CS3200 Spring 2024 Exam 2

Name (as on Canvas): ....

Northeastern Email: ....

Instructions:
- Put your mobile device on silent.
- Turn baseball caps backwards or take them off. No hoodie hoods on.
- No headphones or other personal audio devices of any type allowed.
- Write in **pencil** only and use an **eraser** when necessary.
- Your solutions must appear in the space provided for each question.
- Answer all questions.
- Where appropriate, partial credit is available.
- We are in tight quarters here. Keep your eyes on your **own paper**.

Multiple Choice Questions: For each question, put the letter associated with the choice of the most correct answer in the blank provided to the left of the question number. [3 points each]

_____ 1. In a Relational Database, a table can have a foreign key to more than one other table.

    (a) False
    (b) True

_____ 2. The _____ of an entity is an attribute or set of attributes that are unique among all possible entity instances of that entity.

    (a) primary key
    (b) foreign key
    (c) integrity constraints
    (d) schema

_____ 3. Which of the following is most likely a multi-valued attribute of the associated table provided?

    (a) attribute NUid of table Students
    (b) attribute SocialSecurityNumber of table Employees
    (c) attribute email_address of table Customers
    (d) attribute CourseName of table Courses

_____ 4. Assume you are working with a MySQL database named **Library**. What MySQL specific command must you execute before you can execute a SELECT statement on the tables in the database?

    (a) USE database;
    (b) START Library;
    (c) LOAD database;
    (d) USE Library;

_____ 5. DDL stands for _____.

    (a) data definition language
    (b) definitional data language
    (c) description data language
    (d) data description language

6. Given the ER Diagram below, the primary key of entity E2 is most likely _____.
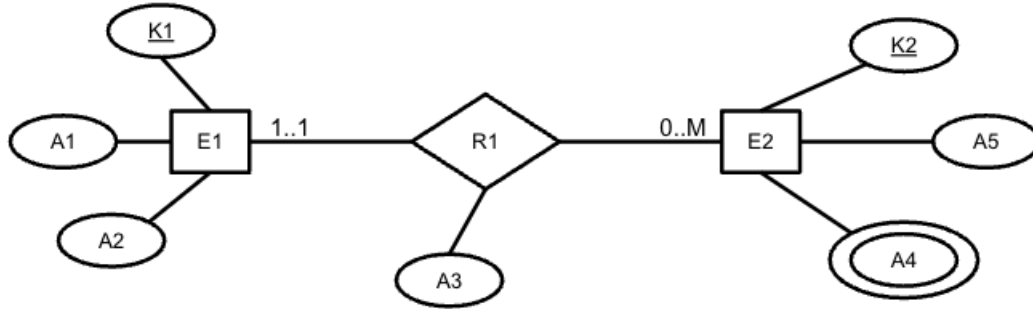

(a) K2, A5, A4
(b) K2
(c) K1 and K2
(d) None of the above

7. Assume you are working with the Students entity of a university's conceptual database model. The Students entity has attributes studentID (unique to each student), lastName, firstName, email (unique to each student), and totalCreditHoursEarned. Which of the following is most reasonably true about the keys of the Students entity based on the information provided?

(a) last name would make a valid primary key.
(b) The combination of studentID and lastName is NOT a valid superkey.
(c) the combination of studentID and email is a valid candidate key.
(d) studentID is a valid candidate key.

8. In a relational data model, a weak entity depends on the existence of _____.

(a) a bridge table
(b) a corresponding strong entity
(c) itself
(d) another weak entity

