

Database Management Systems

(CIS 4301 UF Online)

Fall 2019

Instructor: Dr. Markus Schneider

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.



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.

A database is a collection of information that's organized in some fashion in order to be accessed or updated. A DBMS (database management system) is software that manages and manipulates databases, providing complex query results for the end-user.

2. [4 points] List and explain the main problems of file systems.

A file system is more unstructured and unspecific than a database. File systems also have the problem of being more redundant, less flexible in accessing data, and less consistent than its DBMS counterpart.

3. [5 points] What is the ER model? Explain its three components.

The ER model is a conceptual view of a database and is a good first-step in designing a DBMS. The three components of the ER model are: Entity, Attribute and Relationship. Entity is some sort of object that can be related to the real world. For instance, different “entities” in a company could be something like accountant, sales representative, CEO and more. Entities are notable in that they are distinguishable and exist independently. Attributes, on the other hand, are “attached” to an entity. For instance, the accountant entity mentioned above would have a name, employee ID and a salary attached to it. Multiple types of attributes can exist, such as simple, composite, derived, and single or multi valued. A relationship describes how several entities are associated with each other. For instance, using the above example, the accountant would have the relationship “works at” with the company he/she works at.

4. [4 points] Explain the terms “DDL” and “DML”.

DDL refers to Data Definition Language and is used to create or modify objects in a database, such as schemas, tables, indexes and deletion.

DML refers to Data Manipulation Language and is used in manipulating data in a database, such as inserting tables, accessing data, deleting data and modifying data.

5. [5 points] What are logical data independence and physical data independence?

Logical data independence stores information about how data is managed. Changing the format of a table here wouldn't change the actual data itself.

Physical data independence has the ability to change the actual data itself without modifying the schema or logical data.

6. [4 points] Explain the terms “generalization” and “aggregation”, and provide an example for each term.

Generalization describes a situation where two or more entities have similar attributes, which can then be generalized to a higher entity. In other words, it describes an is-a relationship. For instance, in a university a professor and a student can both be described as a person. The professor would have an is-a relationship with entity “person”, and student would have an is-a relationship with entity “person”.

Aggregation is when several entities that are connected by a common relationship together require a relationship to an additional entity. An example would be in computer programming. The employee entity might have a relationship to a project entity. These together would require the use of a computer entity. So, a relationship can be established by connecting a “requires” relationship between computer programmers working on a project and machinery (computer).

7. [3 points] What are the advantages of Database Systems if you characterize them by concise phrases of at most three words each?

Using concise language has the benefit of querying phrases much more quickly and it provides the ability to append multiple words or phrases together if needed.

