

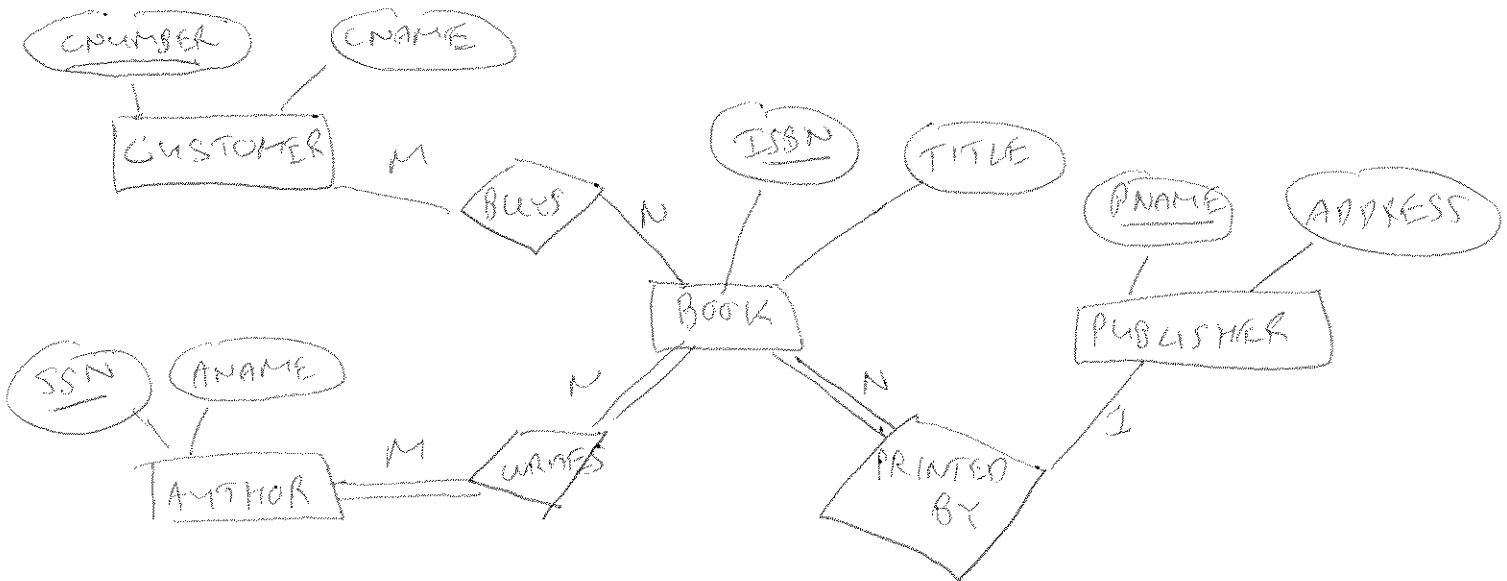
CSCI 6622 — Databases — 14 Winter
HW 3, Due: 3/14/14 Friday

- HW3 is due at the start of class on 3/14/14 Friday and will not be accepted after the start of class on 3/26/14 Wednesday
- **Project due date** The project is due at the start of class on 3/19/14 Wednesday and will not be accepted after the start of class on 3/26/14 Wednesday
- The presentations will be on some of the following days : 3/14/14 Friday, 3/19/14 Wednesday, 3/21/14 Friday, 3/26/14 Wednesday
- Quiz 3 will be on 3/21/14 Friday and will cover ER diagrams, ER to relational mapping, normalization, constraints, assertions, DAC and MAC security.
- The Extra Credit problems are due at the start of class on 3/21/14 Friday, and will not be accepted late.
- The final (open book, open notes) will be on 3/28/14 Friday 12.15 pm - 3.15 pm in the usual room.

1. (15 points) Consider the student database from HW1 Problem 3.

You have to draw an ER diagram for this database. Your ER diagram should use the same type of notation we covered in class or the textbook. For each entity, indicate what are the key(s), and for each relationship indicate whether it is partial/total participation and 1 to 1, 1 to many, or many to many. If you are making any assumptions, please state them clearly.

