CS585

Database Systems

Spring 2009

Midterm Exam

Name: _____

Student ID: _____

	Maximum	Received
Problem 1	20	
Problem 2	10	
Problem 3	13	
Problem 4	20	
Problem 5	25	
Problem 6	12	

Problem 1 (20 points)

Indicate whether each of the following statements is true or false (T/F):

___View is a mechanism that provides support for physical data independence *(F)*

___Stored procedures can be used to maintain logical data independence *(T)*

___A primary key is a candidate key which is minimal *(T OR F)*

___ Foreign key cannot be NULL *(F)*

___Any ternary relationship can be reduced to two or three binary relationships *(F)*

___An expression in group-qualification must have a single value per group *(T)*

___Dynamic SQL provides a mechanism to create applications that are not database specific *(F)*

___SQLJ and embedded SQL enforce the same set of SQL standards *(F)*

___Applications using JDBC drivers that do direct translation to native database API are more efficient than those written in embedded SQL *(F)*

___Triggers can be used to maintain database consistency *(T)*

___In an OODBMS, there is no need to explicitly come up with primary keys.

___ The expression (emp_salary < 70000) used in a WHERE clause will evaluate to "FALSE" if the emp_salary attribute happens to be NULL.

___ The expression (emp_salary >= 70000) used in a WHERE clause will evaluate to "FALSE" if the emp_salary attribute happens to be NULL

___ The degree of a relation instance is its number of tubles.

___Conceptual schema describes how users see the data. *(F)*

___Completeness Constraint is not a constraint on specialization. *(F)*

___In ER-to-relational mapping, a relationship in ER schema does not create a new relation in relational model. *(F)*

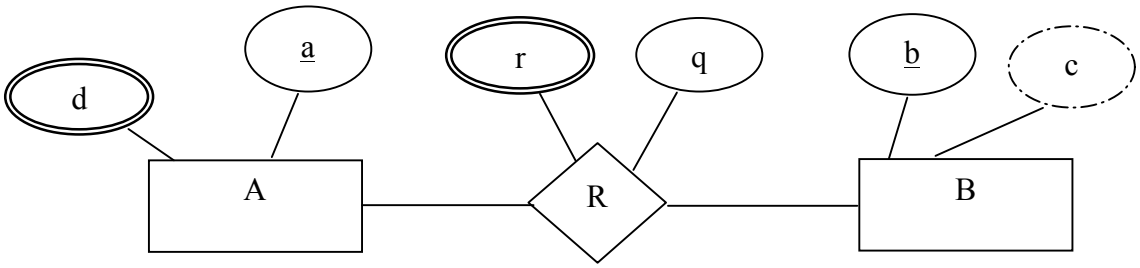
___Entity types which have key attributes of their own are called strong entity types. *(F)*

___A recursive relationship in an ER diagram is always converted to a relation in the Relational Model. *(T)*

___Every entity has a domain. *(T)*

Problem 2 (10 points)

Consider the ER diagram below



(Note: c is a derived attribute)

Table: A

a	d

Table: R

a	B	r	q

Table: B

b	c

(I). Is the given reduction to tables correct? If not, correct it.

Table : A
(a, d)

