Introduction to Databases, ITU, Fall 2004

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November 3, 2004

Exercises on November 12

You are unlikely to be able to do all the exercises in two hours. Therefore you are encouraged to prepare at home, and use the exercises for those parts you find difficult.

1. Suppose that user A has an empty relation `Primes (p INT)`. Then user A and B issue the below statements, in this order. The start and end of transactions are indicated by horizontal lines.

```
A                                 B
SELECT * FROM Primes;
                                  SELECT * FROM A.Primes;

INSERT INTO Primes VALUES (2);
                                  INSERT INTO A.Primes VALUES (3);

SELECT * FROM Primes;
                                  SELECT * FROM A.Primes;

DELETE FROM Primes WHERE p=3;
                                  DELETE FROM Primes WHERE p=2;

SELECT * FROM Primes;
                                  SELECT * FROM A.Primes;

COMMIT;
------------------------------
SELECT * FROM Primes;
                                  SELECT * FROM A.Primes;
                                  COMMIT;
                                  --------------------------------
SELECT * FROM Primes;
                                  SELECT * FROM A.Primes;
```

- Explain what may be seen by user A and user B for each of the three SQL isolation levels `READ COMMITTED`, `REPEATABLE READ`, and `SERIALIZABLE`.

- Try it out in Oracle at isolation levels `READ COMMITTED` and `SERIALIZABLE`. The transactions may be carried out by two different users, or by two different connections to the database.

- What state would the database be in after each of the possible serial schedules for the transactions?

- What happens if the transactions run at different isolation levels?

2. Explain what class of XML documents is described by the following DTD (adapted from "The XML Revolution" by Møller and Schwartzbach), and give an example of an XML document falling into this class:

```
<!ELEMENT collection (recipe*)>
<!ELEMENT recipe (title,ingredient*,preparation,comment?,nutrition)>
<!ELEMENT title (#PCDATA)>
<!ELEMENT ingredient (ingredient*,preparation)?>
<!ATTLIST ingredient name CDATA #REQUIRED
                     amount CDATA #IMPLIED>
<!ELEMENT preparation (step*)>
<!ELEMENT step (#PCDATA)>
<!ELEMENT comment (#PCDATA)>
<!ELEMENT nutrition EMPTY>
<!ATTLIST nutrition fat CDATA #IMPLIED
                    calories CDATA #REQUIRED>
```

3. Explain what class of XML documents is described by the following XML Schema (adapted from "The XML Revolution" by Møller and Schwartzbach), and give an example of an XML document falling into this class::

```
<schema xmlns="http://www.w3.org/2001/XMLSchema">
  <element name="card" type="card_type"/>
  <element name="name" type="string"/>
  <element name="title" type="string"/>
  <element name="phone" type="nonNegativeInteger"/>
  <element name="logo" type="logo_type"/>

  <complexType name="card_type">
    <sequence>
      <element ref="name"/>
      <element ref="title" maxOccurs="unbounded"/>
      <element ref="phone" minOccurs="0"/>
      <element ref="logo" minOccurs="0"/>
    </sequence>
  </complexType>

  <complexType name="logo_type">
    <attribute name="url" type="anyURI"/>
  </complexType>
</schema>
```

To be handed in no later than November 19, 1 PM:

- Problem 6 from the exam, January 2004, available on the course home page under "useful links", or directly at: http://www.itu.dk/people/pagh/IDB04/exam.pdf, **and**

- Problem 5 from the trial exam, December 2003, available on the course home page under "useful links", or directly at: http://www.itu.dk/people/pagh/IDB04/trialexam.pdf