OPEN DATA EXAM

16th of June 2017. *The exam will take 2 hours. Answer each question in the provided space.* Answers out of such space will not be considered.

Name: ……

Not in syllabus now

Question 1. [2p]

From a theoretical point of view, a CDM must provide high **expressiveness** and deal with **semantic relativeness**. We have seen several (graph) data models: the graph property data model, RDF and RDF(S)/OWL (i.e., data models providing formal semantics).

Use the table below to compare them with regard to the desirable properties of a CDM. **For each column** order the four models according to how good (4) or how bad (1) they perform in that criteria. The values must range between 1 and 4. Partial orders are possible. Below the table, for each criteria, briefly **justify your answer**:

	Instances & classes	Rich relationships	Arbitrary constraints	Rich algebra	One basic structure	Multiple semantics
Property GDM	2	1	1	1	4	
RDF	1	2	2	2	3	
RDF(S)	4	3	3	3	1	
OWL	3	4	4	4	2	

Instances and classes: ……

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Rich relationships: ……

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Arbitrary constraints: ……

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Rich algebra: ……

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One basic structure: ……

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Multiple semantics: ……

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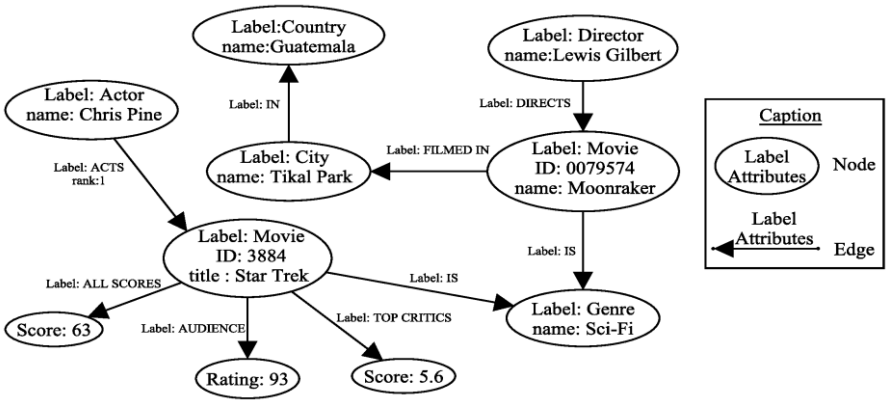
Question 2. [2p]

Given the following property graph:



What **graph operation(s)** would you need to answer each of the following queries? **Justify your answer**:

- Has any movie by Lewis Gilbert been shot in Barcelona? ....label constraint reachability.....

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- In how many movies has Chris Pine participated? .....adjacency with aggregation operation.....

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- List all movies with two or more directors .....adjacency with aggregation operation.....

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- What is the movie with the best audience rating ever shot in Guatemala? .....pattern matching content based.....

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Question 3. [5p]

a) Model in RDF(S) the following statements:

"An insurance company has three kinds of insurances: car, housing and life. All of them must have the mandatory following information: holder, insured, starting date, ending date (if cancelled). Holder and insured must be mandatorily persons. Besides that, a car insurance must provide information about the car model (including brand, cc and date of purchase); housing insurances information about the house (including address, city and total insurable value). Additionally, for life insurances, the holder and insured person (only one) must be the same."

Draw a RDF(S) **TBOX modelling as many statements as you can**. Identify the statements modelled in your graph by underlining them in the text above. Clearly identify in the graph the RDFS constructs. Also clearly distinguish concepts (in rectangles) from literals (in circles). Define your own namespace prefix for the URIs you need to create **[1,5p]**

b) Now, **assert the following instances** to your RDF graph (draw them below the RDF graph sketched above and clearly **separate them from the TBOX by a dashed line**): *John has filed a housing insurance for his house at 123, Avenue Roosevelt, New York City with a total insurable value of 340.000$* **[0,5p]**

c) For those elements in the statement that you could not express in RDF/RDF(S) express them in DL. Assume the URIs you created to assert the DL axioms. **[1p]**

Is there any statement that you could yet not represent?

you cannot guarantee it is the same object
you can express the 1-1 relationship but not that they are exactly the same instance, we do not have anything similar to PKs)

d) Assume a RDFS entailment regime for the RDF graph you just created. Represent the inferred knowledge in the form of triples **and** for each of them justify from what RDFS semantic construct it is inferred. **[1,5p]**

e) Is there any difference between these two assertions? Justify your answer **[0,5p]**

Option 1	Option 2
:takes rdfs:Domain :Person :takes rdfs:range :Insurance	:Person :takes :Insurance

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Option 1 provides a general schema-level definition that applies to all instances of the classes :Person and :Insurance using the :takes property
Option 2 asserts a specific instance-level fact about a particular relationship between an individual :Person and :Insurance. does not provide any schema information about takes

Question 4. [1p]

Considering the *Open-World Assumption*, does the following ABOX entails the certain answer `Query(Brussels)`? **Justify your answer [1p]**

```
Entrusts(Brussels,Milano)
Entrusts(Brussels,Paris)
Entrusts(Milano,Paris)
Entrusts(Paris,Barcelona)
inDebt(Milano)
¬inDebt(Barcelona)
```

```
Query ≡ ∃Entrusts.(inDebt ⊓ ∃Entrusts.¬inDebt)

ABox ⊨ Query(Brussels)?
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yes

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