---------- 9. Given the diagram below, what is the most appropriate primary key for Branches?.
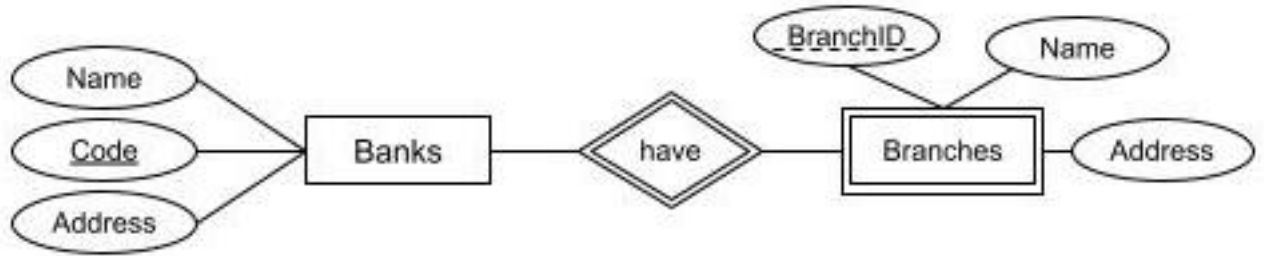
(a) the combination of Code (from Banks) and Name
(b) BranchID
(c) the combination of Code (from Banks) and BranchID
(d) none of the above

---------- 10. To resolve a M:N relationship such that it can be implemented in an RDBMS such as MySQL, we must introduce _____.

(a) extra joins
(b) more RAM
(c) a bridge table
(d) various new attributes

Short Answer Questions Use the following ER Diagram of a simple Banking system to answer the questions that follow.
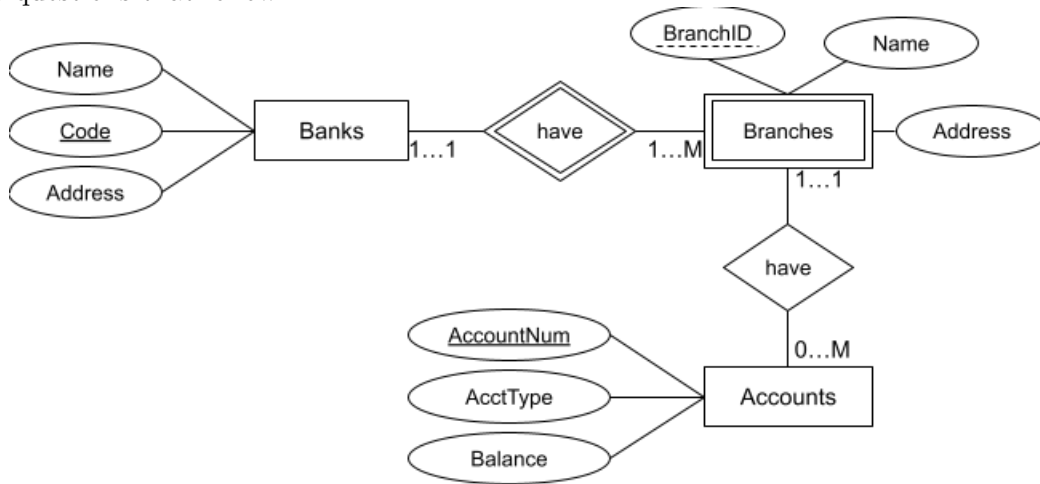
1. List all strong entities from the Banking system. [4 points]

2. When converted to a relational diagram/model, list the primary keys of each entity. [6 points]

3. Assume accounts are used by Customers. Each customer must have at least 1 account but may have many. Each account must be used by/owned by one or more customers. A customer is described by their CustomerID, Name, Email, Address, and TotalBalance. TotalBalance is calculated as the sum of all account balances used by/owned by that customer. Add Customers entity to the diagram above including any necessary entities, relationships, attributes, and multiplicities. [10 points]

4. Convert the banking ER diagram (with the addition of Customers) into a relational diagram. [20 points].

5. Write SQL create table statements for all of the relations from the question above including any foreign key constraints. In all cases, any changes to a foreign key's value in the referenced table should not be allowed, and in all cases, no deletions of a row should occur if some other row in another table is referencing it. [20 points]

6. Write 2 insert statements for each of the tables created in the question above in order such that no integrity constraints are violated. [10 points]

Bonus:

1. Give a reasonable example of a weak entity and corresponding strong entity that is not used anywhere in this exam nor as an example given in lecture. [1 point]

2. What sweet treat was available for students at the front of the classroom yesterday (Wednesday March 27, 2024)? [3 points]