Database and SQL: Problem Set 2

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

(4pts each). Draw an Extended Entity Relationship Diagram (EERD) based on the following specification. Use either Crow's Foot or Chen style diagrams.

Darth Vader would like you to design a database tracking his stormtroopers and the ships they serve on. His business rules include the following:

1. All stormtroopers have names, ranks, home addresses, and commanding officers (who are also stormtroopers).
2. Ships have an id, name, a ship type, and a captain.
3. Every stormtrooper serves on one ship, and each ship has at least soldier aboard it.
4. Some stormtroopers are officers, and some are pilots. All pilots are officers, but not all officers are pilots. For officers, Darth Vader wants to store the date they were commissioned. For pilots, he'd like to store the type of vehicle they can pilot.
5. Every ship "type" is either Star Destroyer or a Cruiser. For Star Destroyers, he'd like to store the number of Tie Fighters they can carry. For Cruisers, he'd like to store the maximum speed.

Grading is based on inclusion of appropriate (1) entities, (2) attributes, (3) identification of primary keys, (4) relationships and "connectivities" and (5) subtype (**isA**) relationships.

Scenario for Problem 6 to 10.

(4pts each). You have been asked to create a normalized database based on the following file-based system that records information for cocktail bar located in the Star Wars universe.

Date	Cust_Id	Cust_Name	Cust_email	Prod name (ID): quantity x price	Order Total
10/10	1247	Rey Skywalker	None	Fuzzy Tauntaun (e02): 1 x $10.00	10.00
10/10/05	04356	Han Solo	han.solo@rebel_alliance.org	Death Star (e53): 2 x $6.00 The Frost Awakens (b23): 1 x $5.00	$17.00
10/10/05	93457	Bobba Fett	BigBF@mandalorian.edu	Bloody Bobby (e44): 1 x $5.00	$5.00
10/11/05	04356	Han Solo	han.solo@rebel_alliance.org	Death Star e53): 2 x $6.00 The Frost Awakens (b23): 1 x $5.00	$17.00
10/11/05	53642	Greedo	None	Green Meany (e27): 1 x $8.50	$8.50

Do the following:

6. Show how this data model could be converted to 1NF, if it isn't already. This involves (a) identifying any **repeating groups**, and (b) resolving these by creating new tables.
7. Draw the ERD for the 1NF data model.
8. Show how this data model could be converted to 2NF, if it isn't already. This involves (a) identifying any **partial dependencies**, and (b) resolving these by creating new tables.
9. Show how this data model could be converted to 3NF, if it isn't already. This involves (a) identifying any **transitive dependencies**, and (b) resolving these by creating new tables.
10. Draw the final ERD for the 3NF data model.

Scenario for Problems 11 to 15

(4pts) The questions concern the "Optimizing Schools" cases study from Lecture 6. Please write a 3-5 sentence response to each question.

1. How should decisions to adopt AI technologies be made? In this case, it came from above – a suggestion from the school board, implemented by the principal. Who are the other relevant stakeholders? Should they have been involved in the decision to utilize Hephaestats? To what extent? How does the decision not to include an opt-out option affect the legitimacy of the school's actions?
2. Did the school violate the privacy of its students by sharing their data with Hephaestats? If so, is this breach justifiable, and on what grounds? Would you feel differently if you were the parent of an atrisk student versus the parent of a valedictorian?
3. How might we define a successful outcome for Minerva High School? What was the school hoping to optimize for by contracting Hephaestats? To what extent is this end legitimate? In order to achieve this end, did Hephaestats ask the right questions and use the right proxies?
4. Graduation statistics did, indeed, improve after Hephaestats came on the scene. But correlation doesn't necessarily imply causation. What are some alternative explanations for the improvement in dropout rates?
5. The rhetorical decision to call a technology "AI" imbues it with a certain mystique. But quantitative and statistical methods, such as those used in many AI systems (including Hephaestats) inherently involve generalizations. While there is value in using statistics to understand social problems and make predictions, the

methodologies may not be useful on an individual basis. What is the danger of calling a system that deals in particulars “AI”? What are the advantages?

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!