ISYS1055/1057 Database Concepts S1/2019 Assignment 1

This is an individual assignment. Plagiarism (oral, written or visual) is the presentation of the work, idea or creation of another person as if it is one's own. Plagiarism is not acceptable and may result in a range of penalties. It is also a disciplinary offence for students to allow their work to be plagiarised by another student.

Submission

Final submission is due at 23:59 12 April 2019 Friday. Submit via the assignment submission system on Canvas a .zip file named after your student number (e.g., S1234567.zip) that contains files for answering each question: **Q1 (.pdf), Q2.1 (.pdf), Q2.2-2.3 (plain text .sql), Q3 (plain text .sql) and Q4 (.pdf).** The penalty for late submission is 2 points per day or part day. After 4 days, assignments get 0 points.

- **Your submission is successful only when you see your submitted file in your Canvas account. No confirmation email is sent to you.**
- Never leave submission to the last minute -- you may have difficulty uploading files.
- You can submit multiple times – a new submission will override any earlier submissions. **But if your final submission is after the due time, late penalty applies.**

Assessment

Twenty points in total for four questions (4+6+5+5=20), which accounts for 20% of the overall assessment for ISYS1057 and ISYS1055. The assessment components and weights are:

Assignment 1	Assignment 2	Exam
20%	30%	50%

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	NULL

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123456789	Michael	M	1988-01-04	Son
123456789	Alice	F	1988-12-30	Daughter
123456789	Elizabeth	F	1967-05-05	Spouse

Fig.1 An Employee database instance (for Question 1)

Question 1. The Relational model (4 points).

The “Employee” relational database schema is as follows:

Employee(fname, minit, ssn, bdate, address, sex, salary, super_ssn*, dno*)
Department(dname, dnumber, mgr_ssn, mgr_start_date)
Dept_locations(dnumber*, dlocation)
Project(pname, pnumber, plocation, drum)
Works_on(essn*, pno*, hours)
Dependent(essn*, dependent_name, sex, date, relationship)

An Employee database instance is shown in Figure 1, where primary keys, and parent and child relations for foreign keys are annotated. The meaning of most attributes is self-explanatory, and “super_ssn” means “the SSN of an employee’s supervisor”. Answer questions below. Your answer to each question must be according to the given database schema and instance.

1.1. (1 point) Does the primary key (dnumber, dlocation) ensure that each department is located at a different location? Explain your answer.

1.2. (1 point) Can two dependents have the same name? Can two dependents of the same employee have the same name? Explain your answer using the data integrity constraints on the Dependent table.

1.3. (1 point) It is possible that an employee does not have a supervisor? Explain you answer.

1.4 (1 point) Can the below SQL statement be successfully executed? Explain your answer.

```
INSERT INTO Dept_locations VALUES(6, ‘Dallas’);
```

Question 2. Relational database design (6 points).

At the ABC company, a spreadsheet was used to keep data for customer orders, where sample data is in a Google Sheet. The Google Sheet is also duplicated in Table 1 below for easy reference. Note that the spreadsheet contains information for customer details and their order details.

customer No	customerName	phone	address	city	state	postCode	country	orderNo	productNo	quantity	unitPrice	salesRep
103	Atelier graphique	40.32.2555	54 rue Royale	Nantes		44000	France	10100	S18_1749	30	136	Adam Jones
103	Atelier graphique	40.32.2555	54 rue Royale	Nantes		44000	France	10103	S10_4325	30	119.67	Adam Jones
112	Signal Gift Stores	7025551838	8489 Strong St.	Las Vegas	NV	83030	USA	10167	S18_1749	50	136	Will Smith
119	La Rochelle Gifts	40.67.8555	67 rue des Cinquante Otage	Nantes		44000	France	10564	S24_1345	49	35.9	Mark Fox
121	Baane Mini Imports	07-98 9555	Erling Skakkes gate 78	Stavern		410	Norway	10732	S11_9087	25	108.04	Mark Lee
114	Australian Collectors	03 9520 4555	636 St Kilda Road Level 3	Melbourne	Victoria	3004	Australia	10897	S18_4409	22	34.5	Cameron Box
128	Blauer See Auto Co.	(49) 69 66 90 2555	Lyonerstr. 34	Frankfurt		60528	Germany	10903	S21_4532	46	44.53	Bill Green
141	Euro+ Shopping Channel	(91) 555 94 44	C/ Moralzarzal 86	Madrid		28034	Spain	11045	S17_2091	26	213.56	Sam Will
129	Mini Wheels Co.	6505555787	5557 North Pendale Street	San Francisco	CA	94217	USA	11412	S18_3409	39	90.23	Will Smith
119	La Rochelle Gifts	40.67.8555	67 rue des Cinquante Otage	Nantes		44000	France	11453	S24_1345	49	35.9	Amanda Kay
125	Havel & Zbyszek Co	(26) 642-7555	ul. Filtrowa 68	Warsawa		01-012	Poland	11509	S20_9083	45	32.87	Judith Max
119	La Rochelle Gifts	40.67.8555	67 rue des Cinquante Otage	Nantes		44000	France	11897	S18_5690	49	55.04	Max Williams
124	Mini Gifts Distributors Ltd	4155551450	5677 Strong St.	San Rafael	CA	97562	USA	12098	S12_2795	26	167.06	Sam Will
119	La Rochelle Gifts	40.67.8555	67 rue des Cinquante Otage	Nantes		44000	France	12345	S19_2313	49	43.21	Bob Karl
231	Land of Toys Inc.	2125557818	897 Long Airport Avenue	NYC	NY	10022	USA	12954	S20_9083	41	32.87	Karl Marx
129	Mini Wheels Co.	6505555787	5557 North Pendale Street	San Francisco	CA	94217	USA	13209	S21_5092	39	95.12	Max Williams
124	Mini Gifts Distributors Ltd	4155551450	5677 Strong St.	San Rafael	CA	97562	USA	13456	S12_8904	26	176.23	Sam Will
129	Mini Wheels Co.	6505555787	5557 North Pendale Street	San Francisco	CA	94217	USA	14321	S22_4501	39	94.23	Will Smith

