

Two hours - online

The exam will be taken on line.
This paper version is made available as a backup
In this event, only MCQ answers written in the boxes on the exam paper will be marked.

EXAM PAPER MUST NOT BE REMOVED FROM THE EXAM ROOM

**UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE**

Modelling Data on the Web

Date: Wednesday 17th January 2018

Time: 14:00 - 16:00

Please answer all Questions.

The running example provided as a print out is to be used in conjunction with the online exam and is provided for students to make notes only. This will NOT be marked.

This is a CLOSED book examination

The use of electronic calculators is NOT permitted

*Q1 – Q21 contain
Multiple Choice
Questions and are
restricted*

22. In 4-5 sentences, describe the relation between an XML document and its internal representation. This description should include

- elements and structure,
- the processes by which this relation is realised computationally,
- conditions these processes may rely on, and
- other documents that may influence these processes.

(6 marks)

23. Sketch out a *partial* RelaxNG schema for XML-based format for recording simplified data as exemplified by the document below (which you have seen in earlier questions). By *partial* RelaxNG schema we mean that your schema should not describe the content prescriptions elements (i.e., no need to write `prescriptionsE = element prescriptions ... or anything for the descendants of prescriptions`) and that we will ignore minor syntax errors.

```
<?xml version="1.0" encoding="UTF-8"?>
<patients>
  <patient FirstName="Bob" LastName="Builder" age="19">
    <history>
      <disease code="Diabetes" timeOfDiagnosis="2016-03-03"/>
    </history>
    <prescriptions>
      <prescription date="2016-03-03">
        <medicin name="Insulin" dosage="on demand"/>
        <medicin name="Aspirin" dosage="daily"/>
      </prescription>
    </prescriptions>
  </patient>
  <patient FirstName="Hilary" LastName="Bolder" age="29">
    <history>
      <accident code="SprainedAnkle" timeOfDiagnosis="2016-02-10"/>
      <disease code="Diabetes" timeOfDiagnosis="2016-04-28"/>
    </history>
    <prescriptions>
      <prescription date="2016-04-28">
        <medicin name="Insulin" dosage="daily"/>
      </prescription>
      <prescription date="2016-02-10">
        <medicin name="Aspirin" dosage="daily"/>
        <treatment name="PhysioTherapy" dosage="daily"/>
        <medicin name="Paracetamol" dosage="on demand"/>
      </prescription>
    </prescriptions>
  </patient>
  <patient FirstName="Bill" LastName="Pooter">
    <history>
      <disease code="Back Pain" timeOfDiagnosis="2016-11-03"/>
      <disease code="Joint Pain" timeOfDiagnosis="2016-11-03"/>
    </history>
    <prescriptions/>
  </patient>
  <patient FirstName="Mary" LastName="Smiley" age="73">
    <history/>
    <prescriptions>
      <prescription date="2016-07-27">
        <medicin name="Aspirin" dosage="daily"/>
      </prescription>
    </prescriptions>
  </patient>
</patients>
```

(4 marks)

24. Consider a (strongly simplified) application where doctors use the format used in the example document below (which you have seen in earlier questions) to record information about their patients, their illnesses, and the medication they take. In 3-5 sentences, describe a suitable validation strategy for this format, focusing on how you would handle the following two constraints:

- the dosage of a medicine has to be one of the following three strings: daily, on demand, with every meal.
- a patient who suffers from Diabetes cannot be treated with Aspirin.

```
<?xml version="1.0" encoding="UTF-8"?>
<patients>
  <patient FirstName="Bob" LastName="Builder" age="19">
    <history>
      <disease code="Diabetes" timeOfDiagnosis="2016-03-03"/>
    </history>
    <prescriptions>
      <prescription date="2016-03-03">
        <medicine name="Insulin" dosage="on demand"/>
        <medicine name="Aspirin" dosage="daily"/>
      </prescription>
    </prescriptions>
  </patient>
  <patient FirstName="Hilary" LastName="Bolder" age="29">
    <history>
      <accident code="SprainedAnkle" timeOfDiagnosis="2016-02-10"/>
      <disease code="Diabetes" timeOfDiagnosis="2016-04-28"/>
    </history>
    <prescriptions>
      <prescription date="2016-04-28">
        <medicine name="Insulin" dosage="daily"/>
      </prescription>
      <prescription date="2016-02-10">
        <medicine name="Aspirin" dosage="daily"/>
        <treatment name="PhysioTherapy" dosage="daily"/>
        <medicine name="Paracetamol" dosage="on demand"/>
      </prescription>
    </prescriptions>
  </patient>
  <patient FirstName="Bill" LastName="Pooter">
    <history>
      <disease code="Back Pain" timeOfDiagnosis="2016-11-03"/>
      <disease code="Joint Pain" timeOfDiagnosis="2016-11-03"/>
    </history>
    <prescriptions/>
  </patient>
  <patient FirstName="Mary" LastName="Smiley" age="73">
    <history/>
    <prescriptions>
      <prescription date="2016-07-27">
        <medicine name="Aspirin" dosage="daily"/>
      </prescription>
    </prescriptions>
  </patient>
</patients>
```