Table : R
(a1, r, b1, q) where a1 is A.a and b is B.b

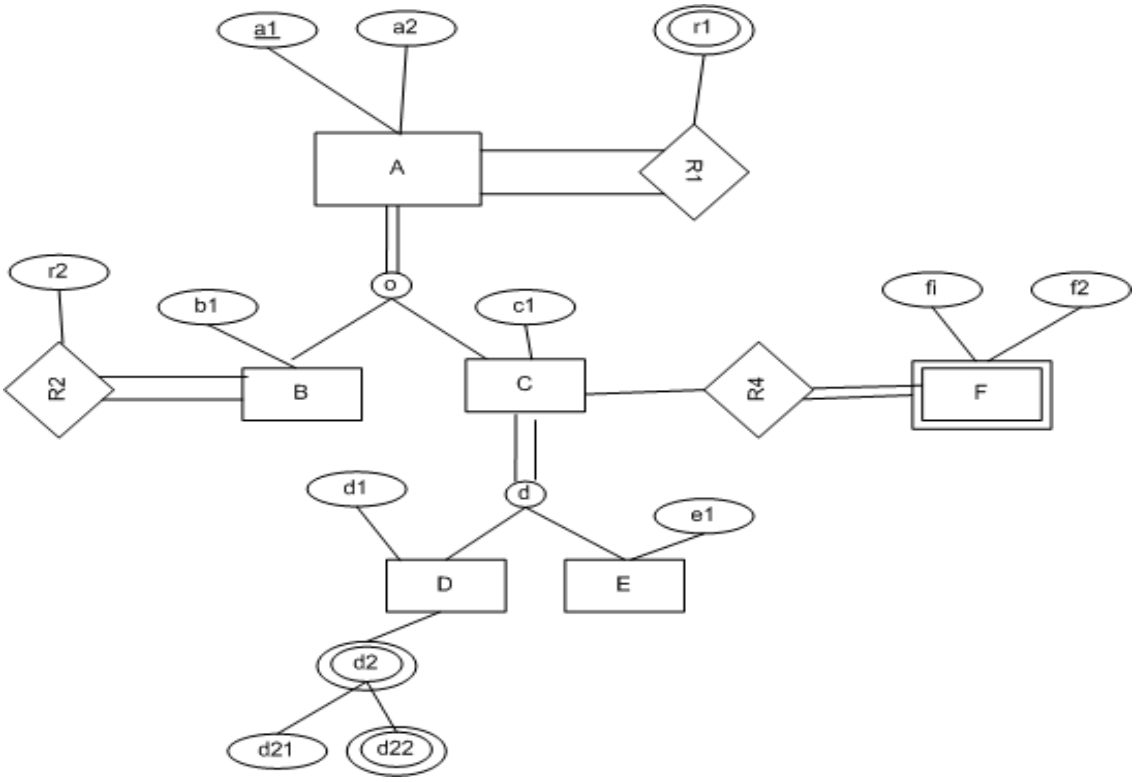
Table: B
(b, c)

(II). What is the primary key of the table corresponding to the relationship R?

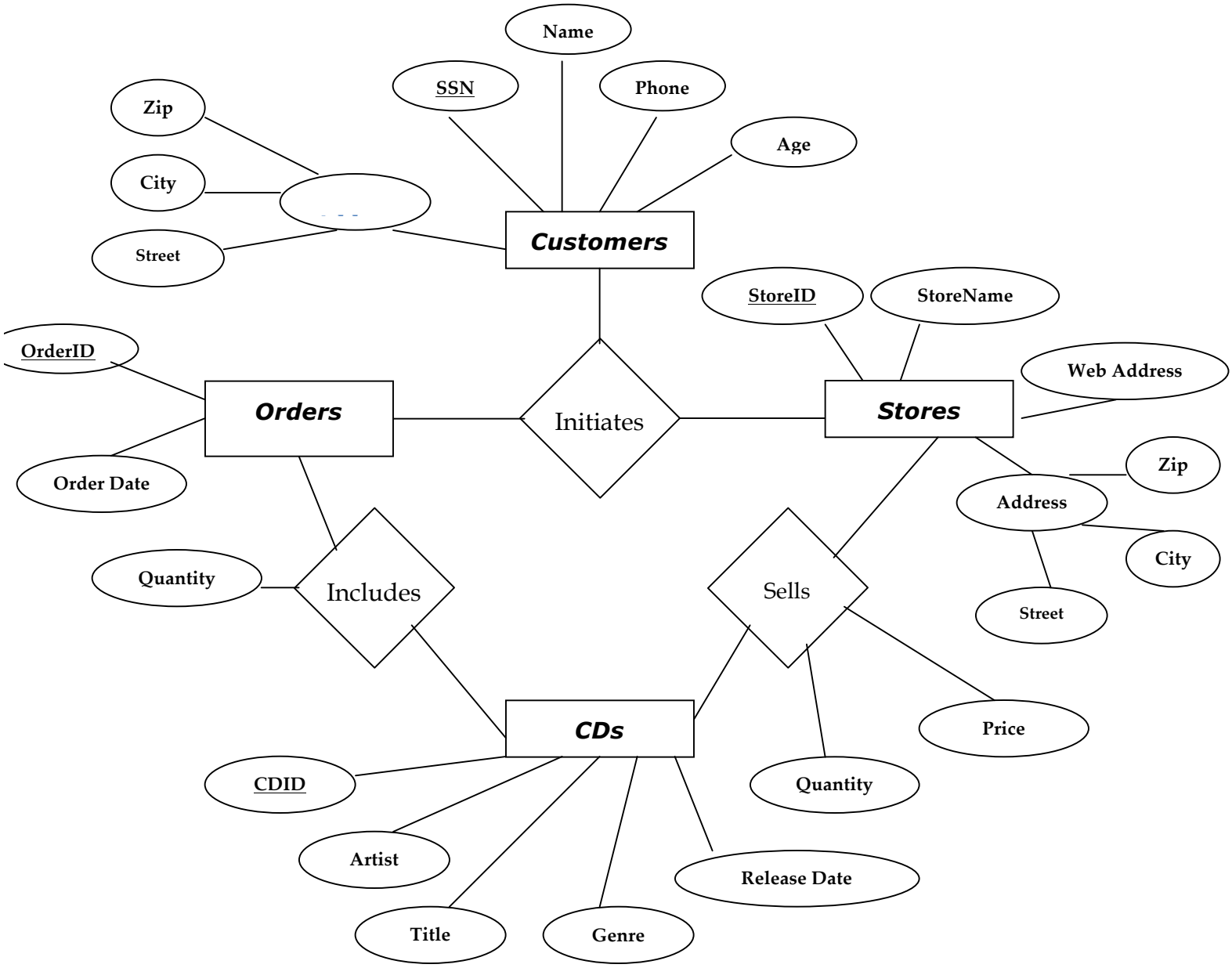
(a1 , b)

