Database Management Systems

(COP 5725)

Fall 2019

Instructor: Dr. Markus Schneider

TA: Kyuseo Park

Homework 1

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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.

weibin Sun

Signature

For scoring use only:

	Maximum	Received
Exercise 1	30	
Exercise 2	40	
Exercise 3	30	
Total	100	

Exercise 1 (Knowledge Questions) [30 points]

Please provide concise but precise answers.

1. [5 points] Explain the terms “database” and “DBMS” and their relationship.
2. [4 points] List and explain the main problems of file systems.
3. [5 points] What is the ER model? Explain its three components.
4. [4 points] Explain the terms “DDL” and “DML”.
5. [5 points] What are logical data independence and physical data independence?
6. [4 points] Explain the terms “generalization” and “aggregation”, and provide an example for each term.
7. [3 points] What are the advantages of Database Systems if you characterize them by concise phrases of at most three words each?

Exercise 2 (Oracle) [40 points]

Consider the following database table `Employees`.

EID	NAME	GENDER	JOB	HIRED_YEAR	SALARY	CITY
1001	Reilly Martins	F	salesman	2016	1500	Gainesville
1002	Amirah Zavala	M	clerk	2016	1300	Gainesville
1003	Sabrina Contreras	F	salesman	2017	1400	Ocalar
1004	Beulah Farley	M	clerk	2015	1000	Gainesville
1005	Griff Ashton	M	clerk	2013	1100	Jacksonville
1006	Amara Berg	F	analyst	2017	2500	Ocalar
1007	Mazie Herring	M	manager	2019	2000	Jacksonville
1008	Dana Ochoa	F	manager	2016	2200	Ocalar

Use your CISE Oracle account to create this table, and perform the operations below by formulating SQL queries. Provide **SQL statements** for all operations. Show the outputs of all results as **screen snapshots** in Oracle.

(1) [6 points] Create the `Employees` table and insert all the records into the table.

(2) [6 points] Find the names of employees who were hired in 2016.

(3) [5 points] Find the number of employees who live in Gainesville.

(4) [6 points] Find the name of employees whose salary is less than 1300 and work as a clerk.

(5) [6 points] Find the name of employees who are female and work as manager.

(6) [5 points] Display the average salary of all employees. [Note: For answering this query, please look into Oracle SQL manuals how to compute the average of a set of values.]

(7) [6 points] Find those students whose name has ‘re’ or ‘la’ in it. [Note: For answering this query, please look into Oracle SQL manuals how to formulate a substring search.]

Exercise 3 (ER Model) [30 points]

Consider the following requirements about a department management system:

- A user has an email address which is unique, name, date of birth, current address, and age. Age is a derived attribute.
- There are two types of users: students and professors.
- Graduate students are students and have an SSN.
- A professor has a title, tenure status, and an SSN.
- A hometown where users were born has a city name and a state name.
- Graduate students are advised by a professor.
- Students enroll in courses that have a title, a description, year, semester, and credits.
- A professor teaches courses, and an evaluation form is created.
- Students and professors belong to a department that has a unique department ID, name, and office address. The address includes street, city, state, and zip code.

Design an Entity-Relationship diagram that models this scenario and takes into account the requirements listed above. That means that you have to identify suitable entity sets, relationship sets, attributes, keys of entity sets (if not specified), and so on. Further add the cardinalities (1:1, 1:m, m:1, m:n) to the relationship sets.

Exercise 1

1. DB: Integrated and structured repository of large collection of persistent data.
   DBMS: All-purpose software system which supports the user in the definition and have access to the data in the DB. Software level between physical and database and user.

   Relation = Database System = Database Management System + Database

2. <1>Redundancy:
   repeated occurrence of the same data in different files;
   Waste of external memory, increased management and processing costs
   <2>Inconsistency:
   lacking logical concordance of file contents
   Especially caused due to changes
   <3>Data-program dependence:
   Data are directly created and accessed buy an application program
   Extensions of the functionality of an application program lead to new requirements of the file structure and to a restructuring of files
   <4>Inflexibility:
   Analysis of data as well as the realization of new applications is problematic
   Data from several files can only be combined with high costs

3. ER model is used to define the data elements and relationship for a specified system.
   Components: objects, attributes, relation

4. DDL(data definition language):
   Language to manipulate a database schema

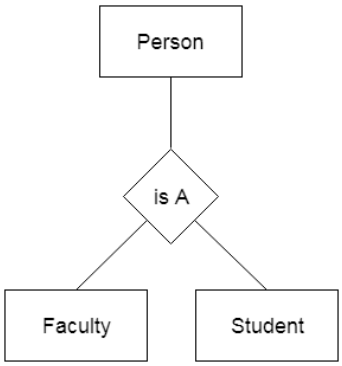
(meta) data for the description of a schema(data dictionary, system catalog)
Permits the specification of implementation details

