Coláiste na Tríonóide, Baile Átha Cliath
Trinity College Dublin
Ollscoil Átha Cliath | The University of Dublin

Faculty of Engineering, Mathematics and Science

School of Computer Science & Statistics

BA (Mod) Computer Science and Business **Trinity Term 2017**
Integrated Computer Science
Year 2 Annual Examinations

Information Management I

Tuesday 16th May 2017 **Exam Hall** **14.00-15.30**

Prof. Declan O'Sullivan

Instructions to Candidates:

Attempt **two** questions. All questions carry equal marks. Each question is scored out of a total of 25 marks. Answer each question in a separate answer book.

You may not start this examination until you are instructed to do so by the invigilator.

Materials Permitted for this examination:

Non-programmable calculators are permitted for this examination – please indicate the make and model of your calculator on each answer book used.

SOME QUESTIONS REFER TO THE FOLLOWING FIGURE A:

```
<?xml version="1.0" encoding="UTF-8" ?>

<volunteerDatabase>
<person age="31" ssn="046187254">
        <name>
                <firstname>Ross</firstname>
                <lastname>Geller</lastname>
        </name>
        <telephone type="landline">
                <number>5534567</number>
        </telephone>
        <telephone type="mobile">
                <number>0851234567</number>
        </telephone>
</person>

<person age="29" ssn="355817204">
        <name>
                <firstname>Chandler</firstname>
                <firstname>Muriel</firstname>
                <lastname>Bing</lastname>
        </name>
        <telephone type="mobile">
                <number>0869932617</number>
        </telephone>
</person>

<person ssn="778123666">
        <name>
                <firstname>Joseph</firstname>
                <firstname>Francis</firstname>
                <lastname>Tribbiani</lastname>
        </name>
        <telephone type="landline">
                <number>01628777</number>
        </telephone>
</person>
</volunteerDatabase>
```

SEE NEXT PAGE FOR QUESTIONS

1. Using UML, design an information system to support aspects of the operation of a **Car Rental company**.

(a) Model at least 6 UML classes (each with at least 2 attributes) representing your information with cardinalities, named associations and roles between the classes. Include exactly one subclass and exactly one aggregation association. [8 marks]

(b) Model 2 UML use cases (include diagrams and standard textual descriptions (e.g. preconditions etc.)) that will be supported by these classes. [6 marks]

(c) Provide a UML Activity diagram for each use case that indicates the flow of tasks that will implement the UML use cases designed in part (b) above. [6 marks]

(d) Provide a detailed commentary on the design decisions you took during the modelling task, and any ethical concerns that may need to be addressed. [5 marks]

[Total 25 Marks]

2. (a) Explain how attributes in a XML document are described differently in DTDs and in XML Schema. Give example(s) to help your explanations. [4 Marks]

(b) Use DTD notation to fully describe the XML document shown in Figure A. Provide explanations for your design decisions. [8 Marks]

(c) Define and explain XQuery statements for each of the following queries posed over the document in Figure A. Show expected results and explain your design decisions.

I. Return within a single new element called 'Friends', all the lastname values in the document separated by a plus sign "+".

II. Return just the values of 'ssn' attributes in a new element called 'SSNs'

III. Return all the age elements but include a new element which is a sum of all the ages.

IV. Return only the first of the firstnames for each person in the document.

[13 Marks]

[Total 25 Marks]

3. The move to Linked Data (and eventually the Semantic Web) will bring benefits, compared with how data is currently available on the web, for application developers, such as: ability to deal with ad-hoc contexts, easy extensibility of data schemas, ease of querying.

Discuss and use diagrams to illustrate your points.

Include at least the following points in your answer:

- Explain the concept of Linked Data.
- Explain the concept of Semantic Web.
- Explain how the W3C RDF standard turns graphs of data into triples.
- Explain the extensibility of the RDF graph model.
- Explain the Linked Data principles.
- Explain the difference between Linked Data and Linked Open Data.
- Explain how RDF is queried.
- Explain in what way does OWL build upon RDF, and what benefits this brings.

[Total 25 Marks]