Database Management Systems

Review Questions

Question 1

- Assume Table A has a foreign key field referring to Table B. After a while, the administrator decides to delete Table B but keep Table A. What changes should he make to Table A? Explain.

- Because Table B is deleted, the foreign keys will change to normal fields. CASCADE cannot be used here because the whole table is deleted, not a few records

Question 2

- The following relations have been given:

  Book < ISBN, Author, Title, Status >

  Client < ID, Name, Phone >

  Borrow < ID, ISBN, Since, Until >

  Assume we are looking for the book “Introduction to Databases” written by Date. We know that the book has been borrowed. Write a relational algebra statement to find the name of the borrower and the date when the book will be returned to the library

$\Pi_{\text{Name, Until}} (\sigma_{\text{Title = “Introduction to Databases” And Author = “Date”}} (\text{Client} \mid\!><\!\mid \text{Borrow} \mid\!><\!\mid \text{Book}))$

Question 3

Write a SQL query to find the maximum, minimum, and average salary of the employees of each department using the following table:

Employee < EmpID, EmpName, Department, Salary >

```
SELECT Department, avg(salary), min(salary), max(salary)
    FROM Employee
    Group by (Department)
```

Question 4

The employer of a company has decided to raise the salaries of its employees. The raise will be as much as 10% of the average salary currently paid. Write necessary SQL query to update the salaries assuming the following table:

Employee < EmpID, EmpName, Department, Salary >

```
UPDATE    Employee
SET   Salary = Salary + 1.1 * ( SELECT  Avg(Salary)
                                FROM Employee )
```

Question 5

- Give the definitions of the followings:
  - **Relation** : A relation is a set of n-tuples, where n-tuples are obtained from the Cartesian product of n domains.
  - **Schema** : Schema is the ordered list of the attributes of a relation
  - **Foreign key** : An attribute from a table which is the primary key of another table
  - **Transaction** : Instruction run on a database which is either executed completely, or cancelled.

Question 6

Assume Employee and department relations are defined as below:

Employee<name, surname, departmentCode, city, salary>

Department<*DepartmentCode*, *DepartmentName*, *Location*>

Write a ***relation algebra*** expression to find the names, surnames, and the name of the department of employees who work in a department located in 'London'.

$\Pi_{\text{name, surname}}\ \sigma_{\text{Location = 'London'}}$ **(Employee |><| Department)**

Question 7

A car producing company has decided to store its data in the following three tables:

1. **Car**<Model, NumDoors, EngineCapacity, Year, Price>
2. **SparePart**<SpareID, CarModel, SparePartName, Price>
3. **Order**<OrderID, SparePartID, Quantity, Date, CustomerName, CustomerPhone>

a) Write necessary SQL instructions to create the tables. Consider all constraints such as primary key, foreign key, not null, etc.

```
create table Car
(  Model varchar primary key,
   NumDoors Integer NOT NULL,
   EngineCapacity Real Not NULL,
   Year  Date,
   Price Real NOT NULL)
Create Table SparePart
( SpareID varchar Primary Key,
   CarModel varchar references car(Model),
   SparePartName varchar,
   Price real NOT NULL
)
```

Create Table Order

(OrderID Integer Primary Key,

SparePartID varchar references SparePart(SpareID),

Quantity Integer NOT NULL,

OrderDate Date NOT NULL,

CustomerName varchar NOT NULL,

CustomerPhone varchar

)

b) Write SQL instructions to insert a record into each table.

Insert Into Car values (‘FordFiesta’, 4, 1600, 2013, 50000)

Insert Into SparePart values (P100, ‘FordFiesta’, ‘Brake Cord’, 550)

Insert Into Order values (P100, 1, 20-11-2014, ‘John’, ‘1234567’)

c) In which order should we run the insert instructions? Why?

First the insert into car, then sparePart, and finally order. Because sparePart has a foreign key field referring to car, and order has a foreign key referring to sparePart

Question 7 – part C

The following relations are available. Write a SQL expression to give the Student name, and the name of the courses he/she took in year 2012 if his/her Student ID is '12345'

Student<StudentID, Student Name, Department>

Course<CourseCode, CourseName , Credit>

Score<CourseCode, StudentID, year, Grade>

```
SELECT StudentName, CourseName
FROM  student join score on StudentID join Course on CourseCode
Where studentID = '12345'
GROUP By StudentName
```

Question 8

In the following tables, delete statement is run as shown below. Explain what problem(s) may arise and what solutions are available for them.

Book<BookID, Title, Author, Publisher>

User<UserID, Name, Address>

Borrowed<BookID, UserID, DateBorrowed, DateDue>

The query is:

```
DELETE FROM Book
 WHERE BookID =’37623’
```

- **Solution:** A record in Borrowed table may refer to a non-existing book. As a solution we should use CASCADE

1) ____ **Hashing and Indexing are two methods for**

a. Storing key values
b. Storing data records
c. **Fast data record retrieval**
d. Sorting data records

2) ____ **Chaining is used for resolving collisions in a hash table by**

a. Putting more than one data record in a bucket
b. **Storing collided records in overflow and connecting them in a linked list**
c. Creating a chain in each data bucket
d. Expanding hash table to store more records in the hash table

3) _____ **Bucketing is used with chaining in a hash table because**

a. Bucketing is not fast enough in data retrieval
b. Bucketing cannot put the records in true order
c. Chaining can group records according to their hash values but bucketing cannot
d. **There is no upper limit on the collisions and hence the bucket size cannot be estimated**