(5 marks)

25. Consider again our (strongly simplified) application where doctors use the format used throughout this exam to record information about their patients, their illnesses, and the medication they take.

In 3-5 sentences, explain how a web based information system can make use of several schemas to follow Postel's law. (5 marks)

The following is a print-out of the XML document used in a number of questions, for you to take notes.

```
<?xml version="1.0" encoding="UTF-8"?>
<patients>
  <patient FirstName="Bob" LastName="Builder" age="19">
    <history>
      <disease code="Diabetes" timeOfDiagnosis="2016-03-03"/>
    </history>
    <prescriptions>
      <prescription date="2016-03-03">
        <medicin name="Insulin" dosage="on demand"/>
        <medicin name="Aspirin" dosage="daily"/>
      </prescription>
    </prescriptions>
  </patient>
  <patient FirstName="Hilary" LastName="Bolder" age="29">
    <history>
      <accident code="SprainedAnkle" timeOfDiagnosis="2016-02-10"/>
      <disease code="Diabetes" timeOfDiagnosis="2016-04-28"/>
    </history>
    <prescriptions>
      <prescription date="2016-04-28">
        <medicin name="Insulin" dosage="daily"/>
      </prescription>
      <prescription date="2016-02-10">
        <medicin name="Aspirin" dosage="daily"/>
        <treatment name="PhysioTherapy" dosage="daily"/>
        <medicin name="Paracetamol" dosage="on demand"/>
      </prescription>
    </prescriptions>
  </patient>
  <patient FirstName="Bill" LastName="Pooter">
    <history>
      <disease code="Back Pain" timeOfDiagnosis="2016-11-03"/>
      <disease code="Joint Pain" timeOfDiagnosis="2016-11-03"/>
    </history>
    <prescriptions/>
  </patient>
  <patient FirstName="Mary" LastName="Smiley" age="73">
    <history/>
    <prescriptions>
      <prescription date="2016-07-27">
        <medicin name="Aspirin" dosage="daily"/>
      </prescription>
    </prescriptions>
  </patient>
</patients>
```

The following is a print-out of the XML document used in a number of questions, for you to take notes.

```
<?xml version="1.0" encoding="UTF-8"?>
<patients>
  <patient FirstName="Bob" LastName="Builder" age="19">
    <history>
      <disease code="Diabetes" timeOfDiagnosis="2016-03-03"/>
    </history>
    <prescriptions>
      <prescription date="2016-03-03">
        <medicin name="Insulin" dosage="on demand"/>
        <medicin name="Aspirin" dosage="daily"/>
      </prescription>
    </prescriptions>
  </patient>
  <patient FirstName="Hilary" LastName="Bolder" age="29">
    <history>
      <accident code="SprainedAnkle" timeOfDiagnosis="2016-02-10"/>
      <disease code="Diabetes" timeOfDiagnosis="2016-04-28"/>
    </history>
    <prescriptions>
      <prescription date="2016-04-28">
        <medicin name="Insulin" dosage="daily"/>
      </prescription>
      <prescription date="2016-02-10">
        <medicin name="Aspirin" dosage="daily"/>
        <treatment name="PhysioTherapy" dosage="daily"/>
        <medicin name="Paracetamol" dosage="on demand"/>
      </prescription>
    </prescriptions>
  </patient>
  <patient FirstName="Bill" LastName="Pooter">
    <history>
      <disease code="Back Pain" timeOfDiagnosis="2016-11-03"/>
      <disease code="Joint Pain" timeOfDiagnosis="2016-11-03"/>
    </history>
    <prescriptions/>
  </patient>
  <patient FirstName="Mary" LastName="Smiley" age="73">
    <history/>
    <prescriptions>
      <prescription date="2016-07-27">
        <medicin name="Aspirin" dosage="daily"/>
      </prescription>
    </prescriptions>
  </patient>
</patients>
```