Tutorial: Creating and Populating Tables

Students at the National University of Ngendipura (NUN) buy books for their studies. They also lend and borrow books to and from other students. Your company, Apasaja Private Limited, is commissioned by NUN Students Association (NUNStA) to implement an online book exchange system that records information about students, books that they own and books that they lend and borrow.

The database records the name, faculty, and department of each student. Each student is identified in the system by her email. The database also records the date at which the student joined the university (year attribute).

The database records the title, authors, publisher, year and edition and the ISBN-10 and ISBN-13 for each book. The International Standard Book Number, ISBN-10 or -13, is an industry standard for the unique identification of books. It is possible that the database records books that are not owned by any students (because the owners of a copy graduated or because the book was advised by a lecturer for a course but not yet purchased by any student.)

The database records the date at which a book copy is borrowed and the date at which it is returned. We refer to this information as a loan record.

For auditing purposes the database records information about the books, the copies and the owners of the copies as long as the owners are students or as there are loan records concerning the copies. For auditing purposes the database records information about graduated students as long as there are loan records concerning books that they owned.

Questions

Not all questions will be discussed during tutorial. You are expected to attempt them before coming to the tutorial. You may be randomly called to present your answer during tutorial. You are encouraged to discuss them on Canvas Discussion.

1. **Data Definition Language**.

   You are provided with the relational schema and with a sample instance of the database as of December 31, 2010. You are given the SQL data definition language code to create the schema and the SQL data manipulation language code to create a instance of the database.

   (a) Download the following files from Canvas `Files` ▶ `Cases` ▶ `Book Exchange`.

`NUNStASchema.sql`	`NUNStAStudent.sql`	`NUNStACopy.sql`
`NUNStAClean.sql`	`NUNStABook.sql`	`NUNStALoan.sql`

(b) Read the SQL files. What are they doing?

(c) Use the files to create and populate a database. If there is a bug, find it, and fix it.

2. **Insertion, Deletion, and Update**.

The following set of questions assume Question 1 has already been completed.

(a) Insert the following new book. Describe the behavior.

Code: INSERT INTO

```
INSERT INTO book VALUES (
  'An Introduction to Database Systems',
  'paperback',
  640,
  'English',
  'C. J. Date',
  'Pearson',
  '2003-01-01',
  '0321197844',
  '978-0321197849'
);
```

(b) Insert the *same book* but with a different `ISBN13` field. For instance, with `ISBN13` field value of `'978-0201385908'`. Describe the outcome of the operation.

(c) Insert the *same book* but with a different `ISBN10` field. For instance, with `ISBN10` field value of `'0201385902'`. Describe the outcome of the operation.

(d) Insert the following new student. Describe the behavior.

Code: INSERT INTO

```
INSERT INTO student VALUES (
  'TIKKI TAVI',
  'tikki@gmail.com',
  '2024-08-15',
  'School of Computing',
  'CS',
  NULL
);
```

(e) Insert the following new student. Describe the behavior.

Code: INSERT INTO

```
INSERT INTO student (email, name, year, faculty, department) VALUES (
  'rikki@gmail.com',
  'RIKKI TAVI',
  '2024-08-15',
  'School of Computing',
  'CS'
);
```

(f) Change the name of the department from `'CS'` to `'Computer Science'`. Describe the behavior.

Code: UPDATE

```
UPDATE student
SET department = 'Computer Science'
WHERE department = 'CS';
```

(g) Delete all the students from the `'chemistry'` department. Describe the behavior.

(h) Delete all the students from the `'Chemistry'` department. Describe the behavior.

3. **Integrity Constraints**.

The following set of questions assume Question 2 has already been completed.

(a) Some constraints in PostgreSQL are `DEFERRABLE` [6]. What does it mean?

(b) Insert the following copy of `'An Introduction to Database Systems'` owned by Tikki.

Code: INSERT INTO

```
INSERT INTO copy VALUES (
  'tikki@gmail.com',
  '978-0321197849',
  1,
  'TRUE'
);
```

What is the difference between the following two SQL programs?

Code: Transaction #1

```
BEGIN TRANSACTION;
  SET CONSTRAINTS ALL IMMEDIATE;
  DELETE FROM book WHERE ISBN13 = '978-0321197849';
  DELETE FROM copy WHERE book = '978-0321197849';
END TRANSACTION;
```

Code: Transaction #2

```
BEGIN TRANSACTION;
  SET CONSTRAINTS ALL DEFERRED;
  DELETE FROM book WHERE ISBN13 = '978-0321197849';
  DELETE FROM copy WHERE book = '978-0321197849';
END TRANSACTION;
```

4. **Modifying the Schema**.

The following set of questions assume Question 3 has already been completed.

(a) Argue that there is no need for the `available` field in the table `copy`. Make the necessary changes.

(b) Argue that the table `student` should not contain both the fields `department` and `faculty`. Make the necessary changes.

References

[1] S. Bressan and B. Catania. *Introduction to Database Systems*. McGraw-Hill Education, 2006. ISBN: 9780071246507.

[2] Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom. *Database Systems: The Complete Book*. 2nd ed. Prentice Hall Press, 2008. ISBN: 9780131873254.

[3] *ISO 8601: Date and Time Format*. `https://www.iso.org/iso-8601-date-and-time-format.html`. [Online; last accessed 2025].

[4] *Mockaroo: Random Data Generator and API Mocking Tool*. `https://mockaroo.com/`. [Online; last accessed 2025].

[5] *PostgreSQL Docs: Appendix A. PostgreSQL Error Codes*. `https://www.postgresql.org/docs/current/errcodes-appendix.html`. [Online; last accessed 2025].

[6] *PostgreSQL Docs: CREATE TABLE (Deferrable)*. `https://www.postgresql.org/docs/17/sql-createtable.html#SQL-CREATETABLE-PARMS-DEFERRABLE`. [Online; last accessed 2025].

[7] Raghu Ramakrishnan and Johannes Gehrke. *Database Management Systems*. 2nd. USA: McGraw-Hill, Inc., 2000. ISBN: 0072440422.

[8] *W3schools Online Web Tutorials*. `https://www.w3schools.com/`. [Online; last accessed 2025].