Lab 07: Normalization

Objective

This lab tests your understanding of database normalization and the concepts covered in previous lab like DDL Queries, Group by, Joins etc.

Submission Requirements

1. Solve Part A in a Word document. For any questions you have solved on paper, take clear images of your solutions, and insert them into the Word document.
2. Solve Part B using SQL and save all SQL commands in a script file.
3. Upload both the Word document and the SQL script file to the LMS.

Part A- Normalization

The following table have been created in database:

```
CREATE TABLE Enrollment (
   StudentID INT,
   StudentName VARCHAR(50),
   CourseID VARCHAR(10),
   Course VARCHAR(50),
   Grade CHAR(1),
   FacultyName VARCHAR(50),
   FacultyEmail VARCHAR(50),
   PRIMARY KEY (StudentID, CourseID)
);
```

With the following data:

StudentID	StudentName	CourseID	Course	Grade	FID	FacultyName
101	Ahmed	C101	Database	B	1	Maria Rahim
102	Fatima	C101	Database	A	2	Abeera Tariq
101	Ahmed	C102	Introduction to Programming	B	3	Samreen Kazi
103	Hassan	C102	Introduction to Programming	A	3	Samreen Kazi
103	Hassan	C103	Accounting	A	4	Dr. Khalid
104	Aisha	C103	Accounting	B	4	Dr. Khalid

1. Identify the data redundancy in StudentCourse.
2. What update anomalies could occur in StudentCourse?
3. What insertion and deletion anomalies can you identify?
4. Identify the partial and transitive dependency and whether the table violates the rules of 1NF, 2NF, or 3NF.
5. Tranform the schema into 3NF.
6. Even after normalising it into 3nf, there exists a relation that does not accurately represent the real-world scenario. Identify this relation to better reflect the real-world requirements. For instance, a faculty member such as Dr. Khalid may be assigned to teach a new course, like “Business”.
7. Draw the final ER diagram of your normalized schema in crowfoot notation.

Part B- SQL Statements

Write and Execute SQL queries for the following information needs:

1. Write the DDL queries for creating the tables of your finalized schema from Question 7.
2. Insert appropriate values into the tables created in Question 8.
3. Dr. Khalid has been assigned to teach the Business course with Course ID C104. Insert this information into the appropriate table of the schema.
4. List all students along with the courses they are enrolled in, displaying StudentName, CourseName, and Grade.
5. List the number of students enrolled in each course. Display CourseName and StudentCount, and sort the results by StudentCount descending.
6. Find all students who are enrolled in more than one course. Display StudentName and the number of courses they are enrolled in.
7. Display the list of courses along with the faculty teaching them. Include CourseName, FacultyName.
8. Find all courses that have more than one faculty member assigned. Display CourseName and FacultyCount.
9. List all students along with the faculty members teaching their courses. Display StudentName, CourseName, FacultyName.
10. Find the students who got grade 'A' in any course. Display StudentName, CourseName, Grade, sorted alphabetically by StudentName.
11. Display the total number of courses each faculty member teaches. Include only faculty teaching more than one course. Display FacultyName and CourseCount.