

CS3200 Spring 2024 Exam 2

ANSWERS VERSION I

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

Correct answers: (b)

----- 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

Correct answers: (a)

----- 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

Correct answers: (c)

----- 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;

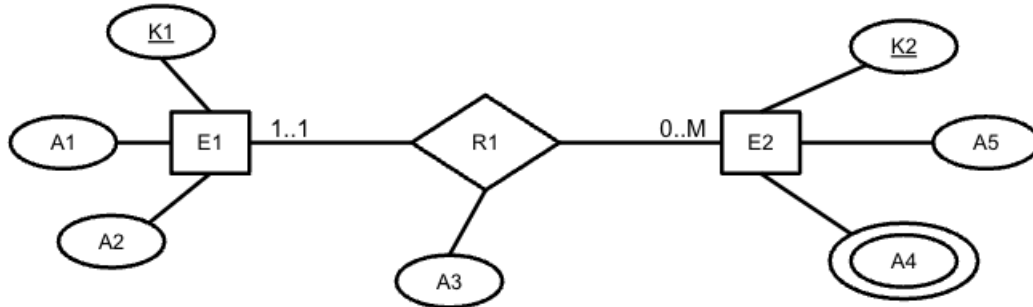
Correct answers: (d)

----- 5. DDL stands for -----.

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

Correct answers: (a)

----- 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

Correct answers: (b)

----- 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.

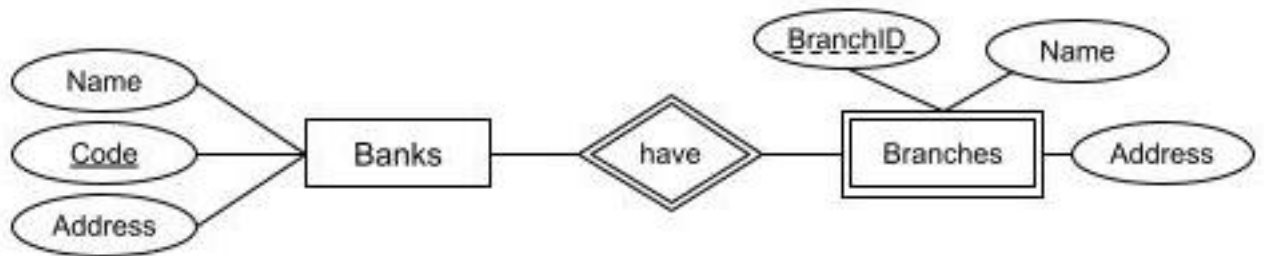
Correct answers: (d)

----- 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

Correct answers: (b)

----- 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

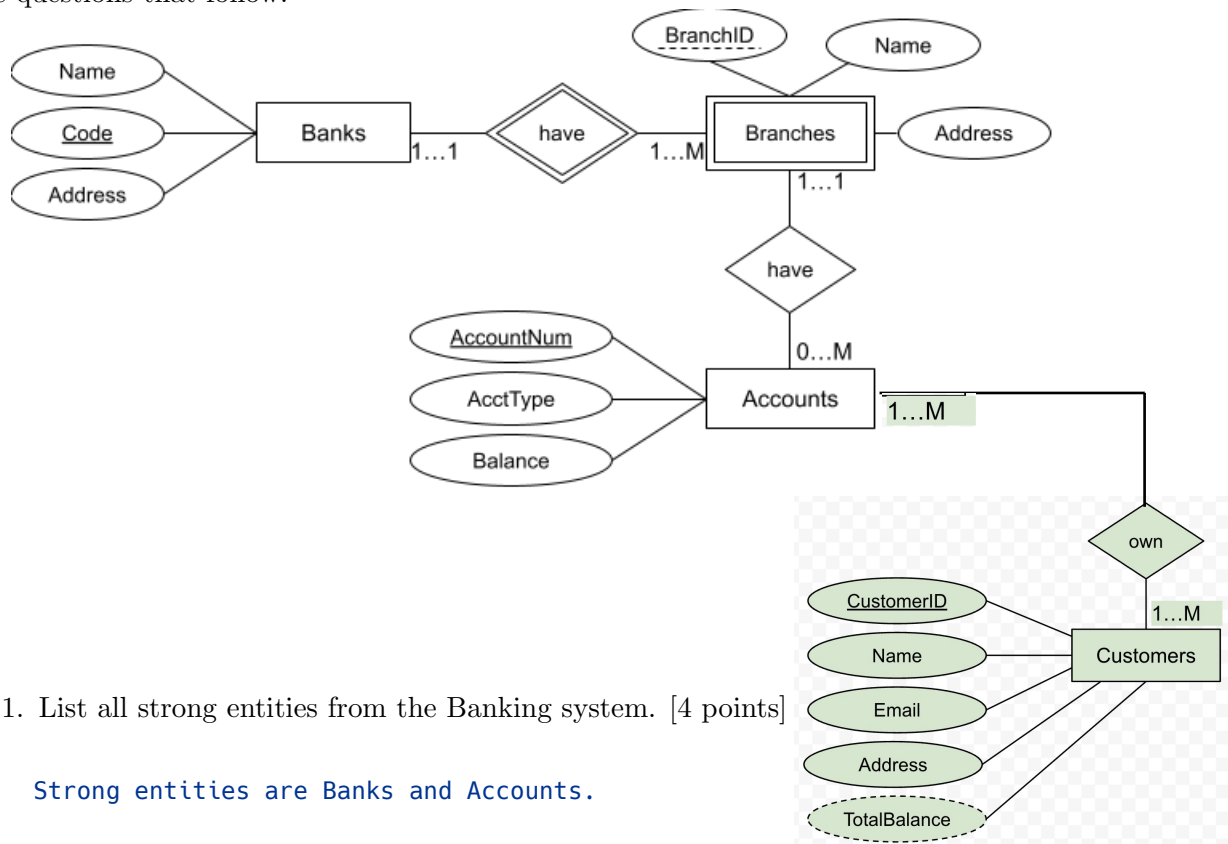
Correct answers: (c)

----- 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

Correct answers: (c)

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]

Strong entities are Banks and Accounts.

