Semantic Web Technologies Winter Semester 2008 - First Exam

28 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 points for this exam; you get 5 points for free. The maximum number of points awarded for each individual question is indicated with the question. You need 55 points to pass; 100 points corresponds to the grade 30.

1. (10) RDF Modeling
   Write the following natural language statement as RDF and RDFS expressions, i.e., as RDF triples that include RDF, respectively RDFS vocabulary. You may need several RDF(S) statements for a given natural language statement.

   (a) "The course 'Mathematics 101' is attended by John, Suzy and Mary, and by nobody else" [hint: implement using a list]

   (b) "Only persons have children, and all children are persons"

   (c) "Students are persons, and persons are animals"

   (d) "The class ex:Wine has two labels, one in English: 'Wine', and one in French: 'Vin'"

2. (25) RDF entailment
   Given the following RDF graph S:

   rdfs:range rdfs:range rdfs:Class .
   :s rdfs:domain :t .
   _:u rdfs:subPropertyOf :s .
   :a :s :b .
   :a rdf:type _:u .
   _:u rdfs:subClassOf _:y .
   :t rdfs:subClassOf :s .
   :t rdfs:comment ''bla'' .

   (a) Which of the following triples are simple-entailed by S:

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

ii. :s rdf:type :t .

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

iv. :b rdf:type rdfs:Resource .

v. :s rdfs:range _:w .

vi. :t rdf:type rdfs:Literal .

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

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

ii. :s rdf:type :t .

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

iv. :b rdf:type rdfs:Resource .

v. :s rdfs:range _:w .

vi. :t rdf:type rdfs:Literal .

3. (10) SPARQL

   (a) Write a SPARQL query that retrieves all properties with a specified `rdfs:range`.

   (b) If you execute the query on the graph S of the previous question, what will be the answer?

4. (15) F-Logic
   Write the following RDFS ontology as an F-logic ontology (plus rules, if needed):

   :Person rdfs:subClassOf :Animal .
   :hasName rdfs:domain :Person .
   :hasName rdfs:range xsd:string .
   :john rdf:type :Person .
   :john :hasName ''John'' .

5. (15) DLs versus F-Logic

   (a) Does F-Logic allow quantifying over class and property names (i.e., variables in class and property positions)? Explain why (not).

   (b) Do typical Description Logics such as OWL DL allow such quantifying over classes and properties? Explain why (not).

6. (10) Applications

   (a) What is GRDDL used for? Sketch how it works.

   (b) Which technology does GRDDL use to convert XML documents to RDF and which syntax for RDF is used for the output?

7. (15) Semantic Web Services

   Describe how Description Logic languages such as OWL DL can be used for describing the functionality of Web services, and how DL technology can be used for Web service discovery, i.e., for matching functional Web service descriptions. Describe two of the notions of matching that we discussed.