# First Test

**Linguagens Para Domínio Específicos**
**Domain-Specific Languages**
**2014/15**
**Segundo Teste – 21st of April 2015**
**Departamento de Informática**
**Universidade Nova de Lisboa**
**(2 hours)**

Good Luck!

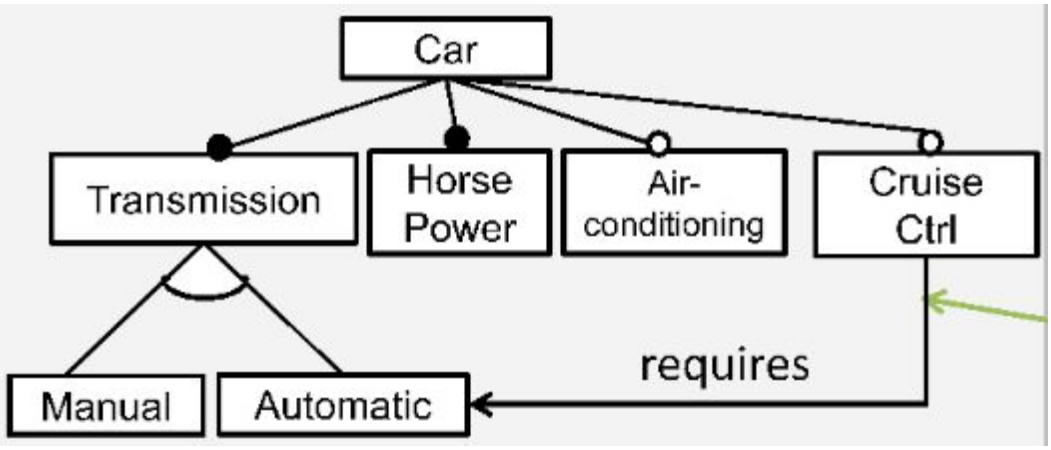
**Part I – Definitions LDE / DSL**

1. What is a Domain and how do we define it?

2. Discuss the following claim: “Domain Engineering is Development for reuse, while Application Engineering is Development with Reuse.” Mention the traditional re-use strategies in Application Development with re-use introducing its porsitive and negative aspects.

3. What are the advantages and disadvantages of GPLs and DSLs?

**Parte II – Feature Models**




1.How many product variants result from all the possible configurations of this Feature Model?

2. Tanslate this Feature Model to the corresponding propositional logic expression:

**Parte III – Models and Metamodels**

1. What is a Model and a Metamodel and how do these concepts relate to DSLs?

2. The work by Thomas Khune presented in class mentions two kinds of model roles: Token Model and Type Model. Please define them and give examples:

3. Consider the following description of a DSLfor Lego Vehicles:

ILego is a small domain-specific language (DSL) to control a number of Lego vehicles to simulate platooning movements. The idea of platooning is to link cars into a trainlike group, which can save fuel, fit more cars on the road, and potentially improve safety. In the group of cars, one car is leading the other ones and it is taking charge of the route to follow by the platoon. Therefore, the platooning described in the instance model using this DSL will have one leading vehicle and a number of following vehicles. The platooning DSL will describe the vehicles taking part in the platoon, the route that these vehicles need to follow and constraints on the vehicles.

Consider the following Examples of code in the textual DSL of this language:

```
1  Box:
2      up 10
3      left 50
4      down 10
5      right 20
6      up 30
```

This is the example of the definition of the BoundingBox (world limits) in Xtext editor: The platoon will move inside the Box. You can assume that in the beginning the robot is facing north (the up direction). The up direction corresponds to the north, the left and right directions correspond to the west and the east respectively and the down direction corresponds to the south.

```
1  platoon:
2      LV Lego0 route R1
3      FV Lego1 front runner Lego0
4      FV Lego2 front runner Lego1
5
6  route R1:
7      forward(10)
8      turn Left
9      forward(50)
10     turn Right
11
12 constraints:
13     20 <= headway <= 30
```

This is an example of the definition of the Platoon in Xtext editor: there is a leading vehicle called Lego0 and two following vehicles called Lego1 and Lego2 (lines 2-4). All the vehicles in the platoon follow the same route R1 (lines 6-10). The distance between vehicles is between 20cm and 30cm (lines 12-13)

Propose the metamodel (Abstract syntax) for this DSL, use a metamodeling notation inspired in Ecore:

4. Consider now the following excerpt of a the sublan-guage “Business Logic” of the visual language OutSystems® (see the technical reference as appendix):


Suppose you want to build a visual editor for the concepts (only) modeled in the instance model. Please present a possible metamodel (ignore the overall semantics of the language):

**Parte III – Model Transformations - Concepts**

1 - Define the following terms regarding model transformations: Endogenous, Exogenous, Out-place, In-place, Vertical and Horizontal.

2- How would you classify, completing the form below, the following purposes for model using model transformations: Optimization, Refinement, Simulatiom, Analysis and Reverse Engineering.

| | **Exogenous** | **Endogenous** | **Either** |
|---|---|---|---|
| **Out-Place** | | | |
| **In-Place** | | | |
| **Either** | | | |

| | **Exogenous** | **Endogenous** | **Either** |
|---|---|---|---|
| **Vertical** | | | |
| **Horizontal** | | | |

FIM!