

Task 4.1: Denormalized Table Analysis

Given Table: StudentProject(StudentID, StudentName, StudentMajor, ProjectID, ProjectTitle, ProjectType, SupervisorID, SupervisorName, SupervisorDept, Role, HoursWorked, StartDate, EndDate)

1) Functional dependencies (FDs):

StudentID → StudentName, StudentMajor

ProjectID → ProjectTitle, ProjectType, SupervisorID

SupervisorID → SupervisorName, SupervisorDept

{StudentID, ProjectID} → Role, HoursWorked, StartDate, EndDate

2) Problems and anomalies :

Redundancy:

-Student data (Name, Major) repeats for every project a student joins.

-Project data (Title, Type) repeats for every student in the project.

-Supervisor data (Name, Dept) repeats for every project record they supervise.

Anomalies Examples:

-Update Anomaly: Changing a student's major requires updates in all their project records. Inconsistencies may occur if not all are updated.

-Insertion Anomaly: Cannot add a new supervisor without assigning them to a project first.

-Deletion Anomaly: Deleting the last student from a project may accidentally delete all information about that project and its supervisor.

3) Apply 1FN:

The table is already in 1NF. All attributes are atomic, and there are no repeating groups.

4) Apply 2FN:

Primary Key: (StudentID, ProjectID)

Partial Dependencies:

StudentID → StudentName, StudentMajor

ProjectID → ProjectTitle, ProjectType, SupervisorID

2NF Decomposition:

Students (StudentID, StudentName, StudentMajor)

Projects (ProjectID, ProjectTitle, ProjectType, SupervisorID)

StudentProjects (StudentID, ProjectID, Role, HoursWorked, StartDate, EndDate)

5) Apply 3FN:

Students (StudentID, StudentName, StudentMajor)

Supervisors (SupervisorID, SupervisorName, SupervisorDept)

Projects (ProjectID, ProjectTitle, ProjectType, SupervisorID)

StudentProjects (StudentID, ProjectID, Role, HoursWorked, StartDate, EndDate)

Foreign Keys:

Projects.SupervisorID references Supervisors.SupervisorID

StudentProjects.StudentID references Students.StudentID

StudentProjects.ProjectID references Projects.ProjectID