COM S 461: ASSIGNMENT 5

Objectives:

1. To enhance your understanding of transaction processing.

Questions

1. (20 points): Consider the following actions taken by transaction T1 on database objects X and Y: R(X), W(X), R(Y), W(Y)
   
   (a) Give an example of another transaction T2 that, if run concurrently to transaction T1 without some form of concurrency control, could interfere with T1.
   
   (b) Explain how the use of strict 2PL world prevent interference between two transactions.

2. (30 points): Consider the following classes of schedules: serializable, conflict-serializable, view serializable, recoverable, avoids-cascading-aborts, and strict. For each of the following schedules, state which of the above classes the schedule belongs to. If you cannot decide whether a schedule belongs in a certain class based on the listed actions, briefly explain.

   (a) S1: R(T1(X)) W(T2(X)) W(T1(X)) Abort(T2) Commit(T1)
   
   (b) S2: R(T1(X)) R(T2(X)) W(T1(X)) W(T2(X)) Commit(T2) Commit(T1).

3. (30 points): Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. Draw the serializability graphs for S1 and S2, and state whether each schedule is serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s).

   T1 : R1(X); R1(Z); W1(X);
   T2 : R2(Z); R2(Y); W2(Z); W2(Y);
   T3 : R3(X); R3(Y); W3(Y);

   (a) S1: R1(X); R2(Z); R1(Z); R3(X); R3(Y); W1(X); W3(Y); R2(Y); W2(Z); W2(Y);
   
   (b) S2: R1(X); R2(Z); R3(X); R1(Z); R2(Y); R3(Y); W1(X); W2(Z); W3(Y); W2(Y);

4. (10 points): Prove that strict two-phase locking guarantees strict schedules.

5. (10 points): Prove that the wait-die and wound-wait protocols avoid deadlock and starvation.