Two hours - on line

The exam will be taken on line.
This is the paper format, which will be available as a backup.

QUESTION PAPER MUST NOT BE REMOVED FROM THE EXAM ROOM

UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE

Ontology Engineering for the Semantic Web

Date: Wednesday 15th January 2014
Time: 09:45 - 11:45

Please answer ALL Questions provided.

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.

This is a CLOSED book examination
The use of electronic calculators is NOT permitted
Questions 1-19 are restricted and cannot be published
20. Consider the following:

*The carburettor is part of the engine. The engine is part of the bus. Thus the carburettor is part of the bus.*

*The engine is part of the bus. The bus is part of the Stagecoach bus fleet. Thus the engine is part of the Stagecoach bus fleet.*

The first of these inferences is valid, while the second is not. Why not? How might you formulate an ontology so that only “correct” inferences are drawn. (5 marks)

21. Consider the following:

*A Fault in an Engine which is part of a Car is necessarily a Fault in the Car*

What design pattern might we use to capture this kind of reasoning in a language that does not support transitivity or role chains? Sketch out the classes that you would need to describe the situation above.

(5 marks)

22. An ontologist wishes to model the classes in the following text using the PIMPS upper-level ontology. For each of the highlighted classes, state which PIMPS class they belong to.

*brewing a pot of tea* involves *tea-leaves*, a tea-pot and some water. Making the tea involves *boiling* the water to a *temperature* of 100 celcius. Darjeeling orange pekoe has a *large* leaf size and a dark brown *colour.*

(5 marks)

23. SKOS provides semantic relationships *skos:broader* and *skos:narrower* that are used to build concept hierarchies. They are *not* asserted to be transitive relationships. Discuss why this may be so, and describe how a *Pattern* is used to add additional features or properties that aid in querying concept hierarchies. Your answer should include reference to any relevant design patterns.

(5 marks)

24. Describe an application scenario where the use of a SKOS vocabulary would be more appropriate than the use of an OWL ontology. Include a discussion of why this is the case and any limitations that may be encountered (i.e., what is lost or gained by moving to SKOS).

(5 marks)
25. Write a closure axiom for the property r1 in the following class description:

```
Class: A
SubClassOf: r1 some c1 and
  r1 some C2 and
  r1 some C3 and
  r2 some C4
```

(3 marks)

26. The following class labels are taken from a "tangled" ontology.

- Red lorry
- Yellow lorry
- Slow lorry
- Green car
- Fast green car
- Fast red sports car
- White estate car
- Red mountain bicycle
- Yellow sports bicycle

What are the dimensions of classification implied by these class labels? (4 marks)

27. Considering the classes from the previous question, using Manchester OWL Syntax write the axioms for the root class of the primary tree of the ontology. (4 marks)