DML(data manipulation language)
Query language for the retrieval of data objects in a database.
"actual" data manipulation language for the change of store data objects, for the insertion of new data, and for the deletion of store data
A query, which is formulated by a user with the objects of his/ her external level, is translated into an efficient query, which rests on the object of the physical level
In general realized as a non-procedural language
-user specifies which data are searched for but not how data can be found

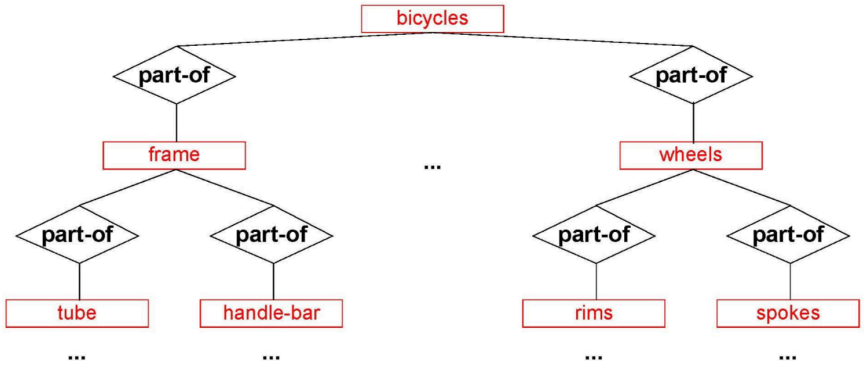
5. Logical data independence
-changes of the conceptual schema do not have impact on external schemas

Physical data independence
-changes of the physical schema do not have impact on the conceptual schema and thus also not to external schemas

6. Generalization:
Generalization is the process of extracting common properties from a set of entities and create a generalized entity from it. For example: Faculty and Student can be generalized and create a higher level entity Person.



Aggregation:
In aggregation, the relation between two entities is treated as a single entity. In aggregation, relationship with its corresponding entities is aggregated into a higher level entity. For example: construction of bicycle



7. Data independence, Efficient data access, Common data basis, Concurrent data access， controlled

redundancy, Consistency of data, Integrity of data, Data security, Flexibility

Exercise 2

（1）create table Employeess

(EID integer,
NAME varchar(25) not null,
GENDER varchar(4) not Null,
JOB varchar(20) not null,
HIRED_YEAR integer,
SALARY numeric(8,2),
CITY varchar(25) not null,
primary key (EID))

```
insert into Employees values(1001, 'Reilly MArtins', 'F', 'salesman', 2016, 1500,'Gainesville');
insert into Employees values(1002, 'Amirah Zavala', 'M', 'clerk', 2016, 1300,'Gainesville');
insert into Employees values(1003, 'Sabrina Contreras', 'F', 'salesman', 2017, 1400,'Ocalar');
insert into Employees values(1004, 'Bealah Farley', 'M', 'clerk', 2015, 1000,'Gainesville');
insert into Employees values(1005, 'Griff Ashton', 'M', 'clerk', 2013, 1100,'Jacksonville');
insert into Employees values(1006, 'Amara Berg', 'F', 'analyst', 2017, 2500,'Ocalar');
insert into Employees values(1007, 'Mazie Herring', 'M', 'manager', 2019, 2000,'Jacksonville');
insert into Employees values(1008, 'Dana Ochoa', 'F', 'manager', 2016, 2200,'Ocalar');
```

	EID	NAME	GENDER	JOB	HIRED_YE...	SALARY	CITY
1	1001	Reilly ...	F	salesman	2016	1500	Gainsville
2	1002	Amirah ...	M	clerk	2016	1300	Gainsville
3	1003	Sabrina...	F	salesman	2017	1400	Ocalar
4	1004	Bealah ...	M	clerk	2015	1000	Gainsville
5	1005	Griff A...	M	clerk	2013	1100	Jackson...
6	1006	Amara Berg	F	analyst	2017	2500	Ocalar
7	1007	Mazie H...	M	manager	2019	2000	Jackson...
8	1008	Dana Ochoa	F	manager	2016	2200	Ocalar

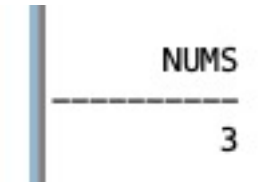
（2）

```
select NAME, HIRED_YEAR from Employees where HIRED_YEAR = 2016;
```

NAME	HIRED_YEAR
Amirah Zavala	2016
Reilly MArtins	2016
Dana Ochoa	2016

（3）

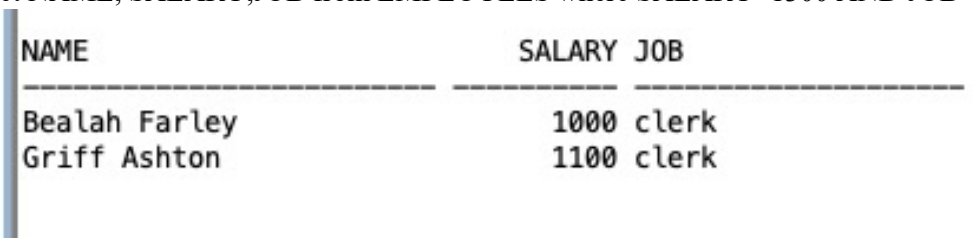
```
SELECT COUNT(CITY) AS nums FROM EMPLOYEES WHERE CITY='Gainesville';
```



