Second Midterm Test – Semantic Web course a.a. 2023/2024

Instructions

The candidate has to submit two files: (i) one file containing the ontology in Turtle format, with extension .ttl or .owl; (ii) one file in PDF format, containing the answers to each question from Q8 to Q10. The solution must be submitted via the Moodle of the course.

Exercise

The fundamental concepts in an application domain related to an Italian research organisation are: employees, institutes, and laboratories. Some of the facts that characterise this domain can be stated as follows:

1. An employee is a person who has exactly one contract with the research organisation.
2. An employee can be a researcher or a technologist.
3. Each employee has a unique ID (a positive integer).
4. A research organisation has two types of subparts: institute and laboratory.
5. Each institute has at least one building.
6. Each building has exactly one location.
7. Each building contains more than one office.
8. Each employee has exactly one office.
9. Research organisation, employee, institute, laboratory, building, location and office are pairwise disjoint concepts.

The candidate must express all the above statements in an OWL 2 DL ontology, using the RDF Turtle notation. In particular, the ontology must:

Q1. Declare the required classes.
Q2. Define the class taxonomy.
Q3. Declare the required object properties, providing for each property:
  Q3.1. one axiom defining the domain of the property
  Q3.2. one axiom defining the range of the property
  Q3.3. one axiom defining the inverse of the property
Q4. Define the object property taxonomy.
Q5. Declare the required data properties, providing:
  Q5.1. one axiom defining the domain of the property
  Q5.2. one axiom defining the range of the property
Q6. Define the axioms necessary for expressing any statement from 1 to 9.
Q7. Populate the ontology with at least one individual for each class, and at least one assertion for each property.

In addition, the candidate must:

Q8. Define the complex role inclusion axiom capturing the fact that if an employee has an office that is contained in a building that is assigned to an institute that is part of a research organisation, then the employee has a contract with that research organisation.
Q9. Identify one assertion that would make the ontology inconsistent.
Q10. Verify and explain whether or not the created ontology (including the complex role inclusion axiom defined in Q8) satisfies the global restrictions on the axioms of an OWL 2 DL ontology.