The University of Texas at Dallas
Computer Science Program

Test 2 August 5, 1997

Conditions: Closed book Duration: 90 minutes

Write legibly; unreadable answers are not answers!

Name: ______________________________

{Please underline last name}

Student Number: ______________________________

1. ____________ /30

2. ____________ /30

3. ____________ /10

4. ____________ /10

5. ____________ /10

6. ____________ /10

Total ____________ /100

1. [30 marks]

For each of the following ten statements, indicate whether it is true (mark T) or false (mark F). (No penalty for a wrong answer)

__T__ This is test 2 for CS6359.

____ **1.** As opposed to dynamic models, functional models specify the inputs to the system, the outputs from the system, and structural relationships between them.

____ **2.** UML was originally proposed as an Object-Oriented Programming Language to be used during the design of a database, after defining data structures and algorithms.

____ **3.** A CASE tool which supports the use of OMT/UML can automatically generate optimal code, given an analysis model, an architectural model and a detailed-design model.

____ **4.** UML adopts the spirit of component-based software engineering and promotes explicit representation of system components and their dependencies.

____ **5.** In OMT's Object-Oriented approach to dealing with system adaptability, the central concern is how to explicitly represent system adaptability and reason about it.

____ **6.** When using CORBA in developing a software system, modelling the dynamic behavior of the system should precede modelling the static aspect of the system, since CORBA involves distribution of system processes and data over communication networks.

____ **7.** Unlike many other object-oriented methodologies, UML treats "extensibility" as an important feature and enables a designer to group attributes under different categories.

____ **8.** During implementation, each aggregation should be translated into a delegation so as to prevent subclasses from accidentally inheriting attributes of their superclasses.

____ **9.** Unlike a DBMS, an object-oriented programming language does not force an implementor to consider translation of metaclasses or constraints.

____ **10.** Overriding can often result in an efficient implementation, but at the expense of low-level of conceptuality and evolvability.

____ **11.** Through information hiding, a software architectural style (such as a layering scheme) enhances software quality (such as comprehensibility, maintainability and testability).

____ **12.** As often is the case with many other object-oriented methodologies, the primary purpose of invariants in OMT is to find ways to automate software development process.

____ **13.** As opposed to an analysis model, a database does not necessarily represent an object by a single tuple; therefore, a database does not represent its intended application as conceptually as an analysis model.

____ **14.** In building an information system (such as SuperBanking), the first step is the construction of a model of the (projected) system by the use of algorithms, data structures, modules and packages.

____ **15.** Unlike analysis models, implementation models are used to describe the structure of information to be maintained by the system and how such structure helps meet the goals of the intended application.

2. [30 marks]

Circle the best answer to each of the following questions.

1. Which is relevant to Object Design in OMT?

1. tuples and fields
2. software architecture
3. validation testing
4. requirements elicitation
5. none of the above

2. Which is relevant to implementation of control during Object Design in OMT?

1. state machine engine
2. DDL (Data Definition Language)
3. delegation
4. clones
5. none of the above

3. Which is relevant to optimization during Object Design in OMT?

1. allocation of subsystems to hardware
2. links as objects
3. unique object identity
4. derived attributes
5. none of the above

4. Which is relevant to System Modelling?

1. heap
2. state transition diagram
3. context diagram
4. client-server relationship
5. none of the above

5. Which is relevant to analysis in OMT?

1. domain knowledge
2. 1NF (First Normal Form)
3. source module
4. programming languages
5. none of the above

6. Which does OMT provide explicitly in its diagrammatic notation?

1. performance
2. paradoxes
3. formal semantics
4. temporal constraints
5. none of the above

7. Which is the role of a DBMS in OMT?

1. analysis
2. system design
3. object design
4. implementation
5. none of the above

8. Which is relevant to System Design in OMT?

1. bubble sort
2. decision-making process
3. unit testing
4. maximum coupling
5. none of the above

9. Which is irrelevant to OMT?

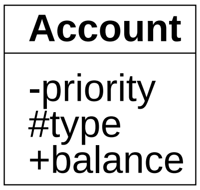
1. AND decomposition
2. OR decomposition
3. OR association
4. disjoint subclasses
5. all of the above

10. Which is irrelevant to any sequence diagram in UML?

1. timing constraint
2. concurrent objects
3. events
4. private derived attributes
5. all of the above

3. [10 marks]

Consider the following class diagram in UML:

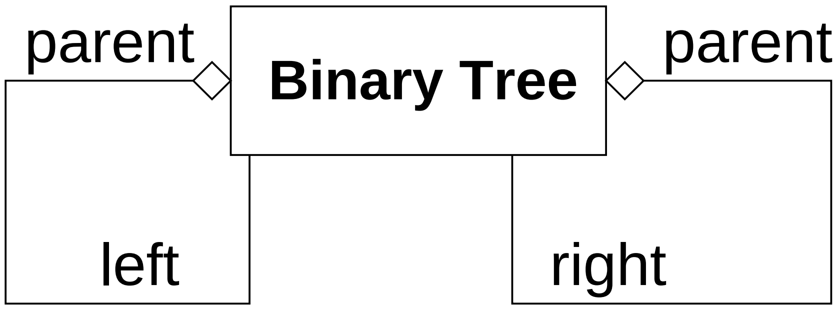


- **a. [5 marks]** Precisely and concisely explain the meaning of the symbols associated with the attributes.

- **b. [5 marks]** Precisely and concisely explain how the class diagram can be translated into a DBMS.

4. [10 marks]

The following is an incorrect model of a binary tree.



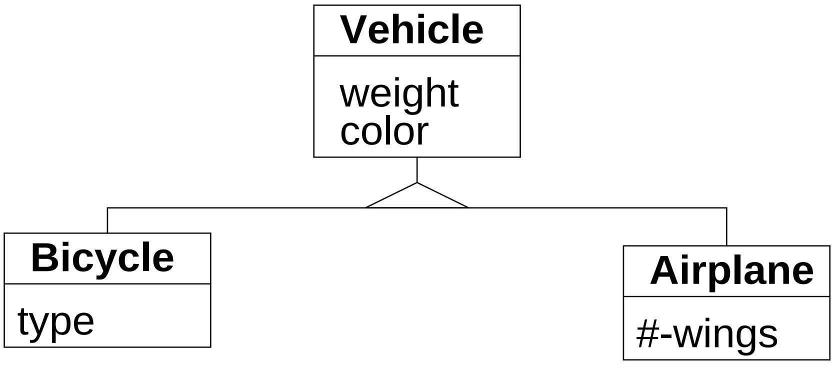
Present a correct model of a binary tree.

5. [10 marks]

Using a diagrammatic example, precisely and concisely explain how the transitivity of aggregation should be translated into an implementation.

6. [10 marks]

Consider the following subclass hierarchy:



- **a. [5 marks]** Present a couple of alternatives for implementing the hierarchy in a DBMS

- **b. [5 marks]** Present a tradeoff analysis (i.e., relative strengths and weaknesses) of the two alternatives.