CSE 182 Midterm Exam, Spring 2023, Shel Finkelstein

Student Name: _____

Student ID: _____

UCSC Email: _____

Midterm Points:

Part	Max Points
I	30
II	20
III	24
IV	27
Total	101

Closed book, but it's okay to bring a single two-sided 8.5" x 11" sheet of paper with as much info written or printed on it as you can read unassisted. Please hand in Midterm (but **not** your sheet, and **not** the Relation Instances sheet you've been given) when you finish the Midterm. You must also show your UCSC ID when you hand in the Midterm.

Be sure to answer each question readably in the space provided for that question.

Part I: (30 points, 6 each):

Question 1: Assume that R1 is a relation that has 6 tuples in it, R2 is a relation that has 3 tuples in it, and R3 is a relation that has 10 tuples in it. How many tuples are there in the result of the following SQL query?

```
SELECT *
FROM R1, R2, R3;
```

Just supply your answer; no part credit.

Answer 1: _____

Question 2: Let R(A,B,C) be a relation, where (A, B) is the Primary Key for that relation, and C cannot be NULL.

Assume that A's domain has 5 different values, B's domain has 7 different values, and C's domain has 12 different values.

What is the maximum number of different tuples that can be in R?

Just supply your answer; no part credit.

Answer 2: _____

Question 3: What does each of the following statements do? Answer both parts of this question clearly and precisely in the spaces provided.

3a): DELETE FROM Students;
Answer 3a):

3b): DROP TABLE Students;
Answer 3b):

Question 4 We discussed the ACID properties for transactions. The letter "D" in ACID stands for Durability. Briefly explain what Durability means, and also say why Durability is important.

Answer 4:

Question 5: SQL uses 3-valued logic. Give the SQL truth value of each of the following conditions if the value of salary1 is NULL and the value of salary2 is 2000.

5a): salary1 > 500 OR salary2 > 500

Answer 5a): _____

5b): salary1 > 500 OR salary1 <= 500

Answer 5b): _____

5c): NOT (salary1 = salary2)

Answer 5c): _____

Part II (20 points, 4 each): The questions in Part II are about an Employees table that was created as follows:

```
CREATE TABLE Employees (
        name        CHAR(30) PRIMARY KEY,
        age         INTEGER NOT NULL DEFAULT(21),
        salary      INTEGER,
        department  CHAR(20) NOT NULL
    );
```

Answer **TRUE** or **FALSE** to each of the following questions, writing out the full word.

Question 6: Attributes age and department can't be NULL, but the other attributes of Employees can be NULL.

Answer 6: _____

Question 7: The result of the query:

```
SELECT COUNT(age)
FROM Employees;
```

can sometimes be greater than the result of the query:

```
SELECT COUNT(DISTINCT age)
FROM Employees;
```

Answer 7: _____

Question 8: The following query is a legal SQL query:

```
SELECT salary, MIN(age), MAX(age)
FROM Employees
GROUP BY department
HAVING salary > 9000;
```

Answer 8: _____

```
CREATE TABLE Employees (
        name        CHAR(30) PRIMARY KEY,
        age         INTEGER NOT NULL DEFAULT(21),
        salary      INTEGER,
        department  CHAR(20) NOT NULL
    );
```

Question 9: The following two SQL queries are equivalent:

```
SELECT e.name
FROM Employees e
WHERE e.age > ANY ( SELECT e2.age
                    FROM Employees e2 );

SELECT e.name
FROM Employees e
WHERE EXISTS ( SELECT *
               FROM Employees e2
               WHERE e.age > e2.age );
```

Answer 9: _____

Question 10: To require that two employees who are in the same department can't have the same salary, we would specify that department is UNIQUE, and that salary is UNIQUE.

Answer 10: _____

Part III: (24 points, 6 each):

Questions 11-14 in this Midterm Part ask for the results of SQL queries on the instances of the tables Customers, Slopes and Activities that are on the separate sheet of paper that you've been given.

Do not turn in that page at the end of the exam.

Show attribute names at the top of all SQL outputs for all questions in Part III.

