

Semantic Web Technologies Summer Semester 2007 - First Exam

31 January 2008

You are not allowed to use any course material; the only things on the table should be this exam sheet, the RDF definition document, the answer sheets, and a pen.

All RDF graphs are written using the Turtle syntax. Throughout the exam, the namespace abbreviation `rdf` stands for `http://www.w3.org/1999/02/22-rdf-syntax-ns#`, `rdfs` stands for `http://www.w3.org/2000/01/rdf-schema#`, `owl` stands for `http://www.w3.org/2002/07/owl#`, `xsd` stands for `http://www.w3.org/2001/XMLSchema#`, and the default namespace is `http://example.org/example#`.

You can earn a total of 100 + 5 points for this exam. The maximum number of points awarded for each individual question is indicated with the question.

1. (30) RDF entailment

Given the following RDF graph S :

```
rdfs:range rdfs:range rdfs:Resource .
_:u rdfs:range :c .
_:u rdfs:subPropertyOf :p .
:a :p :b .
:a rdf:type _:u .
_:u rdfs:subClassOf :b .
:b rdfs:subClassOf :c .
```

- (a) Write down a subgraph of S which is not the same as S . Does the subgraph simple-entail the graph S ?
- (b) Write down an instance of S which is not the same as S . Does the instance simple-entail the graph S ?
- (c) Which of the following triples are simple-entailed by S :
 - i. `rdfs:range rdfs:range rdfs:Class .`
 - ii. `:b rdf:type :c .`
 - iii. `_:x rdfs:range _:y .`
 - iv. `:a rdf:type rdfs:Resource .`
 - v. `:p rdfs:range _:w.`

vi. `:c rdfs:type _:v .`

(d) Which of the following triples are RDFS-entailed by S :

i. `rdfs:range rdfs:range rdfs:Class .`

ii. `:b rdfs:type :c .`

iii. `_:x rdfs:range _:y .`

iv. `:a rdfs:type rdfs:Resource .`

v. `:p rdfs:range _:w.`

vi. `:c rdfs:type _:v .`

2. (25) SPARQL

- (a) Write down a SPARQL query which retrieves all objects of triples in which `:a` is the subject and, optionally, all superclasses of these objects.
- (b) Does SPARQL use simple or RDFS entailment?
- (c) If you execute the query on the graph S of the previous question, what will be the answer?
- (d) (bonus question: 5 points) Would the answer be any different in case SPARQL were to use the other kind of entailment (RDFS or simple, respectively)? Explain why.

3. (25) F-Logic

(a) Write the following RDFS ontology as an F-logic ontology:

```
_:u rdfs:range :c .
_:u rdfs:subPropertyOf :p .
:a :p :b .
:a rdfs:type _:u .
_:u rdfs:subClassOf :b .
:b rdfs:subClassOf :c .
```

(b) One difference in expressiveness between Description Logics and Logic programming is that Description Logics allows the use of classical negation, whereas Logic programming does not. What are the other main differences in expressiveness between Description Logics (such as OWL DL) and F-Logic (Programming)? Mention at least 4 differences.

4. (10) FOAF

- (a) How are relationships between persons expressed in FOAF?
- (b) In RDF resources (e.g., persons) are identified using URIs. In FOAF it is also possible to use URIs to identify persons, but there is another possibility, which is actually the preferred option in FOAF. How are persons identified in FOAF?

5. (10) Explain the general information integration scenario in the automotive use case we discussed in the lecture. In particular, sketch the relationship between the three main components in the scenario and briefly explain their roles.

As a guideline: it is sufficient to draw a simple diagram, write 1 line for each of the components, and write 1 line for each of the relationships.