

# Quiz 1 for CSC 432: Database Management

## 100 points

25 September 1996, 10:15–11:05 AM

June 20, 2000

### Instructions

If you finish early, please try to remain seated or move out discreetly so as not to disturb others.

This quiz is closed-book. However, a one-page crib sheet may be used. Crib sheets may not be shared. Collusion or cheating of any form is forbidden. You can be asked to explain your solutions verbally.

There are no trick questions in this quiz. If you think there is some ambiguity, please make and state additional assumptions, but be prepared to justify why those assumptions were necessary. If you are unable to produce a formal answer, give an English description for partial credit.

### 1 3-Schema Architecture

1. (10 points) List 4 advantages of database systems (other than “sharing data”).  
Also name 1 disadvantage of database systems (other than “higher impact of failure”) and identify its corresponding advantage. For example, “higher impact of failure” is a consequence of “sharing data.”
2. (20 points) Describe the 3-schema architecture in the context of the *Dream Home* database. Include 2 views of your choice. (Number of words expected: 150–300.)

### 2 ER Modeling

Consider a situation similar, but not necessarily identical, to the *Dream Home* database. The entities are Renter, Property, and Staff, and the relationships are (Renter) Views (Property), (Staff) Shows (Property), (Staff) Manages (Property), (Staff) Assists (Renter).

The following knowledge is given:

- Each Renter is assisted by one Staff.
- Each Staff can assist several Renters.
- Each Renter can view several Properties, all shown by the Staff who assists them.
- Each Staff can show several Properties that they manage to Renters that they assist.
- Each Property is managed by exactly 1 Staff.

The following ER model is given (see picture):

- (Renter) Views (Property); 1-M
- (Staff) Shows (Property); 1-M

1. (15 points) Describe and remove a fan trap from this model.
2. (15 points) Describe and remove a chasm trap from the model you produced above.

### 3 Relational Algebra

Consider the following query on the *Dream Home* database.

*Given a staff member, list the names and phone numbers of the owners whose properties he or she manages.*

Assume last names are unique. The input and output for this query are

- *input*: staff member's last name, **name**
- *output*: a relation **res(O\_LName, O\_Telno)**

For example, running the query for **name** = 'Howe' yields an empty relation, but running the query for **name** = 'Beech' yields

**res**

O_LName	O_Telno
Shaw	0141-225-7025
Farrel	0141-357-7419

- (40 points) Give a sequence of 1 or more relational algebra expressions for the above query.