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

Based on the diagram above:

- PK of Banks would be Code
- PK of Branches would be Code (FK to Banks) and BranchID (discriminator attribute)
- PK of Accounts would be AccountNum

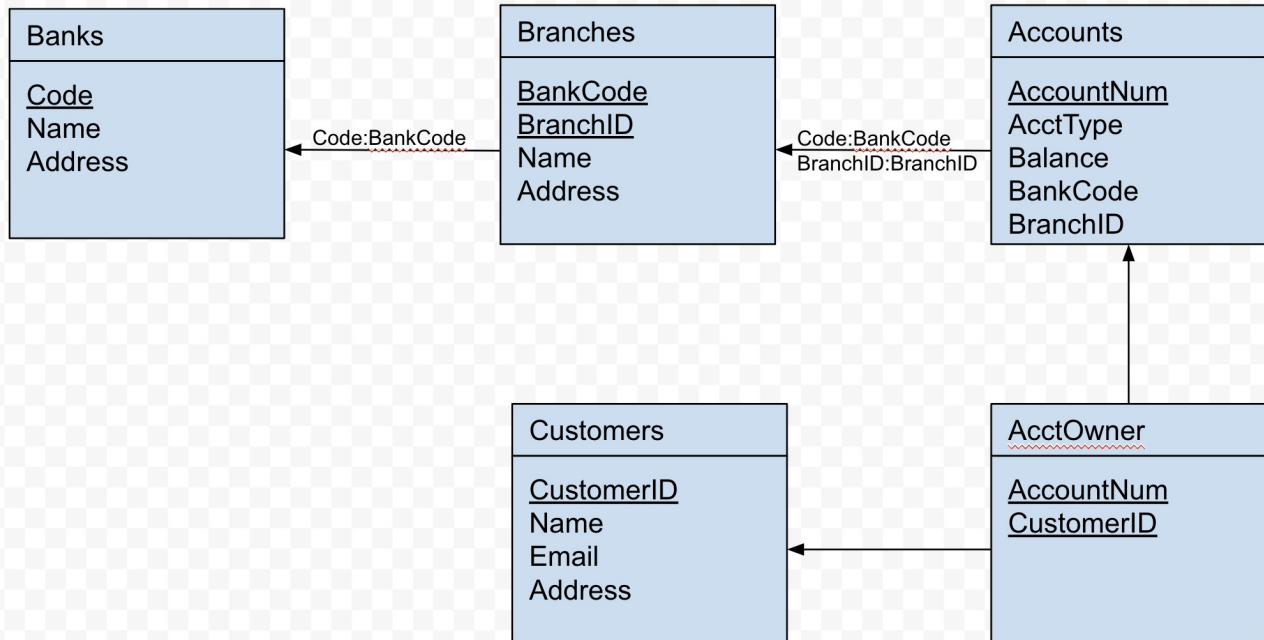
3. Assume accounts are used by Customers. Each customer must have at least 1 account but may have many. Each account must be used by/owned by one or more customers. A customer is described by their CustomerID, Name, Email, Address, and TotalBalance. TotalBalance is calculated as the sum of all account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

See above

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

Short Answer #4

NOTE: If you broke address in any of the tables into its component parts, that would be totally OK.



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]

```
DROP TABLE IF EXISTS banks;
CREATE TABLE IF NOT EXISTS banks
(
    code    INTEGER PRIMARY KEY,
    name    VARCHAR(50),
    address VARCHAR(100)
);

DROP TABLE IF EXISTS branches;
CREATE TABLE IF NOT EXISTS branches
(
    bankCode INTEGER,
    branchID INTEGER,
    name     VARCHAR(50),
    address  VARCHAR(100),
    PRIMARY KEY (bankCode, branchID),
    FOREIGN KEY (bankCode)
        REFERENCES banks (code)
        ON UPDATE RESTRICT
        ON DELETE RESTRICT
);

DROP TABLE IF EXISTS accounts;
CREATE TABLE IF NOT EXISTS accounts
(
    accountNum INTEGER PRIMARY KEY,
    acctType   VARCHAR(20),
    balance    DECIMAL(7, 2),
    bankCode   INTEGER,
    branchID   INTEGER,
    FOREIGN KEY (bankCode, branchID)
        REFERENCES branches (bankCode, branchID)
        ON UPDATE RESTRICT
        ON DELETE RESTRICT
);
```

```
DROP TABLE IF EXISTS customers;
CREATE TABLE IF NOT EXISTS customers
(
    customerID INTEGER PRIMARY KEY,
    name       VARCHAR(50),
    email      VARCHAR(50),
    address    VARCHAR(100)
);

DROP TABLE IF EXISTS acctOwner;
CREATE TABLE acctOwner
(
    accountNum INTEGER,
    customerID INTEGER,
    PRIMARY KEY (accountNum, customerID),
    FOREIGN KEY (accountNum)
        REFERENCES accounts (accountNum)
        ON UPDATE RESTRICT
        ON DELETE RESTRICT,
    FOREIGN KEY (customerID)
        REFERENCES customers (customerID)
        ON UPDATE RESTRICT
        ON DELETE RESTRICT
);
```

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]