CSC 370

Quiz:
SQL and Transactions

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Questions

1. (1 point) Match each of the four ACID properties with the scenario that most clearly violates it more than it violates any other properties.

_____ Atomicity
_____ Consistency
_____ Isolation
_____ Durability

1. As one transaction executes, it reads the intermediate results of another partially completed transaction.

2. After a hard drive failure, the database must be restored from a back-up made prior to the most recent committed transaction.

3. A transaction is delayed because another transaction is currently executing.

4. The power goes off in the middle of a transaction and none of the changes from the transaction are visible in the database once the power returns.

5. A transaction commits a negative value for the *age* attribute of a tuple what has a check constraint to restrict values to the range [0,110].

6. Two identical read-only transactions produce different results.

7. A transaction in a financial database creates a new loan for a client without making an equal deposit into that client's account.

8. One transaction reads a value written by another transaction before the latter was rolled back.

2. (1 point) Below you are given queries expressed both in plain English and in SQL. Indicate which ones match, even if the SQL query could be expressed simpler. All queries use the following schema:

Person(v_number, name, favourite_colour) Student(v_number, major)
Instructor(v_number, specialisation) Teaches(instructor, crn, semester)
EnrolledIn(student, crn, semester, grade)

□ Provide the name of every unique person who is enrolled in at least three courses...

```
SELECT Name
FROM Person
    JOIN EnrolledIn
        ON (student = v_number)
GROUP BY v_number
HAVING COUNT(*) >= 3;
```

□ Retrieve all students, together with the highest grade they have received in any class so far...

```
SELECT Student.*, MAX(grade) AS top_grade
    FROM Student
        JOIN Class
            ON (v_number = student)
    GROUP BY student;
```

□ Retrieve all students whose favourite colour is a shade of blue...

```
SELECT *
FROM Person
WHERE favourite_colour = 'a shade of blue';
```

□ Indicate the names of all instructors who are teaching the same course in the same semester as somebody else (i.e., co-teaching)...

```
SELECT name
FROM Person
    JOIN Teaches AS T1
        ON (v_number = T1.instructor)
    JOIN Teaches AS T2
        ON (T1.crn = T2.crn
        AND T1.semester = T2.semester)
WHERE T2.instructor <> v_number;
```

□ Find the student who has taken the same course the most number of times...

```
SELECT student
FROM EnrolledIn
GROUP BY crn
ORDER BY COUNT(*)
LIMIT 1;
```

3. (1 point) Below are constraints expressed first in relational algebra, then in SQL. Indicate which ones match.

□ $\pi_x(R) \subseteq \pi_y(S)$

```
ALTER TABLE R
ADD CONSTRAINT fk_rx_sy
FOREIGN KEY(x)
REFERENCES S(y);
```

□ Assuming that S.id is already a primary key:

$$\rho_{S1}(S) \bowtie_{S1.id<>S2.id \wedge S1.x=S2.x} \rho_{S2}(S) = \emptyset$$

```
ALTER TABLE S
MODIFY x INT UNIQUE;
```

□ $\sigma_{x>1000}(R) = \emptyset$

```
ALTER TABLE R
MODIFY x INT CHECK(x<=1000);
```

□ $\sigma_{study\_year>age}(Student) = \emptyset$

```
ALTER TABLE Student
MODIFY study_year INT CHECK(study_year <= age);
```

Answer Key

Question 1

__**7**__ Atomicity
__**5**__ Consistency
__**8**__ Isolation
__**2**__ Durability

Question 2

Provide the name of every unique person who is enrolled in at least three courses...

Indicate the names of all instructors who are teaching the same course in the same semester as somebody else (i.e., co-teaching)...

Question 3

$\pi_x(R) \subseteq \pi_y(S)$

$\rho_{S1}(S) \bowtie_{S1.id<>S2.id \wedge S1.x=S2.x} \rho_{S2}(S) = \emptyset$

$\sigma_{x>1000}(R) = \emptyset$

Feedback: The relational algebra expression does, indeed, represent a referenctial integrity constraint.