

## Model-based Software Development

### 2024.06.24. Exam – Group A

Name: .....

Neptun: .....

#	Points
1	/ 10
2	/ 4
3	/ 4
4	/ 4
5	/ 4
6	/ 6
7	/10
8	/ 6
Exam $\Sigma$	/48
Sum $\Sigma$	
Grade	

1. Choose the 1 correct answer for each of the following questions! Correct answers are worth 1 point, incorrect answers are worth -1 point.

Which phase directly precedes semantic analysis in a classic compiler (also considering optional phases)?

<b>A)</b> transformation	<b>B)</b> optimization	<b>C)</b> code generation	<b>D)</b> none of the above
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Which of these has a type?

<b>A)</b> lexeme	<b>B)</b> token	<b>C)</b> both of the above	<b>D)</b> none of the above
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What is true about the LL(k) analysis?

<b>A)</b> prediction algorithm	<b>B)</b> fast	<b>C)</b> both of the above	<b>D)</b> none of the above
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Which of these is a type with special handling in a type hierarchy?

<b>A)</b> AnyType	<b>B)</b> NumberType	<b>C)</b> StringType	<b>D)</b> none of the above
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What is the advantage of generating intermediate code?

<b>A)</b> needs a special compiler	<b>B)</b> multiplatform compilation	<b>C)</b> easy to generate	<b>D)</b> none of the above
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The language OCL is a(n) ....

<b>A)</b> imperative textual lang. for visual languages	<b>B)</b> visual query language	<b>C)</b> both	<b>D)</b> neither
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The MOF...

<b>A)</b> is for creating visual DSLs	<b>B)</b> is a UML Profile	<b>C)</b> is not for metamodeling	<b>D)</b> has its full toolset implemented in ECore
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What is part of the abstract syntax in a Java development environment?

<b>A)</b> Functions	<b>B)</b> Comments	<b>C)</b> Code coloring	<b>D)</b> Font
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In the Y design model, which step is automated?

<b>A)</b> Architecture modeling	<b>B)</b> Architecture verification	<b>C)</b> Component implementation	<b>D)</b> Maintenance
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An OCL precondition is defined on a ...

<b>A)</b> function	<b>B)</b> documentation	<b>C)</b> source file	<b>D)</b> numerical value
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2. What is a projectional editor, what are its advantages compared to traditional editors? (4p)  
3. Compare Blockly and MOF based on a practical example in 6-8 sentences (4p)  
4. Introduce Design Space Exploration (DSE)! What are the inputs and outputs? (4p)  
5. What do we call Dirty Incrementality in incremental transformations? (4p)  
6. Based on the following CF grammar analyze the following sentence using the LL method! (6p)

Grammar:

- (1)  $S \rightarrow ABC$
- (2)  $A \rightarrow a$
- (3)  $B \rightarrow AB$
- (4)  $B \rightarrow b$
- (5)  $C \rightarrow BCc$
- (6)  $C \rightarrow c$

Sentence:

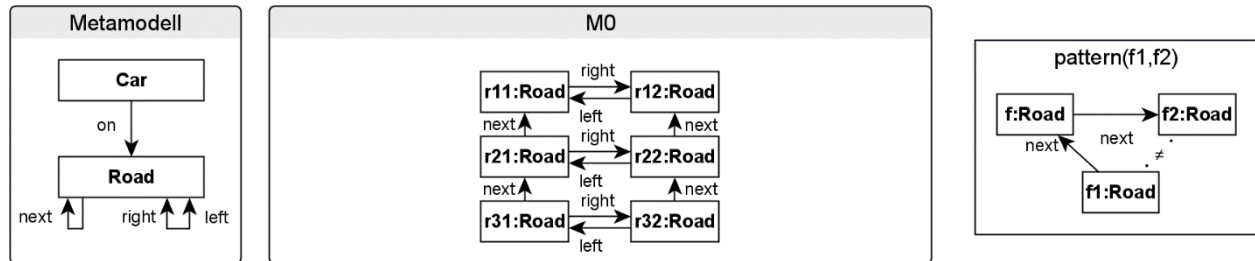
aaababcc

Név: .....

Neptun kód: .....

7. Define the following graph transformation rule! (10p)

When testing self-driving vehicles using simulators, we aim to identify potentially dangerous traffic situations. To model these traffic situations, we use the Metamodel shown below, where we can model road segments (*Road*), the sequential (*next*) and adjacent (*left* and *right*) relationships of the roads, as well as place cars (*Car*) on the roads (*on* reference). The M0 model shows a two-lane road.



- lease provide all the matches of the  $pattern(f1, f2)$  graph pattern found on the right side of the M0 model (please use the table below), and briefly explain the meaning of the pattern. (4p)
  - Provide a graph transformation rule (with graphical notation) that can be used to find a road segment suitable for testing lane following on a given map. (6p)
    - The precondition of the transformation is to find a sequence of three road segments (*Road*) that lead into each other (with the *next* reference) and do not form a circle.
    - An additional precondition of the transformation is that only left-side lanes can be selected (to avoid the possibility of overtaking)!
    - During the execution of the transformation, place two cars (*Car* objects) on the first and last road segments (using the *on* reference).
8. Create a feature model for the following task: cars focusing on their components. The model should be able to describe the differences of different car models and must contain at least one of all types of connections and at least 10 functions in total! Explain the structure of the model briefly! (6p)