DESIGN AND IMPLEMENT A RELATIONAL DATABASE

Scenario:

A university wants to manage information about their students, courses, instructors, and enrolments. The system should allow:

- Storing student personal details and contact information
- Tracking courses and their assigned instructors
- Maintaining enrolment records (which student is enrolled in which course)
- Generating simple reports such as course lists, student enrolment lists, and instructor assignments

Task 1: Requirements Analysis (10 MARKS)

- Identify the main entities in the scenario (e.g., Student, Course, Instructor, Enrolment)
- List key attributes for each entity (e.g., StudentID, Name, DOB, CourseID, CourseName, etc.)
- Identify relationships between entities and their cardinality (1:1, 1:N, N:M)

Task 2: ER Modelling (10 MARKS)

- Draw an Entity-Relationship (ER) Diagram for the system
    - Include entities, attributes, primary keys, foreign keys, and relationships
    - Indicate weak entities if applicable
    - Include multi-valued or derived attributes if needed

Task 3: Normalization (15 MARKS)

- Normalize the database to **3NF**
- Show each step: 1NF → 2NF → 3NF
- Justify how redundancy is reduced and anomalies are eliminated

Task 4: Relational Schema (15 MARKS)

- Convert the ER diagram into relational schema
- Specify:
    - Table names
    - Attributes (with data types)
    - Primary and foreign keys
    - Constraints (NOT NULL, UNIQUE, etc.)

Task 5: Database Implementation (25 MARKS)

- Create the database using SQL (MySQL, PostgreSQL, or another RDBMS)
- Create tables with appropriate constraints
- Insert sample data: at least 10 students, 5 instructors, 5 courses, and 15 enrolments

Task 6: Queries and Views (15 MARKS)

- Write SQL queries for the following:
    1. List all students enrolled in a specific course
    2. List courses taught by a specific instructor
    3. Count the number of students enrolled in each course
    4. Retrieve all courses along with student names using a JOIN
- Create a **view** showing student names, course names, and instructor names

Task 7: Reports (10 MARKS)

- Using SQL or a database client, generate:
    - Student enrolment report
    - Instructor course assignment report
    - Course popularity report (number of students per course)

Deliverables

1. ER Diagram (PDF or image)
2. Relational Schema (tables and constraints)
3. SQL scripts for:
    - Creating tables
    - Inserting sample data
    - Queries and views
4. Reports (exported tables)
5. Normalization steps (document showing 1NF → 3NF)