PAPER CODE NO.
COMP318

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THE UNIVERSITY
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JANUARY 2005 EXAMINATIONS

Bachelor of Science: Year 3
Bachelor of Science: Year 4

ADVANCED WEB TECHNOLOGIES

TIME ALLOWED: 2.5 hours

INSTRUCTIONS TO CANDIDATES

Attempt **ALL** questions from Section A.
Attempt **TWO** questions from Section B only
If you attempt to answer more questions than the required number of questions (in any section), the marks awarded for the excess questions will be discarded (starting with your lowest mark).

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SECTION A

Attempt ALL questions from this section. Section A is worth 50 marks

1. Describe the two ways for defining the structure of an XML document by comparing and contrasting their expressivity. (8 marks)

2. Discuss the limitations of the expressive power of RDF and RDF Schema when used to represent ontological knowledge. (12 marks)

3. Describe the three species of the Web Ontology Language OWL, together with the notion of upward compatibility between them. (10 marks).

4. Define the the syntax of queries on logic programs using monotonic and non monotonic rules in predicate logic. Compare and contrast these two types of rules. (10 marks)

5. Identify and describe the eight basic steps for constructing an ontology manually (10 marks)

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SECTION B

Attempt TWO questions from this section. Each question carries 25 marks. Credit will be given for the best 2 answers only.

1. Consider the following informal description of a publishing company:

   - The publisher has many series (or book genres);
   - Each series is dealt with by a Manager, who is an Employee;
   - Each Employee has another Employee as Supervisor;
   - Each Employee works on a series;
   - Books are edited by an Employee, and each Employee can edit several books.

   Map the description above into the graphical representation of one of the ontological models that it can instantiate, and explain any assumption made in the mapping process. (25 marks)

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2. Consider the ontology below, expressed in RDF Schema. Draw the graph corresponding to the ontology. (25 marks)

```
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#">
  <rdfs:Class rdf:ID="lecturer">
        <rdfs:comment>
              The class of lecturers. All lecturers are academic staff members.
        </rdfs:comment>
        <rdfs:subClassOf rdf:resource="#academicStaffMember"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="academicStaffMember">
         <rdfs:comment>
                The class of all academic staff members.
         </rdfs:comment>
         <rdfs:subClassOf rdf:resource="#staffMember"/>
  </rdfs:Class>
  <rdfs:Class rdf:ID="staffMember">
        <rdfs:comment>
               The class of all staff members.
         </rdfs:comment>
   </rdfs:Class>
   <rdfs:Class rdf:ID="course">
         <rdfs:comment>The class of courses</rdfs:comment>
   </rdfs:Class>
   <rdfs:Property rdf:ID="involves">
         <rdfs:comment>It relates only lecturers ti courses</rdfs:comment>
         <rdfs: domain rdf:resource=#course"/>
         <rdfs: range rdf:resource=#lecturer"/>
   </rdfs:Property>
    <rdf:Property rdf:ID="isTaughtBy">
         <rdfs:comment>
                Inherits its domain ("course") and range ("lecturer")
                from its superproperty "involves"
        </rdfs:comment>
        <rdfs:subPropertyOf rdf:resource="#involves"/>
    </rdf:Property>
    <rdf:Property rdf:ID="phone">
          <rdfs:comment>
                 It is a property of staff members
                 and takes literals as values.
         </rdfs:comment>
         <rdfs:domain rdf:resource="#staffMember"/>
         <rdfs:range rdf:resource="http://www.w3.org/2000/01/rdf-schema#Literal"/>
  </rdf:Property>
</rdf:RDF>
```

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3. Consider the following buyer's requirements in a brokered estate trade.

   - The buyer is looking for a house that has *at least* three bedrooms;
   - The house must have a total surface of *at least* 800 square feet;
   - The house must have gas central heating;
   - If the house is centrally located, the buyer is willing to pay up to 250,000;
   - The buyer would consider a house outside the city centre, however it has to:
     - be less than 15 minutes walking from a train or underground station;
     - have a price no greater than 180,000;

     In addition, the buyer is prepared to pay an extra 50 per square foot for a larger apartment and 20 per square foot for a garden;
   - The buyer cannot afford to pay more than 280,000 in total;
   - Given the choice, they buyer would prefer the cheapest option. If more than one house satisfies the price constraint, then the buyer second priority is the presence of a garden. The third priority, given that the price constraint, is additional space.

   Using the predicates below, provide a formal representation of the buyer's requirements (including the additional ones) in non monotonic rules. Explain any assumptions made when formalising the requirements, such as that the buyer can buy at most one house. (25 marks)

size(x, y)	y is the size of house x in square feet
bedrooms(x, y)	x has y beedrooms
price(x, y)	y is the price for x
station(x)	there is a train or underground station in the vicinity of x
distance-station(x, y)	x is y minutes walking from a train or underground station
garden(x, y)	x has a garden of size y
gas-central-heating(x)	x has gas central heating
central(x)	x is centrally located
acceptable(x)	house x satisfies the buyer requirements
offer(x, y)	the buyer is ready to offer y for house x
cheapest-price(x)	x is the house with the cheapest price
largest-Garden(x)	x is the house with the largest garden
largest(x)	x is the largest house
buy(x)	the buyer decides to buy house x