2. (15 points) Consider a database for a bookstore. The ER schema is as follows:



Map this ER schema into a relational schema. Within your relational schema it should be possible to get an answer to the following queries:

Q1: Get the names of the authors of "Gone with the wind."

Q2: Get the names of the customers who bought "Gone with the wind."

Q3: How many books has Addison-Wesley published?

All you have to do is to show your relational schema, and specify all primary keys (by underlining them) and foreign keys (by drawing arrows). You do not have to implement this database, you do not have to write the schema specification in SQL, you do not have to write the SQL queries.

3. (15 points)

The relational instance of relation $T(A, B, C)$ has three rows: $(8, y, 3)$, $(6, z, 3)$, $(7, y, 3)$. Consider each of the following possible functional dependencies. For each of them, you have to figure out if the functional dependency is consistent with the above relational instance? In each case, you only have to give a YES/NO answer i.e. YES if it is consistent, NO if inconsistent. No explanation necessary.

(i) $B \rightarrow C$. (ii) $C \rightarrow A$. (iii) $A \rightarrow C$. (iv) $\{A, C\} \rightarrow B$. (v) $\{B, C\} \rightarrow A$.

4. (15 points) Consider a relation which keeps track of items and manufacturers, $R(itemid, manufname, price, itemname)$ with primary key $\{itemid, manufname\}$. Apart from the functional dependency implied by the primary key, an additional functional dependency is $itemid \rightarrow itemname$.
- Explain why the relation is not in the second normal form.
 - Indicate what changes you would make to put the relation in the second normal form i.e. show the new relational schema. Clearly indicate primary keys and foreign keys.
 - Give an example to demonstrate how the new relational schema is better than the original relational schema by showing a deletion anomaly i.e. some information which can't be deleted with the original relational (without losing some additional information) but can be deleted with the new relational schema. You have to do this as follows:
 - build a small instance (the same information represented with both the original and new relational schema).
 - explain what is the information you want to delete.
 - Briefly explain why the deletion will not work with the original relational schema.
 - Show how the information will be correctly deleted with the new relational schema.
5. (15 points) Suppose we are keeping track of professors and which departments they belong to. The relation is
- $$R(profssn, profname, deptname, deptaddress)$$
- with primary key $profssn$. Apart from the functional dependency implied by the primary key, an additional functional dependency is $deptname \rightarrow deptaddress$.
- Explain why the relation is not in the Boyce-Codd normal form.
 - Indicate what changes you would make to put the relation in the Boyce-Codd normal form i.e. show the new relational schema. Clearly indicate primary keys and foreign keys.
 - Give an example to demonstrate how the new relational schema is better than the original relational schema by showing an insertion anomaly i.e. some information which can't be inserted with the original relational but can be inserted with the new relational schema. You have to do this as follows:
 - build a small instance (the same information represented with both the original and new relational schema).
 - explain what is the information you want to insert.
 - Briefly explain why the insert will not work with the original relational schema.
 - Show how the information will be correctly inserted with the new relational schema.
6. (10 points) For the Elmasri company database, write the SQL to do the following (you do not have to implement these queries, just write them):
- Give Bob the privilege to read the entire PROJECT table, and the privilege to delete rows, and Bob should also be able to pass this privilege on to other users.
 - Revoke Bob's privilege to delete rows, and also revoke the privilege of anybody else who got this privilege from Bob.
 - Give Alice the privilege to insert new rows into the PROJECT table, but Alice can't pass this privilege to other users.
 - Give Mike the privilege to read the ssu and name of those employees who work in the finance department, and Mike should also be able to pass this privilege on to other users.
7. (15 points) For the Elmasri company database, write SQL constraints or assertions for each of the following (each part is to be done independently of the other parts). You do not have to implement these queries, just write them
- No employee can have a salary of more than 98,000.
 - No employee can have more than 6 dependents.

Textbook Extra Credit Problems: Elmasri problems 15.28, 15.29, 7.19, 13.9, 26.34, 26.37. In the older 5th edition these are problems :10.30, 10.31, 3.19, 9.9, 24.15, 24.18