Question 11: What is the result of the following SQL query?

```
SELECT DISTINCT color
FROM Slopes s
WHERE s.slopeid IN ( SELECT a.slopeid
                     FROM Activities a );
```

Answer 11:

Question 12: What is the result of the following SQL query?

```
SELECT type, MAX(age) AS oldest
FROM Customers
GROUP BY type
ORDER BY type;
```

Answer 12:

Question 13: What is the result of the following SQL query?

```
SELECT DISTINCT a.cid, a.day
FROM Activities a, Slopes s
WHERE a.slopeid = s.slopeid
    AND s.name = 'Mountain Run';
```

Answer 13:

Question 14: What is the result of the following SQL query?

```
SELECT c.cname, s.name
FROM Activities a, Customers c, Slopes s
WHERE a.cid = c.cid
    AND a.slopeid = s.slopeid
    AND a.day <= DATE '01/06/09';
```

Answer 14:

Part IV (27 points, 9 each):

The questions in Part IV ask you to write SQL statements using the tables shown below, which are 4 of the tables in our Lab Assignments. (The CandidatesForOffice tables has been simplified, omitting some unneeded attributes.)

The Primary Key in each table is shown underlined. Assume that there aren't any NOT NULL or UNIQUE constraints specified for these tables. Data types aren't shown to keep things simple. There aren't any trick questions about data types.

Persons(personID, personName, city, state, occupation, isFelon)

ElectedOffices(officeID, officeName, city, state, salary)

Elections(officeID, electionDate, officeStartDate, officeEndDate)

CandidatesForOffice(candidateID, officeID, electionDate, party, votes)

You should assume the following Foreign Keys:

- Every officeID in Elections appears as an officeID in ElectedOffices.
- Every candidateID in CandidatesForOffice appears as a personID in Persons.
- Every (officeID, electionDate) in CandidatesForOffice appears as an (officeID, electionDate) in Elections.

Tables and attributes are repeated at the top of each question, with Primary Keys underlined.

Be sure to answer each question readably in the space provided below that question.

Persons(personID, personName, city, state, occupation, isFelon)
ElectedOffices(officeID, officeName, city, state, salary)
Elections(officeID, electionDate, officeStartDate, officeEndDate)
CandidatesForOffice(candidateID, officeID, electionDate, party, votes)

Question 15: An election is identified by (officeID, electionDate), where officeID is the elected office for that election.

Write a SQL query which finds all the elections for which:

- the electionDate is March 19, 2022 or later,
- the city for that election's elected office starts with 'Santa' (with that capitalization), and
- the salary for that election's elected office isn't NULL.

The attributes in your result should appear as theOfficeID, theElectionDate, theCity and theSalary.

No duplicates should appear in your result.

Answer 15:

Answer 15 (continued):

Persons(personID, personName, city, state, occupation, isFelon)
ElectedOffices(officeID, officeName, city, state, salary)
Elections(officeID, electionDate, officeStartDate, officeEndDate)
CandidatesForOffice(candidateID, officeID, electionDate, party, votes)

Question 16: party is an attribute in the CandidatesForOffice table that identifies the political party of the candidate for office in an election. For example, party is 'Gold' for a candidate who's running for office in the Gold party.

Write a SQL query that finds personName and occupation for each person who never was a candidate running for office in the Gold party.

The tuples in your result should be in reverse alphabetical order based on personName. No duplicates should appear in your result.

Answer 16:

Answer 16 (continued):

Persons(personID, personName, city, state, occupation, isFelon)
ElectedOffices(officeID, officeName, city, state, salary)
Elections(officeID, electionDate, officeStartDate, officeEndDate)
CandidatesForOffice(candidateID, officeID, electionDate, party, votes)

Question 17: As the previous question told you, party is an attribute in the CandidatesForOffice table that identifies the political party of the candidate for office in an election. For example, party is 'Gold' for a candidate who's running for office in the Gold party.

We'll say that a person is a Programmer if the occupation for that person is 'Programmer'. Write a SQL query which finds all the parties for which at least 6 candidates for office are Programmers. But do not include a tuple for the Gold party in your result.

The attributes in your result should appear as party and numProgrammers, where numProgrammers is the number of candidates for office from that party who are Programmers.

No duplicates should appear in your result.

Answer 17:

Answer 17 (continued):