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.

```
CREATE TABLE Employees(EID integer,
```

```
Name varchar(50),
```

```
Gender varchar(1),
```

```
Job varchar(50),
```

```
Hired_Year integer,
```

```
Salary integer,
```

```
City varchar(50),
```

```
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,'Beulah Farley', 'M','clerk',2015,1000,'Gainesville');

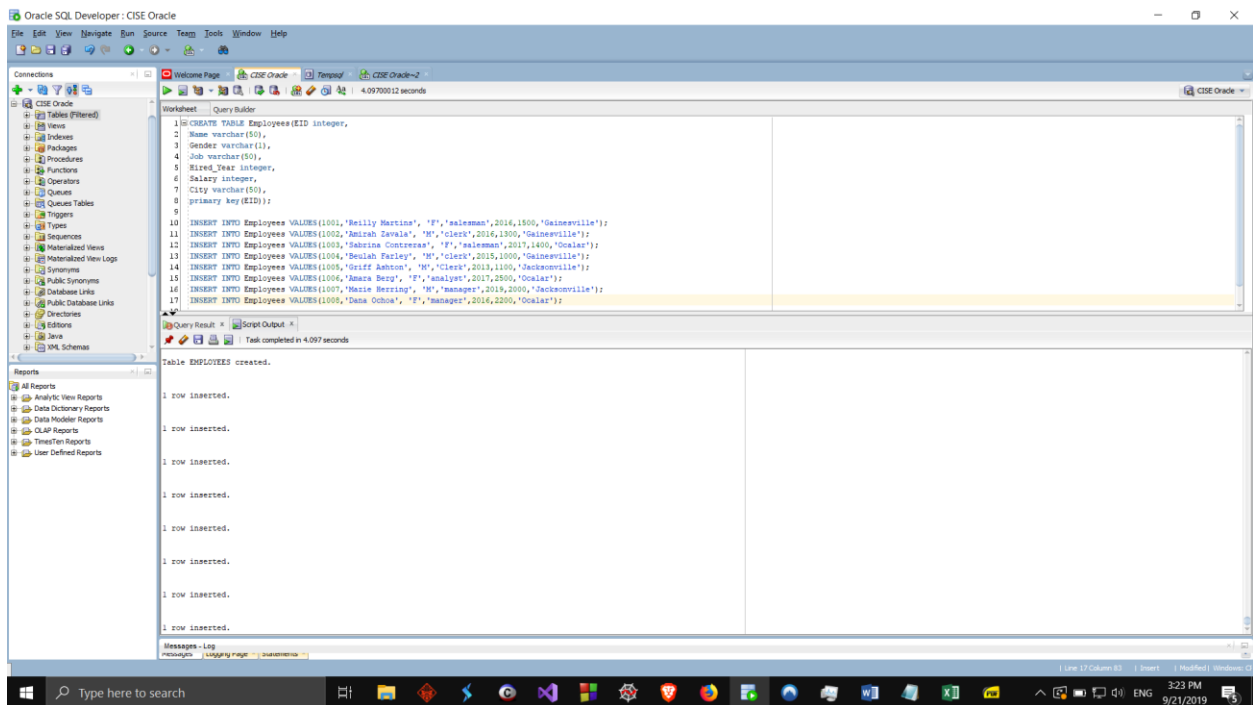
INSERT INTO Employees VALUES(1005,'Griff Ashton', 'M','Clerk',2013,1100,'Jacksonville');

INSERT INTO Employees VALUES(1006,'Amara Berg', 'F','analyst',2017,2500,'Ocalar');

INSERT INTO Employees VALUES(1007,'Mazie Herring', 'M','manager',2019,2000,'Jacksonville');

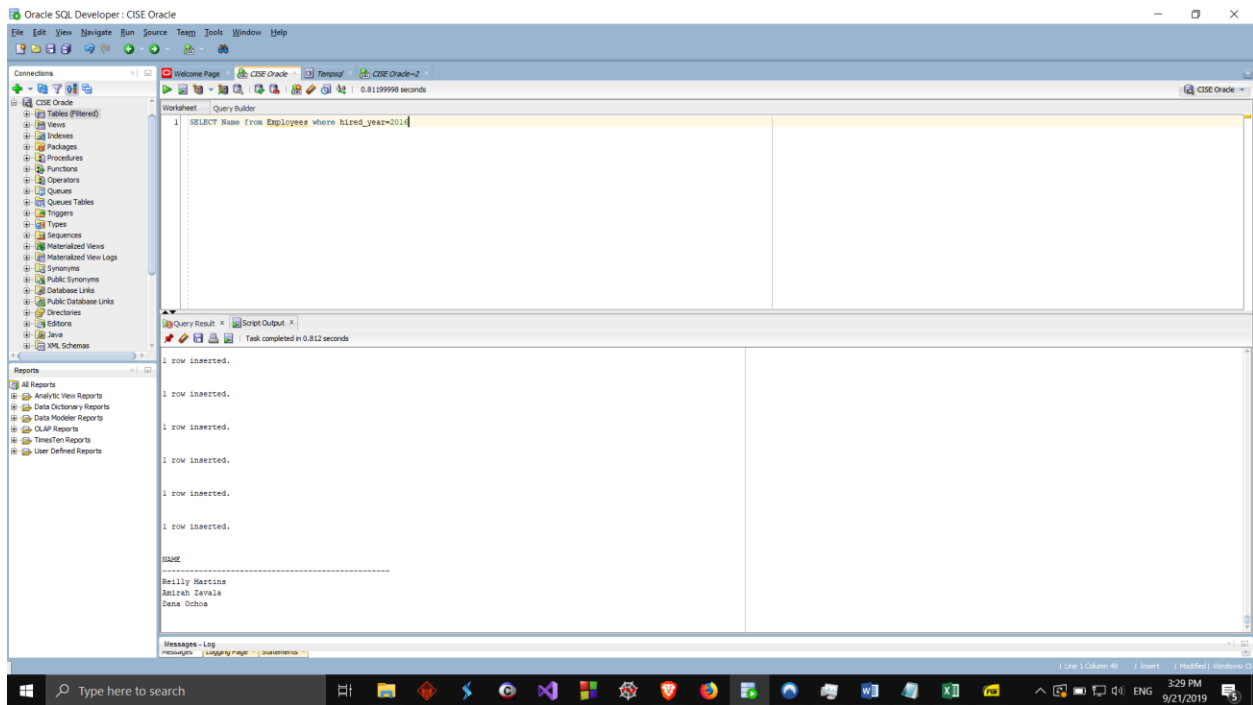
INSERT INTO Employees VALUES(1008,'Dana Ochoa', 'F','manager',2016,2200,'Ocalar');

