Delhi Technological University
Department of Applied Mathematics
MC302- Database Management System

Assignment 3

Q1. Consider a database with two objects *X* and *Y* and two transactions *T1* and *T* 2.
T1 performs the following operations: R(X), R(Y), W(X). *T2* performs the following operations: R(X), R(Y), W(X), W(Y).

i) Give an example schedule with *T1* and *T2* that results in a write-read conflict.
ii) Give an example schedule that results in a read-write conflict.
iii) Give an example schedule that results in a write-write conflict.
iv) For each of the three schedules, show that Strict 2PL disallows the schedule.

Q2. Consider the following classes of schedules: *serializable, conflict-serializable, view-serializable, recoverable, avoids-cascading-aborts,* and *strict*. Classify the below schedules in one of the classes.

The actions are listed in the order they are scheduled and subscripted with the transaction name. If a commit or abort is not shown, the schedule is incomplete; assume that abort or commit must follow all the listed actions.

1. $R_1(X)$, $R_2(X)$, $W_1(X)$, $W_2(X)$
2. $W_1(X)$, $R_2(Y)$, $R_1(Y)$, $R_2(X)$
3. $R_1(X)$, $R_1(Y)$, $W_1(X)$, $R_2(Y)$, $W_3(Y)$, $W_1(X)$, $R_2(Y)$
4. $R_1(X)$, $W_2(X)$, $W_1(X)$, $Abort_2$, $Commit_1$
5. $R_1(X)$, $W_2(X)$, $W_1(X)$, $Commit_2$, $Commit_1$
6. $W_1(X)$, $R_2(X)$, $W_1(X)$, $Commit_2$, $Abort_1$
7. $R_1(X)$, $W_3(X)$, $Commit_3$, $W_1(Y)$, $Commit_1$, $R_2(Y)$, $W_2(Z)$, $Commit_2$
8. $R_1(X)$, $W_2(X)$, $W_1(X)$, $R_3(X)$, $Commit_1$, $Commit_2$, $Commit_3$

Q3. Consider the following lock requests in Table 1. S(.) and X(.) stand for `shared lock' and `exclusive lock', respectively.

Table 1: Lock requests of three transactions: T1, T2, and T3

Time	t1	t2	t3	t4	t5	t6	t7
T1	X(A)						S(C)
T2			S(B)	S(C)		S(A)	
T3		S(C)			X(B)		
LM	G						

i) For the lock requests in Table 1, determine which lock will be granted or blocked by the lock manager. Please write `g' in the LM row to indicate the lock is granted and `b'

to indicate the lock is blocked. For example, in the table, the first lock (X(A) at time t1) is marked as granted.

ii) Give the wait-for graph for the lock requests in Table 1 at time-tick t7.

iii) Determine whether there exists a deadlock in the lock requests in Table 1, and explain why.

Q4. Consider the following lock requests in Table 2.

Table 2: Lock requests of four transactions: T1, T2, T3, and T4

Time	t1	t2	t3	t4	t5	t6	t7	t8
T1	X(B)			S(A)				
T2					X(D)	X(C)		
T3			S(C)				X(B)	
T4		X(A)						S(D)
LM	G							

I) For the lock requests in Table 2, determine which lock request will be granted, blocked or aborted by the lock manager (LM), if it has no deadlock prevention policy. Please write `g' for grant, `b' for block and `a' for abort; for `abort', specify which transaction is aborted - e.g., `a' (T1 is aborted) An example is given in for time-tick t1.

II) Give the wait-for graph for the lock requests in Table 2. Determine whether there exists a deadlock in the lock requests in Table 2 under LM, and explain why.

III) To prevent deadlock, we use a lock manager (LM) that adopts the Wait-Die policy. We assume the four transactions have priority: T1 < T2 <T3 < T4. Determine which lock request will be granted (`g'), blocked (`b') or aborted (`a').

IV) In this question, we use a lock manager (LM) that adopts the Wound-Wait policy. We assume the four transactions have priority: T1 < T2 <T3 < T4. Determine which lock request will be granted (`g'), blocked (`b') or aborted (`a'); for `abort'.

Q5. Perform the following operations in B Tree and B+ tree

The trees can hold up to 4 pointers and 3 keys

a) Insert 1,3,5,7,9,2,4,6,8,10
b) Delete 9,7,8

Q6. Hash the following elements using extendible hashing: **1, 40, 61, 2, 4, 15, 30, 17, 9, 20, 26.**

Assumptions:

i) Bucket Size: 3

ii) Suppose the global depth is X. Then the Hash Function returns X least significant bits.

Hint:

i) Calculate the binary form of each of the numbers
ii) Initially, the local and global depth is 1.

Q7. Answer the following questions in context of static hashing.

a) Define static hashing.
b) Most common hashing functions used.
c) In case of collision, discuss the common collision resolution techniques
d) Differentiate between static hashing and dynamic hashing