COMP 62342

Two hours - online

EXAM PAPER MUST NOT BE REMOVED FROM THE EXAM ROOM

UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE

Ontology Engineering for the Semantic Web

Date: Thursday 30th May 2019

Time: 14:00 - 16:00

This is an online examination. Please answer ALL Questions
The exam contains MULTIPLE CHOICE, TRUE/FALSE and SHORT ESSAY QUESTIONS.
Be sure to answer ALL Questions

Please note that wrong answers on MULTIPLE CHOICE and TRUE/FALSE questions may be penalized (i.e. receive some small negative mark) so random guessing works against you

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This is a CLOSED book examination

The use of electronic calculators is NOT permitted

[PTO]

Questions 1-22 are multiple choice questions and are, therefore, restricted

23. Write an axiom in Manchester Syntax that states that each and every instance of class *A*

- is an instance of *B*, *and*
  - has a *p*-successor that is an instance of *A*, *or*
  - has no *r*-successor that is an instance of *B* or *C*.

(4 marks)

24. Consider the following ontology, which is used in an earlier question

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ObjectProperty: hasColour
    Characteristics: functional
ObjectProperty: eats
Class: Grey
Class: White
DisjointClasses: Grey, White
Class: Animal
       SubClassOf: eats some Thing
Class: Seal
       SubClassOf: Animal
Class: Shark
       SubClassOf: Animal
Class: GreyShark
       EquivalentTo: Shark and (hasColour some Grey)
Class: WhiteShark
       EquivalentTo: Shark and (hasColour some White)
       SubClassOf: eats only Seal
Individual: Jaws
      Types: Shark,
      hasColour some (Grey or White)
```

For each of the Competency Questions below, consider whether the ontology is able to answer the question. If so, show how this can be done. If not, provide a brief discussion as to why not, and how you might extend or edit the ontology to address the problem.

- What kinds of animals are there?
- Are sharks dangerous?
- What colours can animals be?

(8 marks)

25. Consider the following scenario:

    A vehicle is a machine that transports people or cargo. Each vehicle

    - has one or more colours
    - has a length, e.g., measured in centimeters
    - moves via some locomotion system which usually involves
      - an energy *generator*, e.g., a human like on a bicycle or a combustion engine like in a car
      - an energy *converter* that converts the generated energy into movement, e.g., the wheels on a bicycle or in a car, the propellor or the turbines in a aircraft, or the legs in a robot. Of course, the energy generator needs to be connected to the energy converter, but we ignore this here.
      - a medium in which this movement takes place, e.g., a plane moves in the air, a boat on water, and a car on a road.

    (a) Using the normalisation approach to writing an ontology, which major dimensions of classification would you use when modelling this scenario? Give the root classes you would use for each of the dimensions and 2-3 named subclasses as examples if applicable. Also, indicate the PIMPS classes these root classes would fall into. Moreover, name six important properties that you would use to connect these dimensions, and give their domains and ranges.

    (b) Finally, assume you want to describe, in your vehicle ontology, the fact that propellor planes move through the air via propellors, whereas an amphibious car moves through water via a propellor and over land via wheels. Formulate 2-3 OWL axioms in Manchester Syntax that describe the above behaviour (minor syntax errors will be ignored).

    (10 marks)

26. Consider again the scenario from the previous question:

    A vehicle is a machine that transports people or cargo. Each vehicle

    - has one or more colours
    - has a length, e.g., measured in centimeters
    - moves via some locomotion system which usually involves
      - an energy *generator*, e.g., a human like on a bicycle or a combustion engine like in a car
      - an energy *converter* that converts the generated energy into movement, e.g., the wheels on a bicycle or in a car, the propellor or the turbines in a aircraft, or the legs in a robot. Of course, the energy generator needs to be connected to the energy converter, but we ignore this here.
      - a medium in which this movement takes place, e.g., a plane moves in the air, a boat on water, and a car on a road.

    In max. 4 sentences and using examples from this scenario, explain what post-coordination is, and describe the benefits of using a formalism that supports post-coordination for a web application where people can search for vehicles. (4 marks)

END OF EXAMINATION