```



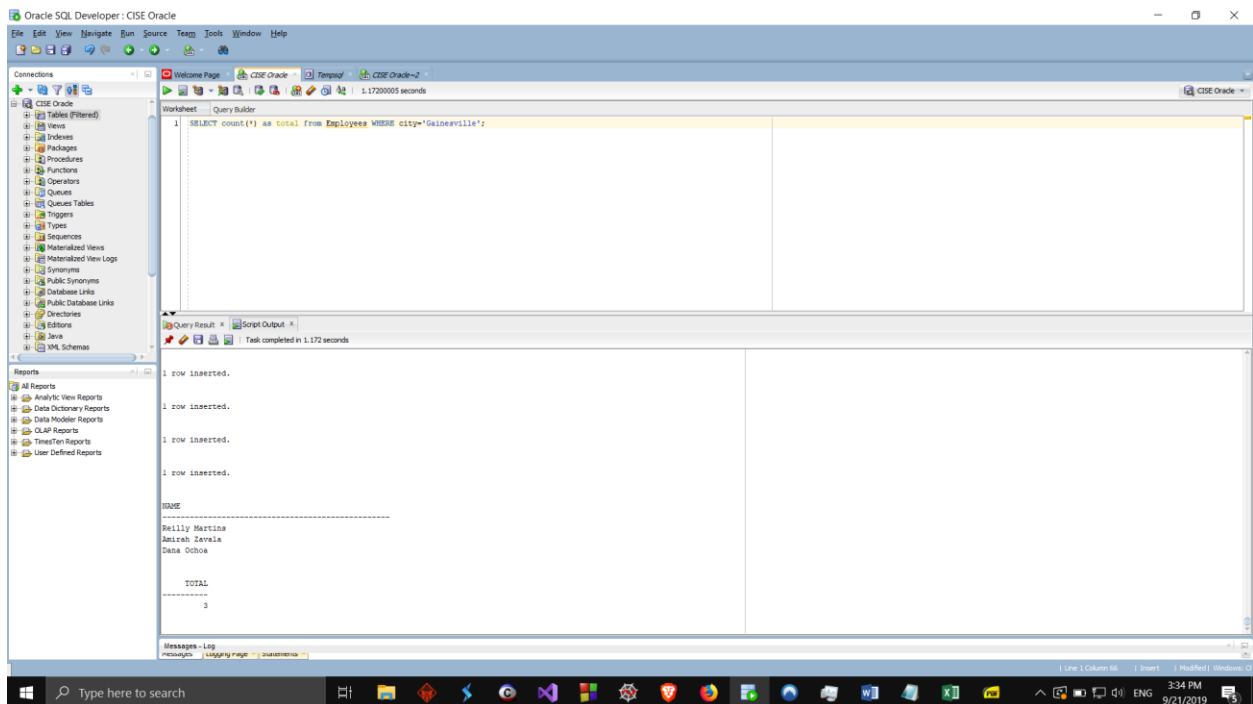
(2) [6 points] Find the names of employees who were hired in 2016.

