Database Management Systems (COP 5725)
(Fall 2011)

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TA:
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Homework 1 Solutions

Name: 
UFID: 
Email Address: 

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:

<table>
<thead>
<tr>
<th></th>
<th>Maximum</th>
<th>Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise 1</td>
<td>30</td>
<td></td>
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<tr>
<td>Exercise 2</td>
<td>30</td>
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<td>Exercise 3</td>
<td>40</td>
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<tr>
<td>Total</td>
<td>100</td>
<td></td>
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</tbody>
</table>
Exercise 1 (Knowledge Questions) [30 points]

1. What is a DBMS? [Points: 2]
   
   All-purpose software system, which supports the user in the definition, construction and manipulation of databases for different applications in an application-neutral and efficient manner

2. What are the problems of using a file system? [Points: 4]
   
   repeated occurrence of the same data in different files (redundancy), lacking logical concordance of file contents (inconsistency), changes of the file structure lead to changes of the application program, extensions of the functionality of an application program lead to new requirements of the file structure and to a restructuring of files (data-program dependence), analysis of data as well as the realization of new applications is problematic (inflexibility)

3. What are the two types of data models in a DBS? [Points: 2]
   
   physical data models for the storage-oriented representation of data
   logical data models for the user-oriented representation of data

4. Describe the levels of abstraction in a database [Points: 3]
   
   - external/view level describe the part of the DB, which is relevant for the user
   - conceptual/logical level gives information about existing data and relationships in the DB
   - physical/internal level describes how data are physically stored

5. What is the difference between a database schema and state? [Points: 2]
   
   - schema describes the structure/ the design of a DB
   - state describes a concrete instance of a DB

6. What are the three components of an ER model? [Points: 3]
   
   - entities are distinguishable, independent, self-contained, physically or intellectually existing concepts of the mini-world to be modeled
   - attributes or properties of the entities
   - a relationship describes a connection between several entities

7. What are the types of binary relationship sets? [Points: 2]
   
   1:1-relationship (one-to-one relationship)
   1:m-relationship (one-to-many relationship)
   m:1-relationship (many-to-one relationship)
   m:n-relationship (many-to-many relationship)

8. What is the difference between generalization and aggregation? [Points: 2]
   
   Generalization defines a is-a-kind of relationship in which one class shares its structure and/or behavior with one or more other classes.
   an aggregation is a special relationship set which associates each superior entity set with several subordinate entity sets

9. What are the requirements and advantages of a database system? [Points: 10]
   
   Data Independence
   Efficient data access
Exercise 2 (Oracle) [30 points]

Consider the following table ‘CUSTOMERS’ maintained by a store.

<table>
<thead>
<tr>
<th>CustomerID</th>
<th>Name</th>
<th>State</th>
<th>Birthday</th>
<th>Purchase_Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001</td>
<td>John</td>
<td>FL</td>
<td>03/15/1984</td>
<td>100.00</td>
</tr>
<tr>
<td>1002</td>
<td>James</td>
<td>FL</td>
<td>10/20/1984</td>
<td>68.00</td>
</tr>
<tr>
<td>1003</td>
<td>Alex</td>
<td>CA</td>
<td>05/17/1985</td>
<td>32.00</td>
</tr>
<tr>
<td>1004</td>
<td>Jean</td>
<td>CA</td>
<td>08/23/1985</td>
<td>54.50</td>
</tr>
<tr>
<td>1005</td>
<td>Kate</td>
<td>FL</td>
<td>11/14/1985</td>
<td>89.99</td>
</tr>
<tr>
<td>1006</td>
<td>Mike</td>
<td>NC</td>
<td>01/25/1986</td>
<td>110.00</td>
</tr>
<tr>
<td>1007</td>
<td>Peter</td>
<td>NC</td>
<td>11/20/1986</td>
<td>76.25</td>
</tr>
</tbody>
</table>

Use your CISE Oracle account to create this table and perform the operations below.

Produce SQL statements for all operations. Show outputs of all your resulting Oracle. [6 points each]

(a) Create the CUSTOMERS table

```
CREATE TABLE CUSTOMERS(
    CustomerID integer,
    Name varchar(50),
    State varchar(2),
    Birthday date,
    Purchase_Amount numeric(5,2),
    primary key(CustomerID));
```

(b) Insert data into the table

```
INSERT INTO STUDENTS VALUES(1001, 'John', 'FL', '15-MAR-1984', 100.00);
INSERT INTO STUDENTS VALUES(1002, 'James', 'FL', '20-OCT-1984', 68.00);
INSERT INTO STUDENTS VALUES(1003, 'Alex', 'CA', '17-MAY-1985', 32.00);
INSERT INTO STUDENTS VALUES(1004, 'Jean', 'CA', '23-AUG-1985', 54.50);
INSERT INTO STUDENTS VALUES(1005, 'Kate', 'FL', '14-NOV-1985', 89.99);
INSERT INTO STUDENTS VALUES(1006, 'Mike', 'NC', '25-JAN-1986', 110.00);
INSERT INTO STUDENTS VALUES(1007, 'Peter', 'NC', '20-NOV-1986', 76.25);
```

(c) Determine the customers who are from FL and born before 1/20/1985

```
SELECT Name from CUSTOMERS where State = 'FL' AND Birthday < '1985-01-20'
```
(d) Find the names of the customers whose name starts with ‘A’

\[ \text{SELECT Name from CUSTOMERS where Name LIKE 'A%'} \]

(e) How many customers are in the ‘CUSTOMERS’ table

\[ \text{SELECT count(*) as total from Customers;} \]

**Exercise 3 (ER Model) [40 points]**

1. For each of the situation, draw an entity-relationship diagram modeling the situation. On the diagram be sure to identify the cardinality, existence, and optionality of each relationship. [Points: 10]

(a) A company has a number of employees. Each employee may be assigned to one or multiple projects. Each project must have a minimum of one employee.

(b) A university has a large number of courses in its catalog. Each course may have one or more other courses as pre-requisites, or may have no prerequisites.

(c) A college course may have one or more scheduled sections, or may not have a scheduled section.

(d) A hospital patient has a patient history. Each patient has one or more history records (we assume that the initial patient visit is always recorded as an instance of the history). Each patient history record belongs to exactly one patient.

(e) A video store may stock more than one copy of a given movie. It is also true that the store may not have a single copy of a particular movie.
2. Consider the following information about a university database:

- Professors have an SSN, a name, a rank, and a research area.
- Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.
- Each project is managed by one professor (known as the project’s principal investigator).
- Professors can manage and/or work on multiple projects.
- Students have an SSN, a name, and a degree program (e.g., M.S. or Ph.D.).
- Each project is worked on by one or more students (known as the project’s research assistants).
- When students work on a project, a professor must supervise their work on the project.
- Students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
- Departments have a department number, a department name, and a main office.
- Departments have a professor (known as the chairman) who runs the department.
- Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
- Students have one major department in which they are working on their degree.
- Each student has another, more senior student (known as a student advisor) who advises him or her on what courses to take.

Design and draw an ER diagram that models the information about the university. [Points: 30]