NUMS
3

(4)

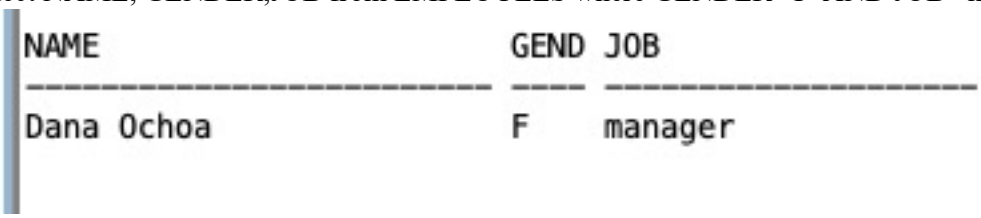
select NAME, SALARY,JOB from EMPLOYEES where SALARY<1300 AND JOB='clerk' ;



NAME	SALARY	JOB
Bealah Farley	1000	clerk
Griff Ashton	1100	clerk

(5)

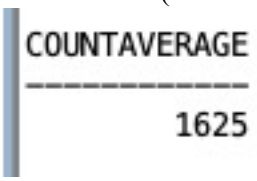
select NAME, GENDER,JOB from EMPLOYEES where GENDER='F' AND JOB='manager' ;



NAME	GEND	JOB
Dana Ochoa	F	manager

(6)

SELECT AVG(SALARY) AS CountAverage FROM EMPLOYEES;



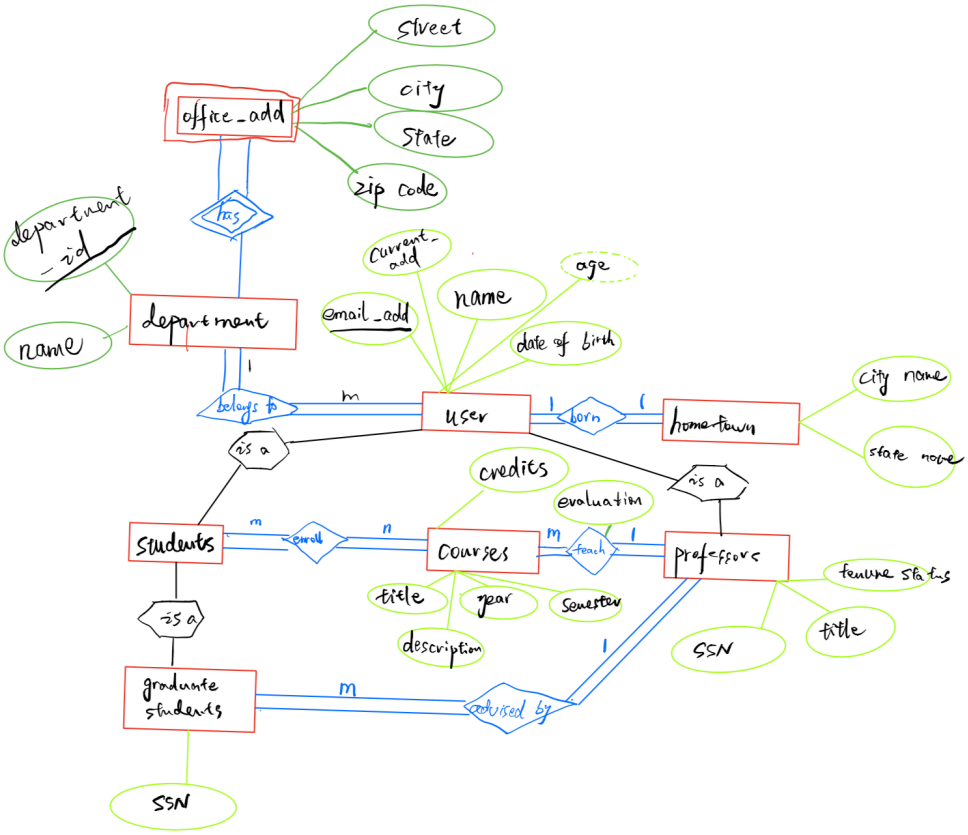
COUNTAVERAGE
1625

(7)

SELECT NAME FROM EMPLOYEES WHERE name LIKE '%re%' or name like '%la%';

NAME
Amirah Zavala
Sabrina Contreras
Bealah Farley

Exercise 3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State
zip code
office_add
has
department_id
name
department
current_add
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