Exercises

(Course: Database Management Systems)

Chapter 4

Introduction to Transaction Processing Concepts and Theory


Which of the following schedules is (conflict) serializable? For each serializable schedule, determine the equivalent serial schedules.

- a. \( r_1(X); r_3(X); w_1(X); r_2(X); w_3(X); \)
- b. \( r_1(X); r_3(X); w_3(X); w_1(X); r_2(X); \)
- c. \( r_3(X); r_2(X); w_3(X); r_1(X); w_1(X); \)
- d. \( r_3(X); r_2(X); r_1(X); w_3(X); w_1(X); \)


Consider the three transactions \( T_1, T_2, \) and \( T_3, \) and the schedules \( S_1 \) and \( S_2 \) given below. Draw the serializability (precedence) graphs for \( S_1 \) and \( S_2, \) and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s).

- \( T_1: r_1(X); r_1(Z); w_1(X); \)
- \( T_2: r_2(Z); r_2(Y); w_2(Z); w_2(Y); \)
- \( T_3: r_3(X); r_3(Y); w_3(Y); \)
- \( S_1: r_1(X); r_2(Z); r_1(Z); r_3(X); r_3(Y); w_1(X); w_3(Y); r_2(Y); w_2(Z); w_2(Y); \)
- \( S_2: r_1(X); r_2(Z); r_1(Z); r_2(Y); r_3(Y); w_1(X); w_2(Z); w_3(Y); w_2(Y); \)

3. Given two following transactions:

- \( T_1: r_1(A); w_1(A); r_1(B); w_1(B); \)
- \( T_2: r_2(A); w_2(A); r_2(B); w_2(B); \)

Prove that the schedule:

- \( S: r_1(A); w_1(A); r_2(A); w_2(A); r_1(B); w_1(B); r_2(B); w_2(B); \)

is conflict-serializable. (Hint: reordering the nonconflicting operations in \( S \) until we form the equivalent serial schedule)

4. Consider the three transactions \( T_1, T_2, \) and \( T_3, \) and the schedules \( S_1 \) and \( S_2 \) given below. Draw the serializability graph for \( S_1 \) and \( S_2, \) and state whether each schedule is conflict-serializable or not. If a schedule is conflict-serializable, write down the equivalent serial schedule.
T\(_1\): r\(_1\)(B); w\(_1\)(B);
T\(_2\): r\(_2\)(A); w\(_2\)(A); r\(_2\)(B); w\(_2\)(B);
T\(_3\): r\(_3\)(A); w\(_3\)(A);
S\(_1\): r\(_2\)(A); r\(_1\)(B); w\(_2\)(A); r\(_3\)(A); w\(_1\)(B); r\(_2\)(B); w\(_2\)(B);
S\(_2\): r\(_2\)(A); r\(_1\)(B); w\(_2\)(A); r\(_2\)(B); r\(_3\)(A); w\(_1\)(B); w\(_3\)(A); w\(_2\)(B);