Problem 3: (13 points)

Reduce the given EER diagram to relations using pure relational model (i.e., No Object Oriented or Object Relational). Be sure to identify all primary and foreign keys.



Problem 4: (20 points)
Consider the following ER diagram and its reduction.



```
CREATE ROW TYPE Address_Type (
      street VARCHAR(15), city VARCHAR(15),
      zip VARCHAR(10));

CREATE TABLE customers (
      ssn CHAR(10) PRIMARY KEY,
      name VARCHAR(15), phone CHAR(20),
      age INTEGER, address Address_Type);

CREATE TABLE CDs (
      CDID INTEGER PRIMARY KEY,
      title VARCHAR(30), releaseDate DATE,
      genre CHAR(1), artist VARCHAR(15));

CREATE TABLE orders (
      orderID INTEGER PRIMARY KEY,
      ssn CHAR(10), storeID INTEGER,
      orderDate DATE,
      FOREIGN KEY (cssn) REFERENCES customers (ssn),
      FOREIGN KEY (storeID) REFERENCES stores (storeID));

CREATE TABLE stores (
      storeID INTEGER PRIMARY KEY,
      storeName VHARCHAR(15), webAddress VARCHAR(20),
      mailAddress Address_Type);

CREATE TABLE store_items (                    // Relation Sells
      storeID INTEGER, CDID INTEGER,
      quantity INTEGER, price INTEGER,
      PRIMARY KEY (storeID, CDID),
      FOREIGN KEY (storeID) REFERENCES stores (storeID),
      FOREIGN KEY (CDID) REFERENCES cds (CDID));

CREATE TABLE order_items (                    // Relation Includes
      orderID INTEGER,
      storeID INTEGER,
      CDID INTEGER, quantity INTEGER,
      PRIMARY KEY (orderID, CDID),
      FOREIGN KEY (orderID) REFERENCES orders (orderID),
      FOREIGN KEY (storeID, CDID) REFERENCES store_items (storeID, CDID));
```

a) Complete the following SQL statement to find the name of the cds that have been ordered by no one younger than 18 in "Los Angeles":

```
SELECT CDs.title
FROM CDs
WHERE …….. ( SELECT order_items.CDID
                FROM order_items, orders, customers
                WHERE order_items.orderID = orders.orderID
               AND orders.ssn = customers.ssn
               AND …….
               AND …….
               AND …….);
```

```
SELECT CDs.title
FROM CDs
WHERE NOT EXISTS ( SELECT order_items.CDID
                      FROM order_items, orders, customers
                      WHERE order_items.orderID = orders.orderID
                     AND orders.ssn = customers.ssn
                     AND customers.address.city = "Los Angeles"
                     AND customers.age < 18
                     AND CDs.CDID = order_items.CDID);
```

