorrect Choice 5:   The schedule is conflict-equivalent to (T3, T2, T1)
Incorrect Choice 6:   The schedule is conflict-equivalent to (T2, T1, T3)

Question 5

Consider the following transactions:

T1: r1(X), r1(Y), w1(Y)
T2: r2(X), w2(X), r2(Y)

Which of the following is a TRUE statement about schedules involving the operations of T1 and T2?

Correct choices:

Correct Choice 1:   There are exactly 6 schedules that are conflict equivalent to (T1, T2)
Correct Choice 2:   There are exactly 3 schedules that are conflict equivalent to (T2, T1)
Correct Choice 3:   There are exactly 9 conflict-serializable schedules

Incorrect choices:

Incorrect Choice 1:   There are exactly 4 schedules that are conflict equivalent to (T2, T1)
Incorrect Choice 2:   There are exactly 5 schedules that are conflict equivalent to (T2, T1)
Incorrect Choice 3:   There are exactly 4 schedules that are conflict equivalent to (T1, T2)
Incorrect Choice 4:   There are exactly 10 schedules that are conflict equivalent to (T1, T2)
Incorrect Choice 5:   There are exactly 10 conflict-serializable schedules
Incorrect Choice 6:   There are exactly 7 conflict-serializable schedules
Incorrect Choice 7:   There are exactly 8 conflict-serializable schedules