 **National University of Computer & Emerging Sciences, Karachi** 

**Fall-2024 School of Computing (BSCS, BSSE, BSCY, BSAI)**

# Assignment # 04

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| **Subject: Database Systems -CS2005 Post Date: 20/11/2024**  **Total Marks: 50 Due Date: 08**/12/2024 |
| **Course Instructors: Dr. Zulfiqar, Dr. Anam Qureshi, Omer Qureshi, Basit Jasani, Abeer**  **Gauher, Atiya Jokiyo, Fizza Aqeel, Javeria Farooq, Zain Noreen, Alina Arshad** |

**Instructions to be strictly followed.**



* It should be obvious that submitting your work after the due date will result in zero points being awarded.
* Plagiarism (copying/cheating) and late submissions result in a zero mark.

**Question #01: Marks /10**

The following schedules are given: Check whether each of these schedules are conflict serializable and view serializable.

1. **S1: R1(A), R2(A), R3(A), R4(A), W1(A), W2(A), W3(A), W4(A)**
2. **S2: R1(A), R2(A), W3(A), W1(A)**
3. **S3: R1(A), R2(A), W1(A), W2(A), R1(B), R2(B), W1(B), W2(B)**

**Question #02: Marks /10**

Consider a database table Accounts with columns Account\_ID and Balance. The following transactions, T1 and T2, are meant to adjust the balance of an account based on its current value.

The interleaving of operations between T1 and T2 happens as follows:

1. T1 reads the current Balance (initially 500).
2. T2 reads the current Balance (initially 500).
3. T1 adds 100 to the balance, calculating it as 600.
4. T2 subtracts 50 from the balance, calculating it as 450.
5. T1 writes 600 back to Balance.
6. T2 writes 450 back to Balance.
7. Identify the Type of Problem(s): What concurrency issues are present in this scenario? Explain how they arise and what consequences they might have.
8. What is the final Balance of Account\_ID after both transactions complete?
9. How does this result differ from the correct, serial outcome?

**Question #03: Marks /10**

Consider two schedules, S1 and S2, involving two transactions, T1 and T2, on the same data items X and Y. The operations are as follows:

**Schedule S1**

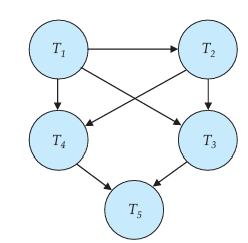
T1: Read(X) T2: Read(X) T1: Write(X) T2: Write(X) T1: Read(Y) T2: Write(Y)

**Schedule S2**

T1: Read(X) T1: Write(X) T2: Read(X) T2: Write(X) T1: Read(Y) T2: Write(Y)

1. List the conflicting operations in S1 and S2.
2. Determine if S1 and S2 are conflict equivalent. Justify your answer by comparing the order of conflicting operations in both schedules.
3. If S1 and S2 are conflict equivalent, state whether they are also conflict serializable. If they are not equivalent, explain how a serializable schedule can be derived from either of them.

**Question #04: Marks /10**

Consider the given precedence graph. Is the corresponding schedule conflict serializable? Explain your answer.

**Question #05: Marks /10**

The definition of a schedule assumes that operations can be totally ordered by time. Consider a database management system that runs on a system with multiple processors, where it is not always possible to establish an exact ordering between operations that are executed on different processors. However, operations on a data item can be totally ordered. Does the above situation cause any problem for the definition of conflict serializability? Explain your answer.