Database Homework1 Written

Shuyu Huang
Sh3967

1. What is a database management system? What are 5 reasons people use DBMS?

Database management system:

- A database management system is a complex software system whose task is to create, access and manage a large complex collection of data.
- The data we used in the system are mostly highly valuable, relatively large.
- The system enables multiple users access and manage data at the same time.
- DBMS touches every aspects of our life. It contains information about a particular enterprise including collections of interrelated data, sets of programs to access the data, and an environment that is both convenient and efficient to use.

5 reasons people use DBMS:

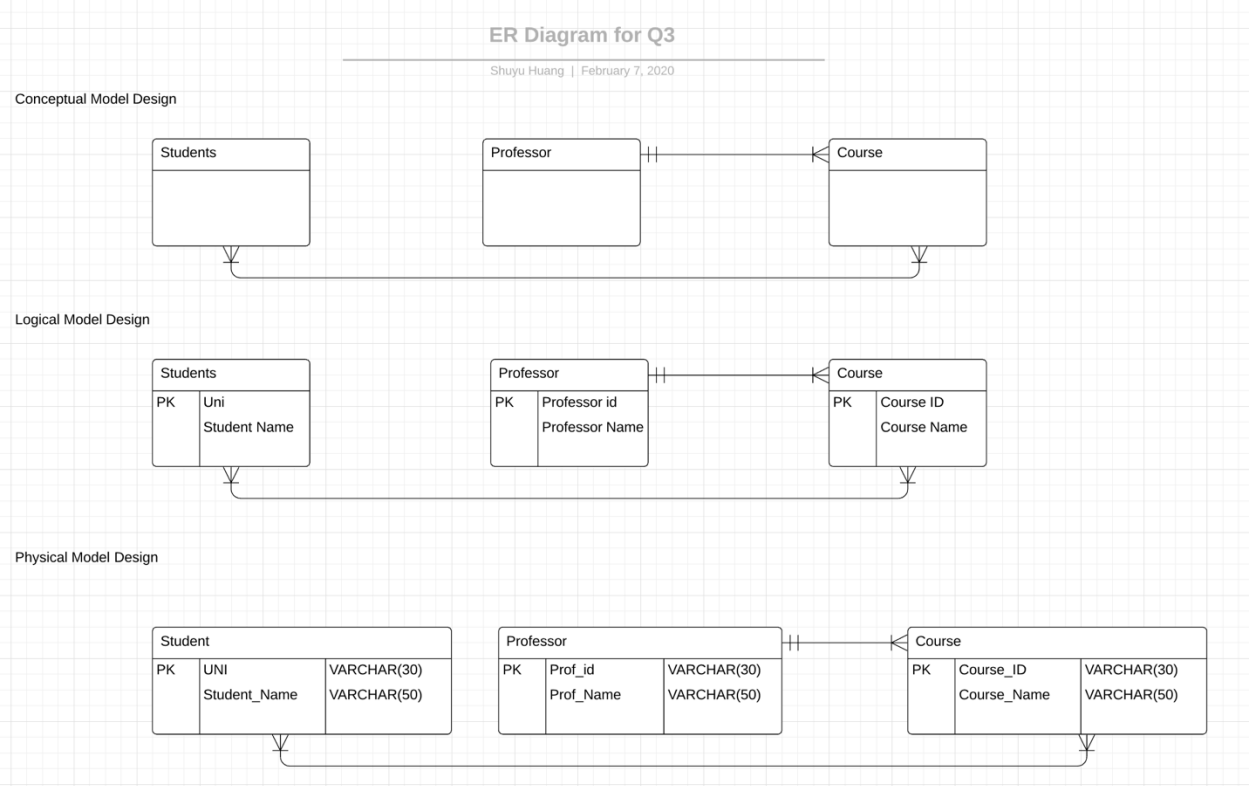
1) DBMS reduces data redundancy and inconsistency. Data can be better managed with database and it support concurrent user access to database.
2) DBMS ensures atomicity of updates.
3) DBMS enables interactions between multiple datasets. (solves data isolation)
4) DBMS provides an easy (convenient) access to data through the operating system.
5) DBMS has an environment that is both convenient and efficient to use by introducing cleverly designed database systems and operating environment.

2. How do DBMS ensure atomicity?

- Atomicity in database is defined as either all updates within the transaction are committed (occurs) to the database. Or none of the updates are committed to the database.
- Fail in maintain atomicity will result in partial updates of data and finally inconsistency in database.
- DBMS ensures atomicity usually by a mechanism that logs or journals to track changes.
- It is done by, firstly, marking state of starting and finishing of transactions. Then, by "read-copy-update" mechanism, DBMS keeps a copy of the data before any update occur. Therefore, by doing so, only the transactions that marked as finished will have updates.

3. What is an ER model? Draw an example ER model for Columbia classes including Students, Professors, and Course IDs. In this example, explicitly show an example of a one-to-many, and many-to-many relationship. (There are many correct answers here)

ER model stands for an Entity-Relationship model. It was developed to be a data structure that implemented in database design. ER model allows specification of an enterprise schemas that represent overall logical structure of a database. ER model consists three elements: entity set, relationship set and attributes.



In this case, a student can take multiple courses (suppose there is no students take 0 course), and one course could be taken by multiple students. Therefore, Students to Course is many-to-many relationship.
For each Professor, he/she can teach one or more courses, but each course can only have one professor. Hence here is a one-to-many relationship.

4. Insert a table that might occur in the relational database version of your ER diagram. What is an example of a key-constraint in this instance?

Example:

Example_col_1	Example_col_2	Example_col_3	Example_col_4
Entry_1	Entry_2	Entry_3	Entry_4

Key-constraint: for a given student and course, there is only one grade

Uni	Student_Name	Prof_id	Prof_Name	Course ID	Course Name	Grade
S01	Amy	P01	Lee	CourseA	Math1	B+
S02	Benny	P01	Lee	CourseA	Math1	A-
S03	Catie	P01	Lee	CourseB	Math3	A
S04	David	P02	Franks	CourseC	Chem1	B

S04	Elle	P02	Franks	CourseC	Chem1	A

Key constraint:
Each student has a unique uni (student id); each course has a unique course id; each professor also has a unique course id. The ids can be considered as the Primary keys respectively.
Also, in a particular course, a student can only get one grade, which also is a primary key.

5. What is the difference between a query language and a programming language?

Query Languages:

- The goal of using query language such as SQL is to manipulate data.
- It is declarative. It can be deemed as tool like calculators. By telling the program your expectation of dataset with codes, it will deal with the problem and generate outputs.

Programming Language

- The goal of using programsming language is to write a program/tool to help you to solve some problems.
- It is imperative. Computer program will act exactly follows what the programming guide. It will not solve problems by itself.