Question Paper

Exam Date & Time: 28-Nov-2022 (09:00 AM - 12:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

MANIPAL INSTITUTE OF TECHNOLOGY
VII SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2022

Semantic Web [ICT 4036]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) Consider the property eats with domain animal and range animal or plant. Suppose we define a new class vegetarian. Name a desirable restriction on eats for this class and represent it using OWL. Do you think that this restriction can be expressed in RDF Schema by using rdfs:range? Justify your answer. (5)

A)

B) Given the following SPARQL query: (3)

```
PREFIX foaf: http://xmlns.com/foaf/0.1/
PREFIX m: http://mydomain.com/myExample#
PREFIX dc: http://purl.org/dc/elements/1.1/
PREFIX rdf: http://www.w3.org/1999/02/22-rdf-syntax-ns#
SELECT ?g
WHERE {
?x foaf:name "Ashwin".
?x ?r ?l.
?r rdf:type rdf:Property.
?l rdf:type m:Novel
?l dc:genre ?g.
}
```

1. What is the informal meaning of this query?
2. Draw the RDF graph corresponding to the graph patterns of the query.
3. What must be added to this query for returning the year of publication of the m:Novel if it is available?

C) With an example, explain how terminologies in relational database is mapped to RDFS/OWL terms. (2)

2) Consider the RDF triples shown in the Figure. (5)

A)

```
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
        xmlns:rdfs=http://www.w3.org/2000/01/rdf-schema#
        xmlns:art=http://art.org/#
        xml:base="http://art.org/">
<rdf:Description rdf:about="#Bacchus">
        <rdf:type rdf:resource="#statue"/>
        <art:title>Bacchus</art:title>
        <art:value>2000000</art:value>
</rdf:Description>
<rdf:Description rdf:about="#Deluge">
        <rdf:type rdf:resource="#painting"/>
        <art:title>The Deluge</art:title>
        <art:value>3000000</art:value>
</rdf:Description>
<rdf:Description rdf:about="#Madonna">
        <rdf:type rdf:resource="#painting"/>
        <art:title>Madonna of the Pinks</art:title>
        <art:value>4000000</art:value>
</rdf:Description>
<rdfs:Class rdf:about="#painting"/>
<rdfs:Class rdf:about="#statue"/>
<art:painter rdf:about="#Michelangelo">
        <art:made rdf:resource="#Deluge"/>
        <art:made rdf:resource="#Bacchus"/>
        <rdf:type rdf:resource="#sculptor"/>
</art:painter>
        <art:painter rdf:about="#Raphael">
        <art:made rdf:resource="#Madonna"/>
</art:painter >
</rdf:RDF>
```

Write SPARQL queries to:

a. List resources that made (art:made) other resources.

b. Count the works of each painter.

c. Give the title of the painting with the highest value.

B) Represent the Core Properties for Defining Relationships axiomatically using basic predicate logic along with suitable examples. (3)

C) Consider the RDF triples shown in the Figure, (2)

```
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"        <rdf:type rdf:resource="#painting"/>
```

```
        xmlns:rdfs=http://www.w3.org/2000/01/rdf-schema#
        xmlns:art=http://art.org/#
        xml:base="http://art.org/">
<rdf:Description rdf:about="#Bacchus">
        <rdf:type rdf:resource="#statue"/>
        <art:title>Bacchus</art:title>
        <art:value>2000000</art:value>
</rdf:Description>
<rdf:Description rdf:about="#Deluge">
        <rdf:type rdf:resource="#painting"/>
        <art:title>The Deluge</art:title>
        <art:value>3000000</art:value>
</rdf:Description>
<rdf:Description rdf:about="#Madonna">
        <art:title>Madonna of the Pinks</art:title>
        <art:value>4000000</art:value>
</rdf:Description>
<rdfs:Class rdf:about="#painting"/>
<rdfs:Class rdf:about="#statue"/>
<art:painter rdf:about="#Michelangelo">
        <art:made rdf:resource="#Deluge"/>
        <art:made rdf:resource="#Bacchus"/>
        <rdf:type rdf:resource="#sculptor"/>
</art:painter>
        <art:painter rdf:about="#Raphael">
        <art:made rdf:resource="#Madonna"/>
</art:painter >
</rdf:RDF>
```

Write SPARQL queries to:

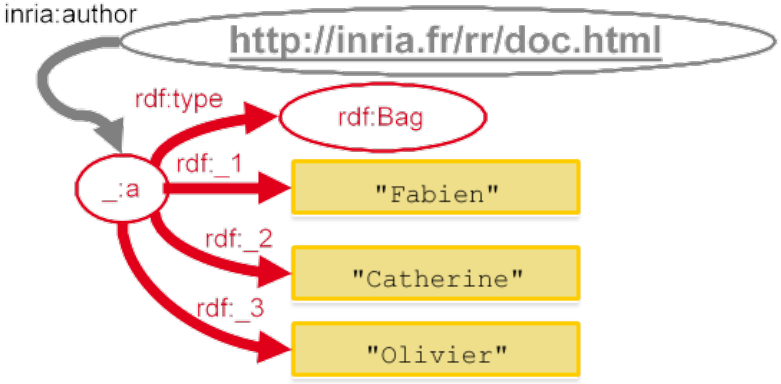
a. Give the rdf:type of the resource that made the resource with title "Bacchus".

b. Write an ASK query which checks whether the domain of art:made for the items with titles "Bacchus" and "The Deluge" are the same resource.