SELECT Name from Employees where hired_year=2016



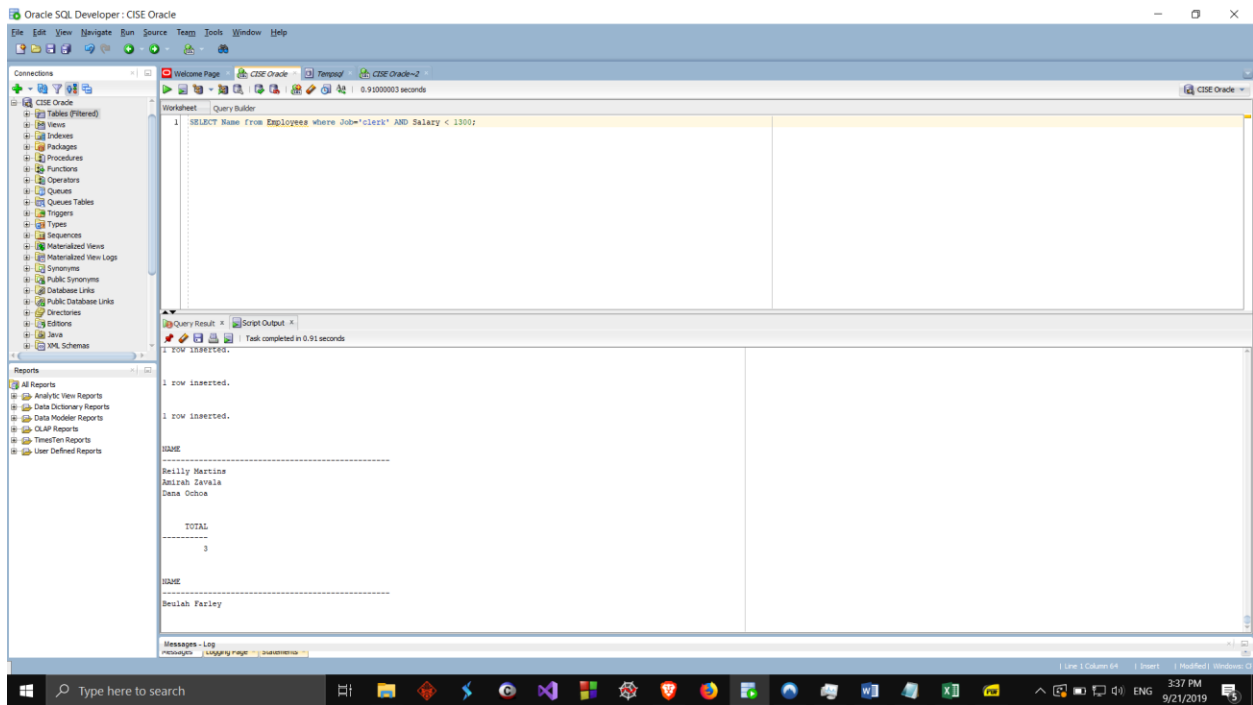
(3) [5 points] Find the number of employees who live in Gainesville.

