Database Management Systems(COP 5725)
HW1

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Pledge(Must be signed according to UF Honor Code)
On my honor, I have neither given nor received unauthorized aid in doing this assignment.

Signature _____

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Exercise 1(ER)

The academic world is an interesting example of international cooperation and exchange. This problem is concerned with modeling of a database that contains information on researchers, academic institutions, and collaborations among researchers. A researcher can either be employed as a professor or a lab assistant. There are three kinds of professors: Assistant, associate, and full professors. The following should be stored:

- For each researcher, his/her name, year of birth, and current position (if any).
- For each institution, its name, country, and inauguration year.
- For each institution, the names of its schools (e.g. School of Law, School of Business, School of Computer Science,. . .). A school belongs to exactly one institution.
- An employment history, including information on all employments (start and end date, position, and what school)
- Information about co-authorships, i.e., which researchers have co-authered a research paper. The titles of common research papers should also be stored.
- For each researcher, information on his/her highest degree (BSc, MSc or PhD), including who was the main supervisor, and at what school.
- For each professor, information on what research projects (title, start date, and end date) he/she is involved in, and the total amount of grant money for which he/she was the main applicant.
- Draw an E/R diagram for the data set described above. Make sure to indicate all cardinality constraints specied above. The E/R diagram should not contain redundant entity sets, relationships, or attributes. Also, use relationships whenever appropriate. If you need to make any assumptions, include them in your answer.
- Convert your E/R diagram from question a) into relations, and write SQL statements to create the relations. You may make any reasonable choice of data types. Remember to include any constraints that follow from the description of the data set or your E/R diagram, including primary key and foreign key constraints.

Exercise 2(Relational Algebra)

Suppose you got an internship next summer in Bay Area. And you want to book a plane ticket from Gainesville to San Jose between date1 and date2. Consider the following schema for an airline database (primary key attributes are in **bold**)

- FLIGHTS(**flight_num**, source_city, destination_city, distance)
- DEPARTURES(**flight_num, date**, plane_type, price)
- BOOKINGS(passenger_id, flight_num, date, seat_number)

Express the following queries in SQLs

- Find the direct flights from Gainesville to San Jose.
- Find the possible itinerary that that have one-stop flights from Gainesville to San Jose.
- Find the cheapest direct flight from Gainesville to San Jose.
- Find the cheapest one-stop flights from Gainesville to San Jose.
- Find the passengers who booked a flight from Gainesville to San Jose.
- Find the flights with one stop which still are not full.

Exercise 3

Consider the following, self-explanatory database schema about employees:

- employee(**employ_name**,street,city)
- works(**employ_name**,company_name,salary)
- company(**company_name**,city)
- revenue(**company_name**,revenue)
- manages(**employ_name**,manager_name)

Primary key attributes are underlined. Foreign key attributes have the same names as the primary keys they reference. Express the folloing queries in SQL:

- Find the lowest salary of all maximum salaries payed in each company.
- Companies may be located in serveral cities. Find the names of all companies located in every city in which Small Bank Corporation is located.
- Find the names of the companies that have the most employees.
- Give all managers of Firt Bank Corporation 1 10-percent raise unless the salary becomes greater than $100,000; in such cases, give only 3-percent raise.
- Find the names of all employees who earn more than the average salary of all employees of their company.
- Find the names of companies that have the smallest payroll.
- Find the company which has the maximum revenue per-employee(revene/totalNumberofEmployee)