3) Illustrate nonmonotonic rules. How defeasible logic can be used to deal with nonmonotonic rules explain with an example. (5)

A)

B) Represent the RDF graph given using RDF/XML and Turtle formats (3)



C) Consider the triple < http://dbpedia.org/resource/Earth> < http://www.w3.org/1999/02/22-rdf-syntax-ns#type> < http://umbel.org/umbel/rc/Planet>. Identify the applicable individual, property, literal, object and subject, predicate from the statement. Represent the same using OWL2. (2)

4) Represent the following using OWL/XML representation. Which axioms are used for representing? { Brian is a pet of Peter. Brian is a dog. Each pet of Peter is either Brian or it is not a dog. }. (5)

A)

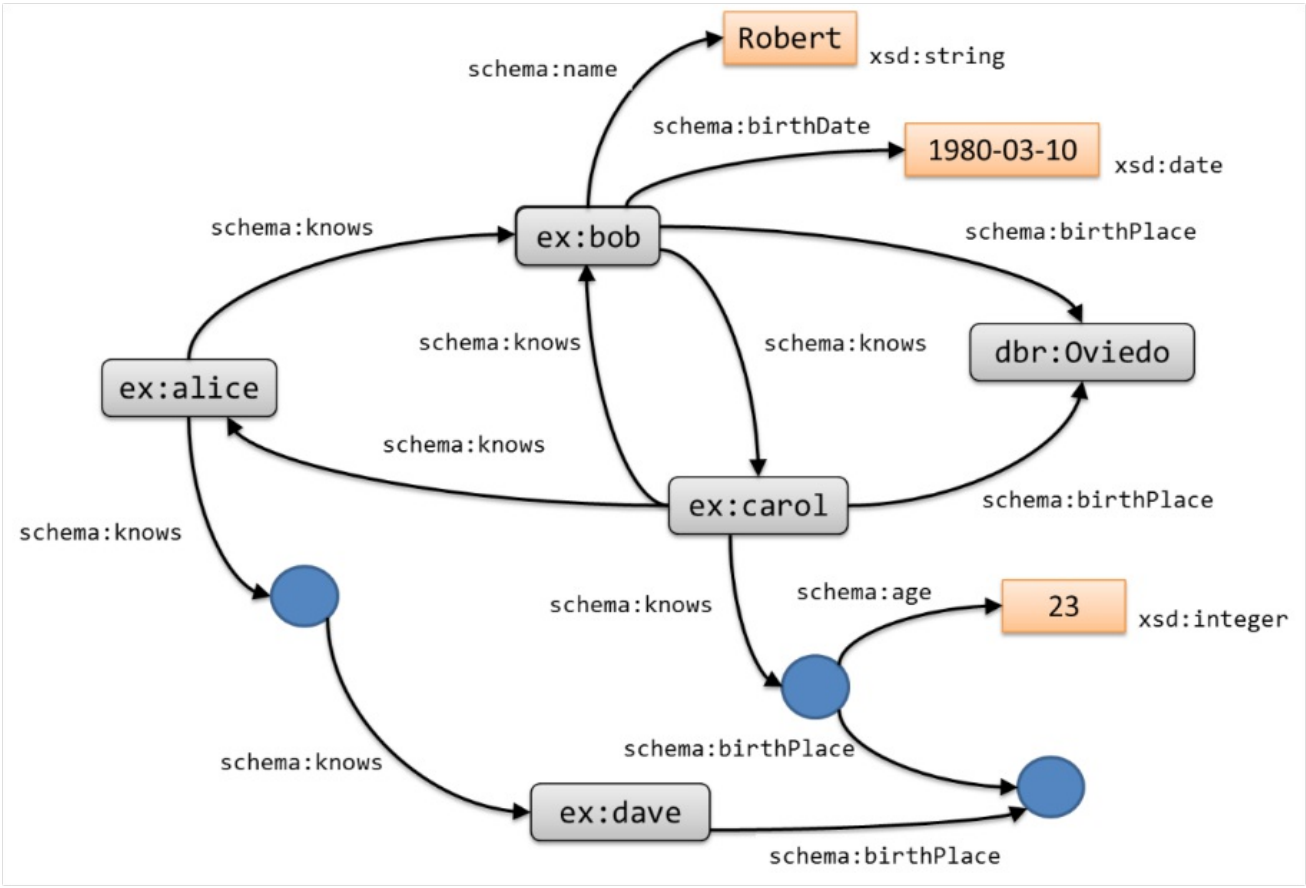
B) Represent the following rule in Rule ML. WorksAt(X, Y), University(Y), Student(Z), Teaches(X,Z)→ ProfessorOf(X,Z) (3)

C) Represent the following Object Property in OWL. an ancestor such as If person A is an ancestor of person B and B of C then A is also an ancestor of C. (2)

5) Indian government wants to make use of semantic web technology for representing all the data. How it can be done? Explain with all the steps involved. What are the advantages and challenges for implementing this. How semantic web can enhance the data utilization from the current practice. (5)

A)

B) From the RDF graph given, infer one RDF triple for each person who is known by "ex:carol". Also represent the RDF triples associated with "ex:bob" using Turtle syntax. (3)



C) In the process of ontology development what questions need to be answered to determine the scope of the knowledge to be represented. (2)

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