CSc 8711 - Spring 2013
Exam 2 (Take Home) Given: April 24th (Friday); Due: April 26th (Sunday)
IMPORTANT NOTE: Submit using handin command - use final as the assignment number/name.
sudo handin final Query.java
sudo handin final final.pdf

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1. Implement the following two queries for the Movies-Screens-Shows Database application that was provided to you.

   (a) List all the screens along with the corresponding theater, place and date that plays a given movie at a given time (eg movie m3 at 12pm). Implement this using the "Cypher" method.

   (b) Find the movie that is played the most number of times across all theaters. Implement this using the API method.

   Integrate this code into the source code provided in the class website:

   `http://tinman.cs.gsu.edu/~raj/8711/sp15/neo4j/`

   We have modified the menu options in MainMenu.java and also added method stubs in Query.java. Submit only Query.java.

2. Consider the TBox T with the following axioms:

$$\forall R.\neg B \sqsubseteq B$$
$$\exists R.(\exists R.C) \sqsubseteq \neg A \sqcup \neg B$$

   and the interpretation I over domain $\Delta^I = \{a, b, c, d, e, f\}$:

$$A^I = \{a, c, e\}$$
$$B^I = \{c, d, e, f\}$$
$$C^I = \{e\}$$
$$R^I = \{< a, f >, < a, c >, < b, d >, < d, c >, < c, e >, < f, a >\}$$

   Is I a model for T?

3. For each of the axioms given below, determine which of the three interpretations (I_1, I_2, and I_3) in the subsequent table satisfy it. Assume A, B, C, and D are atomic concepts and P is a role.

   (a) $B \sqsubseteq D$

   (b) $A \sqsubseteq B \sqcap \forall P.C$

   (c) $D \sqsubseteq B \sqcup \exists P.C$

Candidate Interpretations ($\Delta^I = \{a, b, c, d\}$)

Classes/Roles	I_1	I_2	I_3
A^I	$\{\}$	$\{a\}$	$\{b, c\}$
B^I	$\{a, b\}$	$\{a\}$	$\{b, c, d\}$
C^I	$\{b\}$	$\{b, d\}$	$\{a, b\}$
D^I	$\{\}$	$\{a, b\}$	$\{a, b, c, d\}$
P^I	$\{\}$	$\{< a, b >, < a, c >, < b, d >\}$	$\{< b, a >, < b, b >, < d, a >\}$

4. Consider the following knowledge base K:

$$\underline{\text{TBox}}$$
$$Human \sqsubseteq \exists hasParent.Human$$
$$Orphan \sqsubseteq Human \sqcap \forall hasParent.\neg Alive$$
$$\underline{\text{ABox}}$$
$$Orphan(harrypotter)$$
$$hasParent(harrypotter, jamespotter)$$

   Using the tableaux method show that $\neg Alive(jamespotter)$ is a logical consequence of K.

5. Show using the tableaux that the following knowledge base is unsatisfiable:

$$\underline{\text{TBox}}$$
$$Bird \sqsubseteq Flies$$
$$Penguin \sqsubseteq Bird$$
$$Penguin \sqcap Flies \sqsubseteq \bot$$
$$\underline{\text{ABox}}$$
$$Penguin(tweety)$$

6. SPARQL Queries on PeriodicTable KB (http://www.daml.org/2003/01/periodictable/PeriodicTable.owl): Write SPARQL queries to answer the following and make sure they are tested on the system:

   (a) Find element name, element symbol, atomic weight and color of all elements from the group with group name "Halogen".

   (b) Find element name, element symbol, atomic number and color of all elements with standardState "gas" and having an atomic number less than 10; Result should be sorted by atomic number (increasing).

   (c) List all the possible individuals of the StandardState class.

   (d) Find element name, element symbol, atomic number and color of all elements in period number 3 and group number 14 (ordered by atomic number).

   (e) For each group, list the group name and count of elements in it.

   On the next page is a run of the 5 queries - you should duplicate the results shown.

```
[raj@tinman pt]$ sdbquery --sdb=pt.ttl --query=1
-------------------------------------------------------------------------------
| NAME       | SYMBOL | ATOMICWEIGHT | COLOR                                  |
===============================================================================
| "iodine"   | "I"    | "126.90447"  | "violet-dark grey, lustrous"           |
| "fluorine" | "F"    | "18.9984032" | "pale yellow"                          |
| "astatine" | "At"   | "210"        | "metallic"                             |
| "bromine"  | "Br"   | "79.904"     | "red-brown, metallic lustre when solid" |
| "chlorine" | "Cl"   | "35.453"     | "yellowish green"                      |
-------------------------------------------------------------------------------
[raj@tinman pt]$ sdbquery --sdb=pt.ttl --query=2
-----------------------------------------------------------------------------------
| NAME       | SYMBOL | ATOMICNUMBER | COLOR                                    |
===================================================================================
| "hydrogen" | "H"    | "1"          | "colourless"                             |
| "helium"   | "He"   | "2"          | "colourless"                             |
| "nitrogen" | "N"    | "7"          | "colourless"                             |
| "oxygen"   | "O"    | "8"          | "colourless as a gas, liquid is pale blue" |
| "fluorine" | "F"    | "9"          | "pale yellow"                            |
-----------------------------------------------------------------------------------
[raj@tinman pt]$ sdbquery --sdb=pt.ttl --query=3
------------------------
| aa                   |
========================
| table:solid          |
| table:state_unknown  |
| table:gas            |
| table:liquid         |
------------------------
[raj@tinman pt]$ sdbquery --sdb=pt.ttl --query=4
-------------------------------------------------------------------------
| NAME      | SYMBOL | ATOMICNUMBER | COLOR                            |
=========================================================================
| "silicon" | "Si"   | "14"         | "dark grey with a bluish tinge" |
-------------------------------------------------------------------------
[raj@tinman pt]$ sdbquery --sdb=pt.ttl --query=5
----------------------------------------
| GROUPNAME              | NUMELEMENTS |
========================================
| "Noble gas"            | 7           |
| "Halogen"              | 6           |
| "Alkali metal"         | 7           |
| "Chalcogen"            | 6           |
| "Alkaline earth metal" | 6           |
| "Lanthanoid"           | 14          |
| "Coinage metal"        | 4           |
| "Actinoid"             | 14          |
| "Pnictogen"            | 6           |
----------------------------------------
```