CMPS 182, Final Exam, Winter 2015, Shel Finkelstein

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Final Points

Part	Max Points	Points
I	30	
II	24	
III	18	
IV	36	
Total	108	

Part I: (30 points, 5 each) Assume that there are relations with the following schemas. Assume that attributes can't be NULL. Underlined attributes are keys. For each question in this part, write a SQL statement that does what's requested by the question.

Student(studentID, student_name, major)
For each studentID, gives the students name and major

Course(courseID, course_name, department, instructor)
For each course, gives the course's description and department

Enroll(studentID, courseID, grade)
For each studentID and courseID where the student has taken that course, gives the sudent's grade, which is a float number.

If there is a row for a studentId and courseID in Enroll, then there always is a row in Student for that studentID, and in Course for that courseID.

Question 1: Find the studentId and student_name for all students whose major is 'CMPS', ordered by student_name.

Answer 1:

Question 2: For each course that has students enrolled, find the average grade that students received in that course, listing the courseID for the course and the average grade.

Answer 2:

Question 3: For each course, list student_name of any student who received the highest grade of any student enrolled in that course, together with the course_name.

Answer 3:

Question 4: List the courseID for each course in which some enrolled student has a grade of exactly 4.0. List each courseID at most once, even if multiple students received 4.0 grades.

Answer 4:

Question 5: Delete students from the Student relation if they aren't enrolled in any courses.

Answer 5:

Question 6: For each courseID that has at least 10 students enrolled, list the courseID, course_name, department, and instructor.

Anwer 6:

Part II: (24 Points, 4 each)

Question 7: If R(A,B) is a relation where A's domain is (a1, a2, a3, a4) and A can also be null, and B's domain is (b1, b2, b3, b4,b5,b6), and B can also be NULL, what the maximum number of different tuples that can be in R?

Answer 7:

Question 8: What words do the four letters in ACID stand for in transaction processing?

Answer 8:

Question 9: What is an advantage of using Stored Procedures?

Answer 9:

Question 10: What is an advantage of XML over relational models?

Answer 10:

Question 11: In using SQL embedded in a programming language, you can execute a statement directly using:

```
EXEC SQL <text-of-query>;
```

You can also use dynamic SQL, with:

```
 EXEC SQL PREPARE <query-name>
FROM <text of the query>;
```

And after that you can execute:

```
EXEC SQL EXECUTE <query-name>;
```

What are differences between the direct and dynamic use of SQL? When might dynamic SQL be needed?

Answer 11:

Question 12: Assume that relation R(A,B,C,D) includes the row (1,2,3,4), and that R has Functional Dependencies A,B → C and C → D,

Mark each row below with a check if it might also be in R, and mark each row below with an X if it can not also be in R.

Answer 12:

_______ (1,2,4,7)

_______ (1,3,8,9)

_______ (1,2,3,5)

_______ (2,2,4,6)

Part III: (18 points, 3 each)

Answer the following questions with **YES** or **NO.**

Question 13: Is the following a legal SQL query for a table
Staff(name, age, salary, department)?

```
SELECT MAX(age), department
FROM Staff
WHERE salary > 5000
GROUP BY department
HAVING MIN(age) > 21;
```

Answer 13:

Question 14: Is the following equality always true when R is a relation, *attribs* is some attributes of R, and *cond* is a condition on R that refers only to the attributes of R that are in *attribs*?

$\sigma_{cond} (\pi_{attribs} (R)) = \pi_{attribs} (\sigma_{cond} (R))$?

Answer 14:

Question 15: Is the following relation with the specified Functional Dependencies in **Third Normal Form**?

R(<u>city, street</u>, zip)
city,street → zip
zip → city

Answer 15:

Question 16: Is the following relation with the specified Functional Dependencies in **Boyce-Codd Normal Form**? (Same relation and FDs as in question 15.)

R(city, street, zip)
city,street → zip
zip → city

Answer 16:

Question 17: For OLAP, if you have a Fact Table with associated Dimension Tables, must the dimension attributes of each row in the Fact Table correspond to values of keys in the Dimension Tables?

Answer 17:

Question 18: If the following is part of an XML document:

```
<BAR><ADDR>101 Maple St.</ADDR>
   <PHONE>555-1212</PHONE>
   <PHONE>555-4567</PHONE>
</BAR>
```

Then could:

```
<!ELEMENT BAR (ADDR PHONE* MANAGER?)>
```

be the declaration for BAR in a DTD?

Answer 18:

Part IV: (30 points, 6 each):

Question 19: Write a SQL statement that creates a table Employee with four attributes, empNum, name, deptNum and salary, where empNum, deptNum and salary are integers, name is a character string of length 30, empNum is the primary key, and deptNum and salary can be NULL (but other attributes can't be).

Answer 19:

Question 20: Write a SQL INSERT statement that inserts a tuple into the Employee table (described in question 19) for an employee named John Smith who is in department (deptNum) 56, has salary 25000, and whose employee number (empNum) is 789.

Also, write a SQL DELETE statement that deletes just that tuple.

Question 21: Write a SQL UPDATE statement that increases salary by 100 for all employees in the Employee table (described in question 19) whose salary is less than 8000.

Also, for your UPDATE, what happens to employees whose salary is NULL?

Question 22: How would you change the CREATE statement for question 19 if we wanted to enforce Referential Integrity by making deptNum in the Employee table be a foreign key referring to a deptNum attribute in a Department table?

Also, describe two (out of the three) different actions that might be taken if a department that had employees in it was deleted from the Department table.

Answer 22:

Question 23: Assume that a JDBC connection myCon has been established to a database that has a table Sells(bar, beername, price), where bar and beername are character strings and price is float.

Print out all the beernames and prices that are sold at ‘GoodBar’. Don’t bother with including libraries or variables declarations, and you can have an informal print statement if you want.

Here ‘s an outline of what you need to write:

```
// Execute the query
// Loop through the results
// For each value in the result, get the values of beername and price, and print them
```

Answer 23:

Question 24: Normal forms help avoid anomalies. We discussed 3 anomalies (Update, Delete and Insert) in class. Explain 2 of these 3 anomalies, giving examples of the problems that could arise.

You may use this table Employee(eid, name, addr, rank, salary-scale), with the Functional Dependency rank → salary-scale, to discuss the anomalies, if you want.

eid	name	addr	rank	salary-scale
34-133	Jane	Elm St.	6	70-90
33-112	Hugh	Pine St.	3	30-40
26-002	Gary	Elm St.	4	35-50
51-994	Ann	South St.	4	35-50
45-990	Jim	Main St.	6	70-90
98-762	Paul	Walnut St.	4	35-50

Answer 24: