L2 info. - Databases

Exercise sheet 1: the relational model

1 Remembering sets...

Let $A = \{a, b, d\}$ and $B = \{b, c, d, e\}$ be two sets. What are the sets defined by:

1. $B - (A \cup B)$
2. $A - (A \cap B)$
3. $(A - B) \cup (B - A)$
4. $\mathcal{P}(A) - \{A\}$
5. $(A \cup B) \cap (A \times B)$
6. $(A \times A) - (A \times B)$
7. $(((A \times A) - (A \times B)) \cup ((A - B) \times (B - A)))^+$

2 Getting familiar with the course notations

Consider I, J, K, and L, respectively instances of relations R, S, T, U :

I	A	B
	1	2
	4	2

J	B	C
	2	3
	2	5

K	A	B
	1	2
	2	3

L	A	D
	1	2
	3	4

1. Give the finite subsets of **att**, **dom**, **relname** that are sufficient for describing these instances.
2. What is the sort, the schema and the arity of each relation?
3. How to note this database instance in the conventional approach?
4. Let t be the second tuple of I.
   - What is the sort of t ?
   - What is the arity of t ?
   - How to note t in the unnamed approach.
   - In this approach, what is $t(1)$?
   - How to note t in the named approach.
   - In this approach, what is $t[A]$?

3 Identifying the approaches

Let D be a database with two relations R and S whose instances are, respectively:

I	A	B
	a	b
	c	b
	a	a

J	A
	d

Represent D in each approach:

1. named and conventional
2. unnamed and conventional
3. named and logic
4. unnamed and logic

4 Defining instances

Let R be a relation of schema $R[A, B]$ and let $S = \{a, b, c\} \subset \mathbf{dom}$. Using only the constants of S, give two instances I, J of R such that (using the unnamed logic approach):

1. $I \cap J = \emptyset$
2. $I \subseteq J$
3. $I - J = \{(a, b)\}$
4. $I \cup J = S \times S$

5 Answering queries

Let A and B be the sets of exercise 1. What are the following sets:

1. the set of x such that (x, c) belongs to $A \times B$
2. the set of (x, y, z) such that $(x, y) \in A \times B$ et $(y, z) \in B \times A$ and $z \in A \cap B$
3. the set of (x, y) such that $y = a$ and $(y, x) \in B \times A$
4. the set of x such that there exists $y \in A \cap B$, $(y, x) \in ((A \times B) \cap (B \times A))$
5. the set of x such that for all $y \in A$, $(y, x) \in ((A \times B) \cap (B \times A))$
6. the set of (x, y) such that $x \in A - B$ or $y \in A \cap B$

6 Modeling relations

Consider the following text:

A noir, E blanc, I rouge, U vert, O bleu : voyelles,
Je dirai quelque jour vos naissances latentes :
A, noir corset velu des mouches éclatantes
Qui bombinent autour des puanteurs cruelles,

Golfes d'ombre ; E, candeurs des vapeurs et des tentes,
Lances des glaciers fiers, rois blancs, frissons d'ombelles ;
I, pourpres, sang craché, rire des lèvres belles
Dans la colère ou les ivresses pénitentes ;

U, cycles, vibrement divins des mers virides,
Paix des pâtis semés d'animaux, paix des rides
Que l'alchimie imprime aux grands fronts studieux ;

O, suprème Clairon plein des strideurs étranges,
Silences traversés des Mondes et des Anges :
- O l'Oméga, rayon violet de Ses Yeux !

We need to model the relation between vowels and colors on the one hand, and the relation between colors and objects on the other hand.

Represent these relations in the relational model using

- the unnamed logic approach
- the named conventional approach

These relations are used to answer the following queries:

1. what is the color associated with "E" ?
2. what is the vowel associated with "herbe" ?
3. what vowel is associated to "clairon" ?
4. list the objects associated with "U" ?
5. For each object list the corresponding vowel.

Express each of these queries, using the form of queries of Exercise 5.