Table 1. Data for the ABC Clinic

With more and more orders, the company decides to go for database system to manage data. You are asked to design a relational database to keep data to answer queries such as:

- List the order details for a customer.
- Find the customer details for an order.
- Retrieve the address of customers to send invoices via the postal service.

Answer questions:

2.1. (2 points) You are given the task to design a relational database to keep all information shown in Table 1. Note that Table 1 only contains sample data and your database will need to keep a lot more data. Give the schema for each relation in your database and underline primary keys and put asterisk for foreign keys. Justify your design for each relation. Your database must be able to answer the listed queries and any further queries on customers and their orders.

2.2. (2 points) Give the CREATE TABLE statement for each relation, including primary key and any foreign key constraints.

2.3. (2 points) Give the INSERT INTO statements for each relation in your design. All data shown in Table 1 must be inserted into your database.

Question 3. SQL (5 points).

*In addition to the lecture notes, you should also study by yourself the SQL*Plus tutorial on Canvas (the Oracle section) and other resources for Oracle syntax and useful functions.*

The relational schema for the Academics database is as follows:

DEPARTMENT(deptnum, descrip, instname, deptname, state, postcode)
ACADEMIC(acnum, deptnum*, famname, givename, initials, title)
PAPER(panum, title)
AUTHOR(panum*, acnum*)
FIELD(fieldnum, id, title)
INTEREST(fieldnum*, acnum*, descrip)

Some notes on the Academics database:

- An academic department belongs to one institution (instname) and often has many academics. An academic only works for one department.
- Research papers (PAPER) are often authored by several academics, and of course an academic often writes several papers (AUTHOR).
- A research field (FIELD) often attracts many academics and an academic can have interest (INTEREST) in several research fields.

Download and run the SQL script *academics.sql* on Canvas (the Oracle section) to define and populate the Academics database in your Oracle account.

Write ONE SQL query for each of **questions 3.1--3.10**, and each component of an SQL statement must be on a separate line. Your query should not produce duplicates in output but use DISTINCT only if necessary. **Include any explanation as comments starting with "--" to make the whole SQL script file (.sql) executable (in SQL Developer and other SQL client programs).**

Each question is worth 0.5 point.

3.1. List the title of all research fields in the database.

3.2. How many academics are there in the department where deptnum=100. Return the total number.

3.3. List in alphabetical order the institution name (instname) and department name (deptname) of all departments.

3.4. Return the famname and givename of academics whose acnum is in the range [200..299] or whose famname starts with “T”.

3.5. List the deptnum of departments having at least two academics. (Hint: Join queries in the SQL2 lecture).

3.6. List in alphabetical order the famname, givename of academics who work for institutions in Victoria. Note: the values for “Victoria” include “VIC” or “Vic”.

3.7. Find academics who do not have any title. Give their famname and givename.

3.8. Find authors who have interest in the field of “Logic Programming” (field.title). List their famname and givename.

3.9. The below query is meant to list the fieldnum and title of fields whose fieldnum is between 500 and 599 or whose title contains the word 'Data'. But it has errors. Give the correct SQL query.

```
select panum, title
from paper
where panum >=500 and <=599 or upper(title) like 'Data%';
```

3.10. The query is meant to list paper number (panum), title and author (acnum) for papers, and research interest (fieldnum) for each author, but it has errors. Give the correct SQL query.

```
select panum, title
from author, interest, paper
where author.acnum=interest.acnum
order by panum;
```

Question 4. ER model (5 points).

You are asked to design the ER diagram for a database to manage data for athletes competing at the O athletic game. Requirements are as follows:

- Each participating team has a name and a manager.
- Each athlete has a unique athlete ID, and is also described by first name and last name, gender and age.
- A team has many athletes but an athlete only belongs to one team.
- Each sport has a unique code and some sport name. A sport usually has one or more events. For example, “Men 50 metre Freestyle” is a swimming event and “4 x 100 metre Mixed Medley Relay” is another swimming event.
- An athlete may compete in several sport events and an event usually have many competing athletes. The result for an athlete competing in an event is also kept, together with his/her medal if any.

According to the given description, state any assumptions you make and construct an Entity Relationship (ER) diagram for the database. You must represent entities, relationships and their attributes, and all applicable constraints in your ER diagram. Explain any concepts in the description that cannot be expressed in the ER diagram.

- *Your ER diagram must only use the UML class diagram notations from the lecture notes.*
- *You are encouraged to use LucidChart to complete your ER diagram. You can use create a free student account at: http://www.lucidchart.com/*

Some common errors in ER diagrams:

- If the scenario is set in say, a club, you do not need an entity for the club. The arrangement you depict in the ER diagram **is** the club.
- Every entity must have a primary key.
- The names of all relationships and entities must be unique.
- There are no foreign keys in ER diagrams. They come about as part of mapping an ER model into a relational schema.