Quiz5 (Solution)
Database Systems
CE 373/ CS 355 (L2)

Fall 2023

Student Name: _____   **Student ID:** _____

Question 1 (2 points)

Assume that the database locations A and B store the balances of two bank accounts. Consider the following code for transaction T1 (using the notations discussed in class) that transfers Rs.100 between two accounts:

Read(A)
A = A -100
Write(A)
Read(B)
B = B + 100
Write(B)
Send_Email_Confirmation()
Commit( )

Does this code violate any of the ACID properties of a transaction. If there is a violation, identity the property that is being violated.

Solution:
    Yes, atomicity property is being violated because of an external observable write before the transaction has been committed. If there is failure after send the email, it cannot be reversed.

Question 2 (3 points)

Consider three transactions: T1, T2, T3.
  a.) If the execution schedule of these transaction is the serial schedule [T1, T3, T2], can this execution schedule violate the isolation property of a transaction. (Yes / **No**)
  b.) If the precedence graph of a concurrent execution schedule of these transactions includes the edge T1→ T3, can the following be a conflict-equivalent serial schedule: [T2,T3,T1] (Yes / **No**)
  c.) A serializable transaction schedule is always a recoverable schedule (True / **False**)

Question 3 (2 points)

Consider the following two transactions: T1, T2. Assume that through the *lock-X(A)* instruction, a transaction can obtain an exclusive-mode lock on data item A such that no other transaction can read/write A until the original transaction executes the *unlock-X(A)* instruction. Add the *lock-X* and *unlock-X* instructions to T1 and T2 so that they observe the two-phase locking protocol.

T1(Without locks)	T2 (Without Locks)	T1(With Locks)	T2(With Locks)
Read(A)	Read(A)	Lock-X(A)	Lock-X(A)
Read(B)	Read(S)	Read(A)	Read(A)
Read(C)	Read(T)	Lock-S(B)	Lock-S(S)
A=B+C	A=S+T	Read(B)	Read(S)
Write(A)	Write(A)	Lock-S(C)	Lock-S(T)
		Read(C)	Read(T)
		A=B+C	A=S+T
		Write(A)	Write(A)
		Unlock-X(A)	Unlock-X(A)
		Unlock-S(B)	Unlock-S(S)
		Unlock-S(C)	Unlock-S(T)

Question 4 (3 points)

Consider the following sequential file for the Player relation in a database.

ID	Name	Category	PSL Team
10	Abdullah	Batter	Lahore
9	Shan	Batter	Multan
2	Babar	Batter	Peshawar
1	Rizwan	Wicketkeeper	Multan
3	Sarfaraz	Wicketkeeper	Quetta
8	Faheem	AllRounder	Islamabad
4	Shaheen	Bowler	Lahore
5	Haris	Bowler	Lahore

a.) If a dense index file is created using Category as the search key, how many rows/entries will that index file contain. (4)

b.) If an index file is created using the PSL Team as the search key, will this index be clustering index? (Yes / **No**)

c.) If you were allowed to create only a sparse index (due to storage space restrictions), what search key will you choose. Justify your answer.
Solution: Sparse index can only be a clustering index. Since the database file is not ordered by any attribute. No attribute will be appropriate as a search key in this scenario.