CS-UY 3083, Introduction to Database Systems, Fall 2025 Prof Dey

Homework #3

Instructions: You may work alone or with a group of up to 3 people. Hand in your solutions via Gradescope as a single pdf file. **Follow the Gradescope instructions to mark your solution to each problem or subproblem as indicated in the outline; otherwise the graders will have trouble finding them and will apply a small penalty to your score.** See student workflow section in GradeScope help to learn how to do this. If you're working with a group, use GradeScope's group submission feature to indicate all members of your group.
Note: You may find it useful to use *draw.io* or another drawing tool to draw ER diagrams. Alternatively, you may draw them neatly by hand. You must use the notation used in class ... rectangles for entity sets, diamonds for relationship sets, double lines and arrows for participation/cardinality constraints, etc.

1. Problem 1
    a. Consider the ER diagram shown in Fig. 1 (on pg 3). Derive a relational database schema from the ER diagram. You may show your answer with a schema diagram or with text indicating the relation schemas, their attributes, primary keys and foreign keys.
    b. Show the tuples (rows) that would be in the relations (tables) in the following situation:
    (Preferred format for the answers: several tables, each with table name at top and attribute names as column headers)
        i. the item with itemID = 123 has the description "baseball cap with Tandon motto" and is available in large blue and in small green.
        ii. Each member of your homework group is a customer. (Use your netID as the cID. You may use your real addresses or 370 Jay St, Brooklyn, NY 11201.)
        iii. Each member of your group has purchased item 123 in some size and color on Mar 1, 2021.
        iv. Can the same customer purchase more than one of item 123? Choose one of these answers:
            1. No
            2. Yes, with no restrictions
            3. Yes, but they have to be different sizes
            4. Yes, but they have to be different colors
            5. Yes, but the purchases have to be on different dates

In Fig 2, SizeColor is a weak entity set and should have a double box in the notation of textbook 7th ed.

2. **Problem 2:** Repeat problem (1) using the ER diagram shown in Fig. 2 (on page 3).

3. **Problem 3:** Consider the **takes** and **student** relation schemas from the university database schema (The database you loaded for HW#1). Using netID of a member of your group as student ID, **Write relational algebra expressions for each of the following:**
    a. Find the course_id and grade for each course that the student whose ID is <your net ID> has taken.
    b. Find the course_id and grade for each course that the student whose ID is <your net ID> took in 2018
    c. Find the student ID of each student who took course_id ‘CS-UY 3083’ in Spring 2021
    d. Find the name of each student who took course_id ‘CS-UY 3083’ in Spring 2021
4. **Problem 4:** Consider the same tables, **takes** and **student**, **write SQL queries for each of the following:**
    a. Find the course_id and grade for each course that the student whose ID is <your net ID> has taken.
    b. Find the course_id and grade for each course that the student whose ID is <your net ID> took in 2018
    c. Find the student ID of each student who took course_id ‘CS-UY 3083’ in Spring 2021
    d. Find the name of each student who took course_id ‘CS-UY 3083’ in Spring 2021

Figure 1.

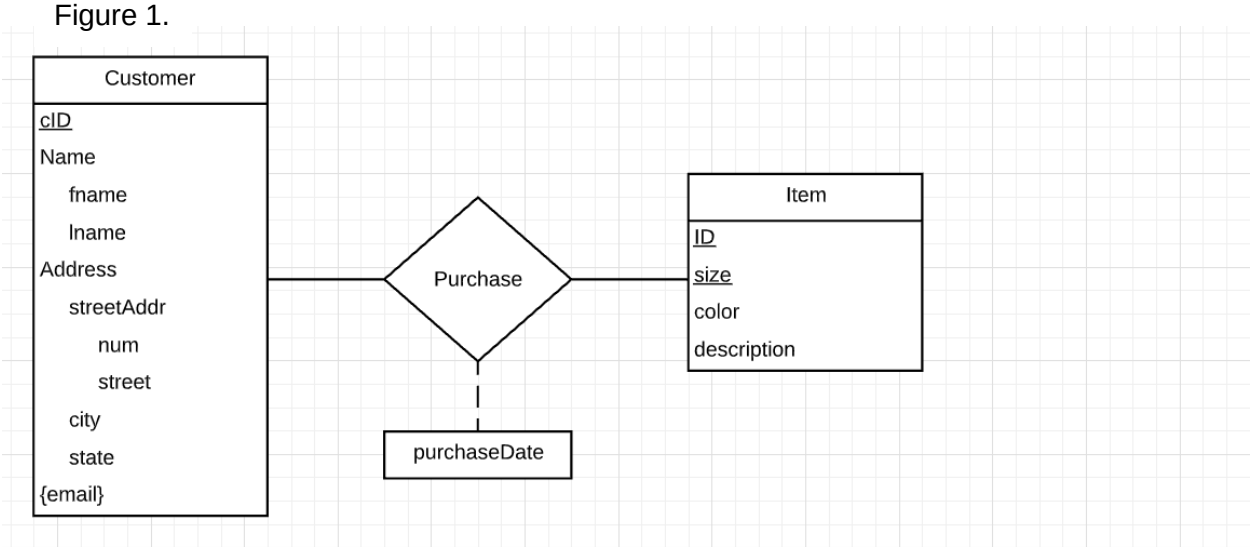

Figure 2.