**Project Assignment for Data modeling and database application course**

**Assignment Instructions:**

1. There are two projects, each group choose one to finish all the functions of the requirements. Please read the requirement carefully.
2. Each project contains two parts: report and program. They are submitted by group. Detailed requirements can be found in
3. Project submission deadline: **6th DEC 12:00 AM (NOON).**
4. ***Note***: Security features requirements in the project are not supported by all DBMS, such as SQLite. In that case, you just need to provide the code.

**Project I**

1. Design a relational database (E/R diagram) for a library system, which fulfils the following requirements:

* Information of books, branches of the library, borrowers and book loans are stored in the databases.
* The relationships of books, branches of the library, borrowers and book loans are stored in the databases. When one copy of a book is loaned out from a branch, the due date needs to be stored.
* Books has one title, one publisher, and one or more authors. And there are several copies in each branch of the library.
* The library has several branches which located in different addresses. Each branch has its own name and addresses. Two different branches may have the same name.
* Borrowers have name, address, contact info, etc.
* Borrowers as database users have the right to query the book information, not borrower’s information.
* A book can only be loaned for one borrower at a time.

1. Based on the designed database, write down the SQL for the following queries (the sqls for queries need to be listed in the submitted document):

* How many copies of the book titled "A" and published by "B" are owned by the library branch whose address is "C"?
* How many copies of the book titled "A" are owned by each library branch?
* Retrieve the names of all borrowers who borrowed the book titled "A" for each library branch.
* For each book that is loaned out from the branch "A" and whose due date is today, retrieve the book title, the borrower's name(s), and the borrower's address(es).
* For each branch, retrieve the branch name and the total number of books loaded out from that branch.

1. To design a database step by step, read this [Quick-Start Tutorial on Relational Database Design](http://www.ntu.edu.sg/home/ehchua/programming/sql/relational_database_design.html).
2. Create tables based on your design for this library system in the provided empty SQLite database "empty\_db.db". For each table, the description of table and the corresponding create sql need to be listed in the notebook. One simple example (template) of an education system has been given.

* Rename the db file
* Command for "show tables" with ipython-sql: "%sql SELECT name FROM sqlite\_master WHERE type='table' ORDER BY name;"
* Command for "describe tables" with ipython-sql: "%sql PRAGMA table\_info(Table\_Name);"
* If working with a shell or DOS prompt, Sqlite also provides command ".tables" and ".schema Table\_Name".
* More information on Sqlite can be found at [Sqlite Quick Start](https://sqlite.org/quickstart.html" \t "_blank)
* More information on Postgres can be found at.

**Project II**

1. Design a relational database (E/R diagram) for a software project management system, which fulfils the following requirements:

* Information of projects, information of employees, activities and project plans are stored in the databases.
* The relationships of projects, employees, activities and plans are stored in the databases.
* A software project needs name, start and end date, leader and budget. One project can have several plans.
* An employee has names and their hourly cost.
* Activities in software project can have different types, for example, requirement analysis, architecture design, development, testing, deployment…
* Plans have to contain project, employees and activities with start and end dates. It has to satisfy the requirements from the project time and budget.
* Employees as database users have the right to query the project information, not employee information.
* An activity can be planned to more than one employee, but not the same time period.

1. Based on the designed database, write down the SQL for the following queries (the sqls for queries need to be listed in the submitted document):

* How many employees of for a project titled "A" are involved in its plan “B”?
* Retrieve the names of plans made for project “A” with least cost.
* For each employee retrieve the name, project name and plan name with the most working time.
* Retrieve all the employee name and their least working time with respect to different project.
* Retrieve all the plans for project with order of their working period.

1. To design a database step by step, read this [Quick-Start Tutorial on Relational Database Design](http://www.ntu.edu.sg/home/ehchua/programming/sql/relational_database_design.html).
2. Create tables based on your design for this library system in the provided empty SQLite database "empty\_db.db". For each table, the description of table and the corresponding create sql need to be listed in the notebook. One simple example (template) of an education system has been given.

* Rename the db file
* Command for "show tables" with ipython-sql: "%sql SELECT name FROM sqlite\_master WHERE type='table' ORDER BY name;"
* Command for "describe tables" with ipython-sql: "%sql PRAGMA table\_info(Table\_Name);"
* If working with a shell or DOS prompt, Sqlite also provides command ".tables" and ".schema Table\_Name".
* More information on Sqlite can be found at [Sqlite Quick Start](https://sqlite.org/quickstart.html" \t "_blank)
* More information on Postgres can be found at [Postgres tutorial](http://www.postgresqltutorial.com/).

**Report Criteria**

1. Form: 3-5 pages.
2. Content

Title: Conceptual Design for Library Management/Project Management Database

* 1. Problem Analysis
  2. Conceptual Design (E/R diagram and description)
  3. SQL code (Example can be found in Project-Example.ipynb)
     + Schema and table definition (base table structure, security, integrity).
     + Insert data (test data defined by yourself, at least 10 tuples for each base table).
     + Query question solutions.

1. Template: Project report template.docx.