

Two hours - online

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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: Tuesday 15th January 2019

Time: 14:00 - 16:00

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**This is an online examination. 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.**

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This is a CLOSED book examination

The use of electronic calculators is NOT permitted

[PTO]

*Questions 1 - 25  
contain Multiple  
Choice Questions  
and are restricted*

26. In 4-5 sentences, describe the processes of parsing and serialising in the context of XML; for full marks, include a description of internal and external representation and various levels of internal representation. (6 marks)

27. Sketch out a RelaxNG schema for XML documents to record simplified data about health and safety incidents (minor syntax errors will be ignored) as exemplified by the following document (which you have seen in an earlier question):

```
<?xml version="1.0" encoding="UTF-8"?>
<incidents>
  <incident id="345">
    <description location="Kilburn 2.19" time="Monday, October 22, 2018" code="fall">
      A person tripped and fell.
    </description>
    <damage>
      <health>A broken arm.</health>
      <equipment>A broken laptop</equipment>
    </damage>
  </incident>
  <incident id="344">
    <description location="IT 407" time="Saturday, October 20, 2018" code="fire-alarm">
      A toaster burned some bread and triggered a fire alarm.
    </description>
    <damage>
      <nuisance>Evacuation of Building</nuisance>
    </damage>
  </incident>
  <incident id="343">
    <description location="Kilburn LF31" time="Thursday, October 18, 2018" code="cut">
      Minor cut of finger with knife
    </description>
    <damage/>
  </incident>
  <incident id="342">
    <description location="Kilburn Byte Cafe" time="Monday, October 15, 2018"
      code="theft">
      A student's laptop was stolen.
    </description>
    <damage>
      <equipment>A lost laptop</equipment>
    </damage>
  </incident>
</incidents>
```

(4 marks)

28. Consider again the XML-based format for documents to record simplified data about health and safety incidents as exemplified by the following document (which you have seen in an earlier question) and the RelaxNG schema you have designed in an earlier question: in 2-3 sentences, explain where and how XML Schema (XSD) datatypes could be used your schema.

```
<?xml version="1.0" encoding="UTF-8"?>
<incidents>
  <incident id="345">
    <description location="Kilburn 2.19" time="Monday, October 22, 2018" code="fall">
      A person tripped and fell.
    </description>
    <damage>
      <health>A broken arm.</health>
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    </damage>
  </incident>
  <incident id="344">
    <description location="IT 407" time="Saturday, October 20, 2018" code="fire-alarm">
      A toaster burned some bread and triggered a fire alarm.
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  </incident>
  <incident id="343">
    <description location="Kilburn LF31" time="Thursday, October 18, 2018" code="cut">
      Minor cut of finger with knife
    </description>
    <damage/>
  </incident>
  <incident id="342">
    <description location="Kilburn Byte Cafe" time="Monday, October 15, 2018"
      code="theft">
      A student's laptop was stolen.
    </description>
    <damage>
      <equipment>A lost laptop</equipment>
    </damage>
  </incident>
</incidents>
```

(3 marks)

29. Martin Fowler wrote:

*...we are gearing up for a shift to polyglot persistence where any decent sized enterprise will have a variety of different data storage technologies for different kinds of data. There will still be large amounts of it managed in relational stores, but increasingly we'll be first asking how we want to manipulate the data and only then figuring out what technology is the best bet for it.*

In 5-7 sentences, describe a *concrete* application that benefits from a polyglot persistence strategy. Be sure to articulate the different formats needed and their "best" data model. You should include a discussion of both the *positives* and *negatives* of such a strategy, but you should select a case where the positives *outweigh* the negatives. (5 marks)

## Handout example

```
<?xml version="1.0" encoding="UTF-8"?>
<incidents>
  <incident id="345">
    <description location="Kilburn 2.19" time="Monday, October 22, 2018"
      code="fall">
      A person tripped and fell.
    </description>
    <damage>
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</incidents>
```