PAPER CODE NO.	EXAMINER : Dr V. Tamma	Tel. No. 54246
COMP318	DEPARTMENT : Computer Science	

UNIVERSITY OF
LIVERPOOL

MOCK EXAMINATIONS 2021/22

Advanced Web Technologies

TIME ALLOWED : Two and a Half Hours

INSTRUCTIONS TO CANDIDATES

Attempt FIVE questions in Section A.
Attempt TWO questions in Section B.

If you attempt to answer more questions than the required number of questions (in any section), the marks awarded for the excess questions answered will be discarded (starting with your lowest mark).

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SECTION A

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

1. Provide a definition of Knowledge Graph and describe some of the properties characterising them? (**5 marks**)

2. Explain what is meant by linked data and discuss the principles for deploying linked data on the web according to the Linked Data Effort. (**5 marks**)

3. Define the following statements in OWL (using its Turtle syntax). Use the names of classes and relations indicated in parentheses, with their respective namespaces, and consider each statement independently (**15 marks in total**):

   a. All managers (`ont:Manager`) are employees (`ont:Employee`) ; (**3 marks**)

   b. An employee (`ont:Employee`) has exactly one staff number (`ont:hasStaffNo`) associated with them; (**3 marks**)

   c. A secretary (`ont:Secretary`) is an admin staff (`ont:AdminStaff`) and an admin staff is an employee (`ont:Emloyee`); (**3 marks**)

   d. The name (`foaf:name`) of an employee is a string (`xsd:string`); (**3 marks**)

   e. The relation "manages" (`ont:manages`) links a manager to an employee. (**3 marks**)

4. Describe the benefit of formulating competency questions in order to start the process of ontology modelling, and of specifying an ontology using a *formal* language. Clarify the meaning of *formal* in this context. Provide at least four examples of competency questions for a domain and task of your choice. (**15 marks**)

5. Define the meaning of reification and explain what it is used for. Represent the following sentence in RDF by means of reified triples (in Turtle syntax): Romeo thought that Juliet was dead. **(10 marks)**

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SECTION B

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

1. Consider the following RDF graph G, expressed in Turtle, where the triples have been numbered to improve readability, and `rdf` and `rdfs` are the usual namespaces.

```
1   s:Person            rdf:type            rdfs:Class .
2   s:Author            rdf:type            rdfs:Class .
3   s:Woman             rdfs:subClassOf     s:Person .
4   s:Book              rdfs:subClassOf     s:PrintedMedia .
5   s:writtenBy         rdfs:subPropertyOf  s:createdBy .
6   s:writtenBy         rdfs:range          s:Author .
7   s:writtenBy         rdfs:domain         s:Book .
8   s:createdBy         rdfs:range          s:Creator .
9   s:Creator           rdfs:subClassOf     s:Person .
10  d:GoneWithTheWind   s:writtenBy         d:Margaret .
```

(a) Draw a diagram representing the graph G. Use dashed lines to identify instances of classes and properties. (**5 marks**)

(b) For each of the statement below, decide if the graph G entails the statement(s) given and explain why/why not? If the answer is "yes", the statement(s) is entailed by G, then use the simple entailment rules (se1, se2) and the rdfs entailment rules (rdfs1, . . . , rdfs13) to prove that your answer is correct. If the answer is "no", then explain, informally or formally, why this is so. A summary of the rdfs entailment rules is provided at the end of this exam paper.

i. `_:n rdf:type s:Book .` (**5 marks**)

ii. `_:n rdf:type s:Person .` (**5 marks**)

iii. `s:Author rdfs:subClassOf s:Creator .` (**5 marks**)

iv. `d:Margaret rdf:type s:Woman .` (**5 marks**)

2. Represent the following statements in the most appropriate ontology language and explain why you choose that specific language. Please note some statements can be represented in more than one language whilst others can only be modelled using one ontology language. (**5 marks**)

Model the statements listed below by using the following URIs - Person, Woman, Man, Wife, Spouse, Husband, isWifeOf, isHusbandOf, paul:

a. isWifeOf and isHusbandOf are functional properties; (**4 marks**)

b. paul is a Man; (**4 marks**)

c. Wife is ~~**not**~~ a Person who is not a Husband; (**4 marks**)

d. a Husband is someone who has at least been married once; (**4 marks**)

e. LifetimeSpouse is a Spouse who has one Spouse and only one Spouse; (**4 marks**)

3. a. An ontology alignment system A needs to be evaluated with respect to a set 120 of reference correspondences (gold standard), R. A generates 45 correct correspondences and 28 incorrect ones. Discuss the different measures that can be used to evaluate the performance of an alignment system and explain what each tells us about the generated alignment. Show the calculations of these measure for the alignment system A. (**15 marks**)

b. Given two alignment systems, A1 and A2 with the following values of p and r: $p1$=0.3, $r1$=0.7, whereas $p2$=0.4 and $r2$=0.8. Which system do you think performs best? Can you assess the performance using either only p or only r? (**10 marks**)