

Exam Modeling and Verification 2021

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Based on the two selected questions, you should coherently present the theory behind the concepts, when these concepts can be applied and illustrate them through well chosen examples. You are encouraged to pick up other concepts around your questions and use them to support your presentation and make connections to other topics of the course.

1 AADT : Syntax and Semantics

- Q 1 : 1.1 Definition of AADT Signature
 - Definition of S-sorted set
 - Role of the operations
 - Definition of terms (with variables)
- Q 2 : 1.2 Equations and conditional axioms definition
 - How to use Graceful presentations
- Q 3 : 1.3 Examples (Set, Tables, Lists)

2 AADT : Equational Proofs

- Q 4 : 2.1 What are Equational theories and Inductive theories?
- Q 5 : 2.2 Hierarchies in Algebraic Abstract Data Types
 - Sufficient completeness
 - Hierarchical consistency

3 AADT : Rewriting

- Q 6 : 3.1 Rewrite Systems, rewriting of terms, definition.
- Q 7 : 3.2 Properties of rewrite systems : proof of equalities, termination, confluence.
- Q 8 : 3.3 Operational view, definition of strategies.

4 CTL

Q 9 : 4.1 CTL syntax of the operators and extended syntax of CTL operators

Q 10 : 4.2 CTL semantics of the operators

Q 11 : 4.3 Philosophers example and CTL properties of other examples

5 CTL model checking

Q 12 : 5.1 CTL model checking

— Recursive definitions

Q 13 : 5.2 Fixpoints and Operators implementation (algorithms)

6 Decision Diagrams

Q 14 : 6.1 Definition of SFDD

— Build SFDD

— Factorize nodes / Remove useless nodes

Q 15 : 6.2 Canonicity and Efficient implementations

Q 16 : 6.3 Operations on SFDD

Q 17 : 6.4 Encoding and state space computation of Petri Nets

— General Algorithm

— Operations

Q 18 : 6.5 Encoding Kripke structure and Model checking CTL with SFDD