b) Describe what the following SQL statement does.

```
SELECT s.storeName, SUM(si.price * oi.quantity) Total_Value
FROM store_items si, order_items oi, stores s
WHERE s.storeID = si.storeID
AND oi.storeID = s.storeID
AND oi.CDID = si.CDID
GROUP BY s.storeName
HAVING SUM(si.price * oi.quantity) >= ALL (
      SELECT SUM(si1.price * oi1.quantity)
      FROM store_items si1, order_items oi1, stores s1
      WHERE s1.storeID = si1.storeID
      AND oi1.storeID = s1.storeID
      AND oi1.CDID = si1.CDID
      GROUP BY s1.storeName
```

);

Display the store with the maximum total value of orders.

c) Describe what the following SQL statement does.

```
SELECT s.storeID, oi.CDID, SUM(oi.quantity)
FROM order_items oi, stores s
WHERE s.storeID = oi.storeID
GROUP BY s.storieID, oi.CDID
HAVING SUM(oi.quantity) >= ALL (
      SELECT SUM(oi2.quantity)
      FROM order_items oi2
      WHERE oi2.storeID = oi.storeID
      GROUP BY oi2.storeID, oi2.CDID
      HAVING SUM(oi2.quantity) < SOME (
            SELECT SUM(oi1.quantity)
            FROM order_items oi1
            WHERE oi1.storeID = oi2.storeID
            GROUP BY oi1.storeID, oi1.CDID
      )
)
```

Displays the first 2 top selling cds, for each store separately.

d) Write a SQL statement to find the name of stores that have less than 300 cds.

```
SELECT s.storeName, COUNT(si.CDID)
FROM stores s, stores_items si
WHERE s.storeID = si.storeID
GROUP BY s.storeName
HAVING COUNT(s.CDID) < 300;
```

Problem 5 (25 points)

Draw the EER model diagram for the DBMS that manages the following information:

Design Specification

The following is a description of the information requirements for a fictitious property rental management system of a company in Los Angeles. The system must contain Salesperson Information, Property Information, Property Information, Owner Information, Customer Information and Lease Information. In particular, the system is to keep track of the following:

Salesperson Information

Each salesperson has a name, social security number, address, phone number, salesperson number, and salary. Supervisors are responsible for a number of salespersons.

Property Information

The company has properties for rent. A property belongs to one or more owners and is either a building or an open space land lot. A building is built upon a land lot and a land lot may have several buildings. The details of property include a unique property number, location, type of property (building or land), and asking monthly rent. For a building, the address, type of building (for example, house, apartment), and number of rooms are recorded. Each property for rent is assigned to a specific salesperson that is responsible for the management of that property. A salesperson may manage several properties for rent.

Owner Information

The company manages properties for private or business owners. Each private owner and business owner is uniquely identifies by an owner number. Additional information on private owners includes the owner's name, social security number, address and phone number. The details of business owners include the name of the business, business address, contact name and phone number.

Customer Information

When a customer first contacts the company, he/she is given a unique customer number and his/her details are recorded. This includes the customer's name, social security number, address, phone number and preferred types of accommodation. In addition, the maximum rent the customer is prepared to pay and the desired locations for each preferred type are also recorded.

A customer may request reservations of the desired properties for a three-day grace period before he/she signs a lease agreement to become a renter. In this case, the date of request is recorded.

Lease Information

The company is responsible for drawing up the terms of the lease agreement between a renter and property. The lease agreement details the unique lease number, monthly rent, rental deposit and the date the rent starts and finishes. Renters can rent out one or more properties in a lease agreement. If a rent is not paid after 5 days of the due date, the first day of a month period, a penalty of 1% of rent per additional day will be charged for that month.

Problem 6 (12 points)

Describe the following three technologies and identify their pros and cons.

a) Embedded SQL

b) Dynamic SQL

c) SQLJ