

LAB 5

Mahir Patel - 202303013

Jaspreet Singh Gill - 202303014

Deepak Parmar - 202303056

Functional Dependencies for Each Table:

1. Applicant Table:

- FDs: ApplicantID -> FirstName, LastName, DateOfBirth, Email
- Candidate Key: ApplicantID

2. LicenseType Table:

- FDs: LicenseTypeID -> LicenseName, Description
- Candidate Key: LicenseTypeID

3. Vehicle Table:

- FDs: VehicleID -> VehicleModel, VehicleYear
- Candidate Key: VehicleID

4. License Table:

- FDs: LicenseID -> ApplicantID, LicenseTypeID, IssuedDate, ExpiryDate, ValidityPeriod
- Candidate Key: LicenseID

5. Test Table:

- FDs: TestID -> ApplicantID, VehicleID, TestDate, Result
- Candidate Key: TestID

6. TestSchedule Table:

- FDs: ScheduleID -> TestID, ScheduledDate
- Candidate Key: ScheduleID

7. User Table:

- FDs: UserID -> Username, PasswordHash, Role
- Candidate Key: UserID

8. Payment Table:

- FDs: PaymentID -> UserID, LicenseID, PaymentDate, Amount
- Candidate Key: PaymentID

9. Renewal Table:

- FDs: RenewalID -> LicenseID, RenewalDate, NewExpiryDate
- Candidate Key: RenewalID

Anomalies

Update, Delete, and Insert Anomalies:

1. Applicant Table:

- Insert Anomaly: Cannot add an applicant without all details such as FirstName and LastName.
- Update Anomaly: Updating an email would require changing multiple places if not normalized.
- Delete Anomaly: If an applicant is deleted, associated licenses and tests could also be lost.

2. License Table:

- Insert Anomaly: Cannot insert a license without a valid ApplicantID and LicenseTypeID.
- Update Anomaly: Changing a license type would require changes across multiple licenses.
- Delete Anomaly: Deleting a license could cascade into deletion of related payments and renewals.

3. Test Table:

- Insert Anomaly: Cannot record a test without a valid ApplicantID and VehicleID.
- Update Anomaly: If the vehicle model changes, multiple test records might need to be updated.
- Delete Anomaly: Deleting an applicant may lead to loss of associated test records.

Logic for 3NF/BCNF Design:

- Each table is already in 3NF because there are no partial or transitive dependencies.

Additionally, they all satisfy

BCNF since every FD has a superkey as a determinant.

- The only reason some tables may not be normalized further to BCNF is that doing so would result in loss of certain functional dependencies or foreign key relationships critical for referential integrity.