Midterm

Spring 2024

**Q1.** This is a closed booked exam. Do not consult any course materials or outside sources. Relate your answers to the material studied in class.

This is a closed booked exam. Do not consult any course materials or outside sources. Relate your answers to the material studied in class.

Part 1 (14 points). Draw a conceptual model based on the description below. Draw your model on a sheet of paper with your name and seat number on it.  You may use either the Chen notation or the Crow's feet notation, just be sure to be consistent.

The answer to this question is due at the time your midterm finishes. Please keep track of the time. Take a picture of your answer when you hand it in and sign out.

Suppose you work for a company that sells home improvement products and tools. You need to develop a database to keep track of the products and tools, for inventory and other purposes. The products are always sold. For the tools, some are sold and some are rented (e.g., hammers are always sold whereas carpet cleaners can be rented (or sold)).  Many of the employees work on commission and are eligible for bonuses if they meet their target sales. You need to keep track of your employees and the customers to whom they sell products and sell or rent tools. For tools that are rented, you need to keep track of which tools are available for rent and when the rented ones will be returned.

An employee can receive an employee discount for any purchase they might make. The amount of the discount depends upon the length of time an employee has worked for the company.  Besides regular customers who are buying products or buying or renting tools for their home projects, the company also has contractors whom they recommend to their customers. Any contractor, regardless of whether they are on the company's list of recommended contractors or are regular contractors, receive a 5% discount on every product or tool they buy, but not on anything they rent.

Draw a conceptual model for this application. Hint: make sure the model will capture what is needed to ensure that the database can provide the data needed to support this company's operations.

Part 2 (4 points). State one query that you would want to answer, but could not do so using the model you have drawn.  Explain how you would modify your conceptual model so that the query could be answered by the resulting database.  Do not modify your model or draw a new one.

|  |
| --- |
| **Q2.** Consider both the WalMart case and the Russian Soldiers case discussed in class.  List two dimensions that you could use to compare (and contrast) these cases from a data management perspective and explain why. |
| **Q3** Recall the chef database:  Dish:       (DishName, description, cuisine-type)  Chef:       (Emp#, name, email, kitchen-where-trained, specialty)  Creates:  (DishName, Emp#, expertise-level)  Write a query to retrieve the specialties of the chefs who work at the restaurant that is supported by this database. What type of query is this? |
| **A4.** After successfully receiving a masters degree in information systems from a well-known university, you have taken a job at a large hospital. You have been asked to design a database to keep track of the day surgeries (relative minor surgeries performed on patients who do not remain in the hospital over night). The hospital provides their facilities to surgeons who rent them in order to perform operations on their patients. There are multiple types of operating rooms (e.g., for ENT, orthopedics, etc).  The database should keep track of the patients, the different kinds of surgeries that are performed and the equipment required (e.g., heart monitors, blood pressure machines). You need to be able to produce reports on the number of patients who have had surgeries, the surgeons who performed the surgery, and the costs of the surgeries (which depends on which surgeon is performing the surgery, the equipment used, and other factors). For this situation, describe in words how you would model the relationship between the surgeons and equipment. Do NOT draw a conceptual model. |
| **Q5.** Identify the application domain for which you developed a conceptual model in Assignment #1. Explain why it was useful to generate representative queries that could be asked of the resulting database. |
| **Q6.** What is the requirement that a foreign key have a matching primary key value called?  At what stage of the database design process does this requirement occur? |
|  |
|  |
|  |
|  |
|  |
| A maximum cardinality of 0 should not appear in a useful conceptual model. (t/f) |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |