



## Languages and Tools for Object-Oriented Development

### Exam Winter Semester 2006/2007

February 23<sup>rd</sup>, 2007

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Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

#### Rules:

1. The exam is closed book. That means that the only things you are allowed to have on your desk or use during the exam are pens and the exam itself.
2. All phones off. A switched on phone is considered cheating.
3. Keep your eyes on your own work.
4. Cheating will cause you to fail this exam.

#### Additional information:

- The exam will take 90 minutes.
- Each problem is associated with a number of points. This is also the amount of time in minutes we expect you to take for the answer (the total sum is 75).
- Please put your student identification as well as a passport/official id card on the table. We need to check these.
- Don't forget to put your name and student number on each page.
- If you draw into existing diagrams, please think *before* you draw to keep your answer readable.
- We took the utmost care to make the English and German version semantically identical. In case of doubt, you may inspect both versions on the front desk.
- We have more paper, should you need some, ask.

**Good luck!**

**Task 1: Object Orientation.**

- a) Summarize the differences between comparing object references vs. comparing object equality. (3 pts)
- b) Summarize the differences between upcasting vs. downcasting an object reference, and the possible consequences regarding exceptions. (3 pts)
- c) Elaborate on the phrase “Exceptions constitute an alternative control-flow mechanism”. What are the other control-flow mechanisms? (continue your answer on the reverse of this sheet) (5 pts)

**Task 2: Modeling Tools.**

(a) Explain why Design-by-Contract is useful when developing frameworks. (5 pts)

(b) What is understood under the term “roundtripping”? (3 pts)

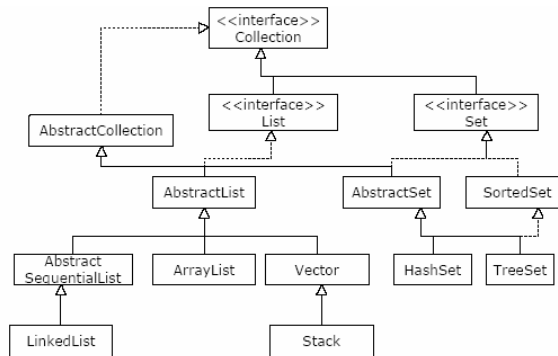
**Task 3: Project Management**

(a) Describe the information content of a Gantt chart  
(provide your answer on the reverse of this sheet) (3 pts)

(b) Describe the information content of a PERT chart  
(provide your answer on the reverse of this sheet) (3 pts)

**Task 4: OO Libraries and extensions**

Figure 1 depicts some classes and interfaces from the Java Collections Library. Based on that diagram, answer the following questions:



**Figure 1: Fragment of the Java Collections Library**

(a) What does it mean for TreeSet to have two super types (AbstractSet and SortedSet)? (3 pts)

(b) Which functionality do Lists and Sets have in common? (3 pts)

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**(c)** Why are components useful in describing the architecture of a software system as compared to a functional decomposition? (4 pts)

**(d)** Define framework. (4 pts)

**(e)** Mention the interplay between frameworks and design patterns. (3 pts)

**Task 5: Implementation and change**

(a) The usage of a Revision Control System implies adopting a conflict resolution strategy. In this context, explain

(a.1) a pessimistic approach, and (a.2) an optimistic approach to conflict resolution.

(8 pts)

**Task 6: Integrated Development Environments**

(a) Define refactoring.

(4 pts)

(b) Describe the code transformation performed by the “Encapsulate field” refactoring.  
(provide your answer on the reverse of this sheet)

(6 pts)

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**Task 7: Testing**

**(a)** Define (a.1) functional and (a.2) non-functional requirements (6 pts)

**(b)** In the context of testing, what are the difficulties associated to testing  
(b.1) non-functional requirements and (b.2) distributed systems (5 pts)

**(c)** What is a “regression suite” and why is JUnit useful in this regard?  
(provide your answer on the reverse of this sheet) (4 pts)