SELECT count(*) as total from Employees WHERE city='Gainesville';



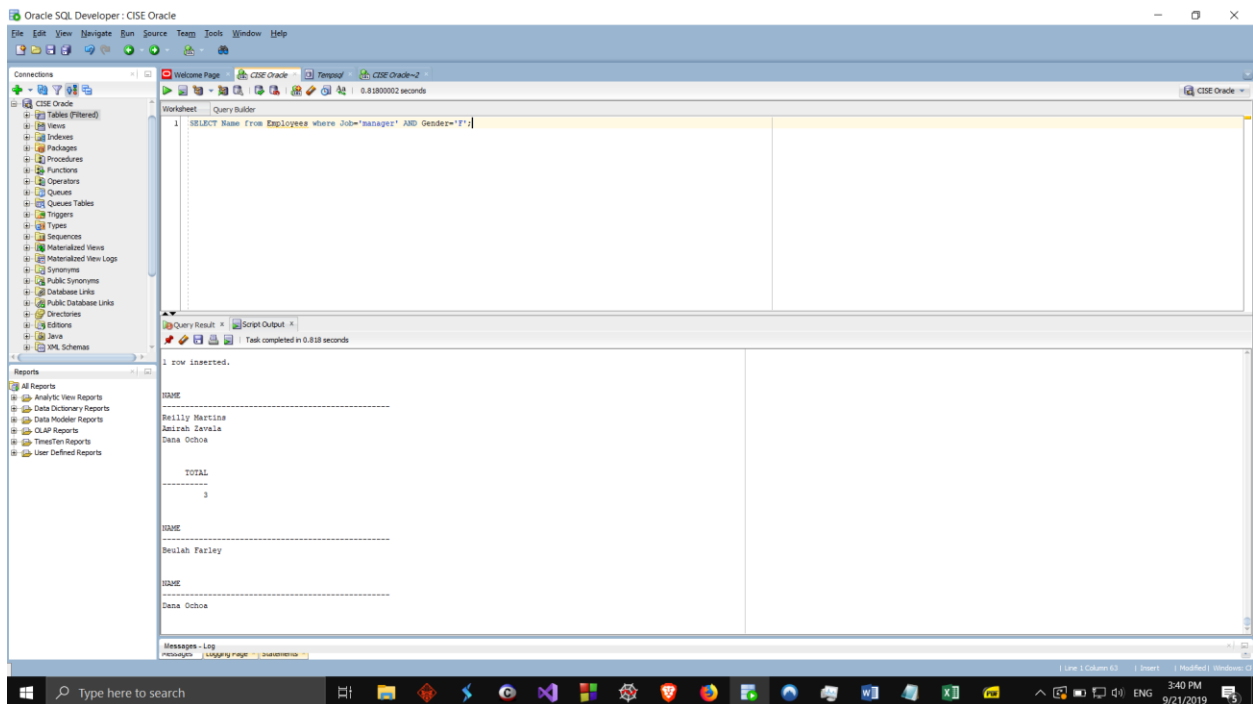
(4) [6 points] Find the name of employees whose salary is less than 1300 and work as a clerk.

SELECT Name from Employees where Job='clerk' AND Salary < 1300;



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

SELECT Name from Employees where Job='manager' AND Gender='F';



(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.]

select avg(Salary) from Employees;

The screenshot shows the Oracle SQL Developer interface. The 'Query Builder' window displays the query: `select avg(Salary) from Employees;`. The 'Query Result' window shows the execution results:

NAME
Beulah Farley
Dana Ochoa

The 'Messages - Log' window shows the task completed in 0.708 seconds.

(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.]

SELECT Name FROM Employees WHERE Name LIKE '%re%' OR Name LIKE '%la%' ORDER BY Name;

The screenshot shows the Oracle SQL Developer interface. The 'Query Builder' window displays the query: `SELECT Name FROM Employees WHERE Name LIKE '%re%' OR Name LIKE '%la%' ORDER BY Name;`. The 'Query Result' window shows the execution results:

NAME
Beulah Farley
Dana Ochoa
Amirah Zavala
Beulah Farley
Sabrina Contreras

The 'Messages - Log' window shows the task completed in 0.649 seconds.

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.

