Assignment 2: University Examination System Normalization

October 24, 2025

Assignment Overview

Kalam University of Technology (KUT), a leading Indian university, stores its student academic and examination data in a single unnormalized table named `ACADEMIC_RECORD`. Your task is to analyze this table, identify its primary and composite keys, determine functional dependencies, and apply the normalization process (1NF, 2NF, 3NF/BCNF) to eliminate data redundancy and anomalous dependencies. Submit your answers in a single document, including explanations, functional dependencies, and the final normalized tables with their Primary Keys (PK) and Foreign Keys (FK).

Database Context

The `ACADEMIC_RECORD` table captures details about students, departments, courses, faculty, and examination results at KUT. The table includes attributes relevant to an Indian university context, such as student IDs, Indian names, and department codes. Below are two tables: the first describes the table structure, and the second provides sample data.

Unnormalized Table Structure: ACADEMIC_RECORD

Column Name	Data Type	Description
StudentID	VARCHAR(10)	Unique identifier for the student.
StudentName	VARCHAR(100)	Name of the student.
DeptCode	VARCHAR(10)	Code for the department where the student is enrolled.
DeptName	VARCHAR(100)	Name of the department.
DeptLocation	VARCHAR(10(	Physical location of the department.
CourseID	VARCHAR(10)	Unique code for the course.
CourseTitle	VARCHAR(10(	Title of the course.
CourseCredits	INTEGER	Number of credits for the course.
FacultyID	VARCHAR(10)	Unique identifier for the faculty teaching the course.
FacultyName	VARCHAR(100)	Name of the faculty member.
ExamSemester	VARCHAR(20)	Semester in which the exam was conducted.
Grade	CHAR(1)	Grade obtained by the student in the course.

Sample Data: ACADEMIC_RECORD

StudentID	StudentName	DeptCode	DeptName	DeptLocation	CourseID	CourseTitle
23CS102	Priya Sharma	CS01	Computer Science	Block A, Main Campus	CS205	Data Structures
23CS103	Arjun Mehta	CS01	Computer Science	Block A, Main Campus	CS206	Operating Systems
23EE201	Neha Gupta	EE02	Electrical Engineering	Block B, East Campus	EE301	Circuit Theory
23ME045	Rohan Verma	ME01	Mechanical Engineering	Block C, Engineering Wing	ME302	Thermodynamics

Tasks (5 Total)

Complete the following tasks to normalize the `ACADEMIC_RECORD` table. Label each task clearly (e.g., Task 1) in your submission. Submit your answers in a single document, including explanations, functional dependencies, and the final normalized tables with their Primary Keys (PK) and Foreign Keys (FK).

Task 1 Identify the Primary Key and any potential Composite Keys for the unnormalized `ACADEMIC_RECORD` table. Explain why your chosen key(s) uniquely identify each record.

Task 2 Identify all Functional Dependencies (FDs) present in the `ACADEMIC_RECORD` table. List each FD clearly and justify how it is derived from the data.

Task 3 Normalize the `ACADEMIC_RECORD` table to First Normal Form (1NF). Explain any changes made to ensure the table meets 1NF requirements (e.g., eliminating repeating groups, ensuring atomic values).

Task 4 Normalize the resulting 1NF table(s) to Second Normal Form (2NF), addressing any Partial Dependencies. Provide the resulting tables and explain how partial dependencies were eliminated.

Task 5 Normalize the resulting 2NF table(s) to Third Normal Form (3NF) and, if necessary, Boyce-Codd Normal Form (BCNF), addressing Transitive Dependencies. Provide the final normalized tables, their Primary Keys (PK), Foreign Keys (FK), and explain the normalization process.

Submission Instructions

- Submit your answers in a single document (e.g., PDF or Word).
- Label each task clearly (e.g., Task 1, Task 2).
- Include explanations for each normalization step, functional dependencies, and the final schema with Primary Keys (PK) and Foreign Keys (FK).
- Present all tables clearly, preferably in a tabular format, with PK and FK constraints specified.
- Submit by the deadline specified by your instructor via the course portal.