Database and SQL: Problem Set 1

Directions

Please answer the following questions in complete sentences. Explain your answers thoroughly (my general advice is that you are writing to a bright but ignorant 12-year-old and NOT your CS professor!). Please submit your answers as a PDF or MS Word document to the appropriate D2l-Brightspace assignment folder.

Diagrams: You are free to make the diagrams using any software you like. I like http://www.diagrams.net, which nicely supports Crow's Foot, Chen, and UML diagrams. Directions on how to create ER diagrams are here: https://www.diagrams.net/blog/entity-relationship-tables.

Citation: You don't need to cite in-class material (from my notes or the lecture books). Any outside material must be cited appropriately.

Scoring. Unless noted otherwise, each question is worth 3 points. The scoring is as follows:

- 3 points: The answer is complete and correct.
- 2 points: The answer is between 50% and 99% correct.
- 1 point: The answer is less than 50% correct, but it gets *something* right.
- 0 points: Nothing relevant was submitted OR there was evidence of plagiarism (*Note:* Please don't do this, as I scan PSETs for plagiarism using *Turnitin.* If you need help, please ask me!).

Working with Partner. You are free to work with a partner on this assignment, but each of you should hand in your OWN work.

If you worked with a partner enter their name here: _____

Scenario for Problems 1 to 5

A brand-new "School for Aspiring Supervillains" keeps track of which instructors teach which classes using a single spreadsheet file. Here's a selection from the file in which they store this information

Instructor_name	Location	Time	Course	Credits
Hannibal Lecter	Online	Asynchronous	"Scaring People into Submission"	3
Cruella Deville	M.N. 234	TuTh 3-5	"Ind. Study"	3
Anakin Skywalker	SP 176	Friday 2-5	"Scaring People into Submission"	3
Nurse Ratched	PR 113	MWF 9-11	"Independent Study"	2
Hans Gruber	SP 376	MW 9-10	"Wrecking Things"	3
H. Lecter	PR 0113	TuTh 3-5	"Laughing Evilly"	3
Anakin "Darth Vader" Skywalker	Zoom	MW 8a-10a	"Wrecking Things"	4
Deville, Cruella	MN 087	MWF 12-1	"Being Mean to Puppies"	2
Hannibal Lecter	SW 234	TuTh 3a-5a	"Evil Laughs"	3

1. How many fields are in this file? Which sorts of data does each field contain?

2. Identify at least three ways that the current fields could be "partitioned" (or "split up)" to make data retrieval and updating easier.
3. Please (a) define **data redundancy** and (b) give three examples of data redundancy in this file.
4. Please (a) define **data anomaly** and (b) give three examples of data anomalies in this file.
5. Suppose that you were asked to develop a relational database for this information. What table(s) would you include? Which attribute(s) would be in which table?

Scenario for Problem 6 to 10. Suppose Mario keeps track of the social world of "Super Mario" games. He has created a database with two tables: one representing the occupants of "Bowser's Castle" and one representing "Guests at Peach's Birthday Party." Some entries from these tables are as follows:

Table: BowserCastle

Name	JobTitle	Salary
Koopa Troopa	Guard	15,000
Toad	Prisoner	NULL
Bowser	Leader	999,999
Koopa Troopa	Attendant	18,000
Zelda	Prisoner	NULL
Goomba	Guard	30,000

Table: PeachGuests

Name	Age
Koopa Troopa	7
Toad	25
Goomba	41
Mario	25
Luigi	33
Yoshi	7

6. What does it mean for an attribute to be a **candidate key?** What are the candidate keys for each table?
    a. Hint: Remember that a candidate can be a *combination* of attributes. Also, a candidate key needs to *uniquely* pick out a row. So, for example, "JobTitle" can't isn't a candidate key.
7. What is a **primary key?** Which attribute, if any, candidate key (from the previous question) would you choose to be a primary key for each table? Why (explain in a few sentences)? OR, if you would create a new attribute to serve as a primary key, say why, and describe this attribute and its characteristics.
8. Show the table that results from the following relational algebra query (PROJECT Name FROM BowserCastle) UNION (PROJECT Name FROM PeachGuests).
9. Show the first TEN rows of the table that results of the following relational algebra query: BowserCastle CROSS JOIN PeachGuests.
10. Show the table that results following relational algebra query: BowserCastle NATURAL JOIN PeachGuests.

Scenario for Problems 11 to 15

You have a job tutoring students on databases, and would like to set up a simple database for record keeping. Your database should include at least TWO tables. First, there should be a table tracking personal information of your clients. Second, there should be a table sessions recording the time/date you met with clients, and the amount they were charged. Answer the following:

11. Identify and describe at least five “Business Rules” that might be used for this database. (So, for example, you mightg have a business rule such as “Each client must have a first and last name.” As part of this, you’ll want to think about what sort of data might be included for each table.
12. Give the “relational schema” for the two tables above. Each table should have at least THREE attributes. The relational schema is of the form:
    a. TableName(attribute1, attribute2, attribute3).
13. Identify the primary key for each table, and say how you decided this. At least one of the tables should also have a foreign key. Identify this attribute, and explain its importance.
14. Give sample “entries” for each of the tables (about pretend clients and sessions).
15. Draw an ERD for this database, in either Chen or Crow’s Foot style.

Problem 16 (5 points). Assess your preparation for this exam by answering the following questions.

1. How long did you spend on the exam? Did you think this was enough time?
2. Which specific problems did you feel the most confident about? Which did you feel the least sure about?
3. Is there anything you learned in the class so far that wasn’t on the exam that you wanted to show mastery of? Tell me about it!