Lab 07: Normalization

Part A- Normalization

1. Identify the data redundancy in StudentCourse.

Ans. There is data redundancy because several attributes repeat multiple times:

- StudentName repeats for every course that a student takes.

- FacultyName repeats for every course they teach.

- Course repeats for every student enrolled in it.

2. What update anomalies could occur in StudentCourse?

Ans. For example, if Course Accounting changed from Financial Accounting it would have to be changed where ever 104 (CourseId of Accounting) is written.

3. What insertion and deletion anomalies can you identify?

Ans. Insertion Anomaly: We cannot add a new course or faculty if no student is enrolled in it, because we don't have any StudentID or Grade to insert

Deletion Anomaly: If we delete a student's record, we may lose information about the course or faculty teaching it e.g., deleting Fatima "Database" record removes Abeera Tariq faculty details too.

4. Identify the partial and transitive dependency and whether the table violates the rules of 1NF, 2NF, or 3NF.

Ans. It violates 2NF and 3NF as there are partial and transitive dependencies. 1NF is satisfied as records are atomic, the primary key is identified (StudentID, CourseID) and the dependencies are listed below:

Partial Dependency:

StudentID-> StudentName

CourseID-> Course, FID, FacultyName

Transitive Dependency:

FID-> FacultyName

5. Tranform the schema into 3NF.

Ans. To transform into 3NF we need to establish 2NF and get rid of transitive dependencies.

Transforming into 2NF:

Student (StudentID, StudentName)

Courses(CourseID, Course, FID, FacultyName)

Enrollment(StudentID, CourseID, grade)

Now, its in 2NF so getting rid of transitive dependencies will give us 3NF:

Student (StudentID, StudentName)

Courses (CourseID, Course, FID, FacultyName)

Faculty (FID, FacultyName)

Enrollment (StudentID, CourseID, grade)

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".

Ans. After 3NF, the Enrollment table is completely correct because a teacher can't be linked to a new course unless a student enrolls. To fix this, we add a COURSES_FACULTY table to show which teacher teaches which course so for example it can reflect that Dr. Khalid teaches accounting and business.

7. Draw the final ER diagram of your normalized schema in crowfoot notation.