Database Systems LAB – BSDSF23

(Morning and Afternoon)

Lab 02 – 14-02-2025

Create a database named Lab2.db

Task 1: Create Tables with Primary & Foreign Keys (Including CASCADE DELETE & UPDATE)

- **Create the following tables with specified columns:**
  1. **Courses Table**
     - course_id (**INTEGER PRIMARY KEY**)
     - course_name (**TEXT, NOT NULL**)
     - credits (**INTEGER**)

  2. **Student Table**
     - student_id (**INTEGER PRIMARY KEY**)
     - name (**TEXT, NOT NULL**)
     - age (**INTEGER**)
     - department (**TEXT**)
     - course_id (**INTEGER, FOREIGN KEY referencing Courses(course_id)**)

- Apply **ON DELETE CASCADE** and **ON UPDATE CASCADE** to the foreign key (course_id).

Task 2: Insert Sample Data into Courses Table

- Insert at least **4 courses** into the Courses table.

course_id	course_name	credits
101	Database Systems	3
102	Machine Learning	4
103	Operating Systems	3
104	Computer Networks	3

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Task 3: Insert Sample Data into Student Table

- Insert at least **5 students**, ensuring that course_id values match existing course_id in the Courses table.
- Insert **one student with NULL course_id** to verify that a foreign key can be NULL.

student_id	name	age	department	course_id
1	Ali	20	Data Science	101
2	Hassan	22	Computer Science	101
3	Ayesha	21	Software Engineering	102
4	Umer	23	Information Technology	103
5	Sara	19	Artificial Intelligence	NULL

Task 4: Primary Key Rules (Uniqueness & Non-NULL)

- Try inserting a **duplicate student_id** (should fail).
- Try inserting a **NULL student_id** (should fail).

Task 5: Foreign Key Rules (Values Must Exist in Primary Table)

- Try inserting a student with a course_id that **does not exist** in the Courses table (should fail).

Task 6: Foreign Key Rule - Data Can Repeat or Be NULL

- Insert multiple students with the **same course_id** (should pass).
- Insert a student with **NULL course_id** (should pass).

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Task 7: CASCADE DELETE Implementation

- Delete a course from the Courses table and verify that **all students enrolled in that course are also deleted automatically**.

Task 8: CASCADE UPDATE Implementation

- Update a course_id in the Courses table and verify that the **Student table automatically updates the course_id** values.

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Task 1 Solution:

```
PRAGMA foreign_keys = ON; -- Enable foreign key constraints in SQLite
-- Create Courses Table
CREATE TABLE Courses (
        course_id INTEGER PRIMARY KEY,
        course_name TEXT NOT NULL,
         credits INTEGER );

-- Create Student Table with Foreign Key Constraints
CREATE TABLE Student (
        student_id INTEGER PRIMARY KEY,
        name TEXT NOT NULL,
        age INTEGER,
        department TEXT,
        course_id INTEGER,
        FOREIGN KEY (course_id) REFERENCES Courses(course_id)
        ON DELETE CASCADE
        ON UPDATE CASCADE );
```

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--**UPDATE Statement syntax**

```
UPDATE table_name
SET column1 = new_value1,
    column2 = new_value2,
    ...
    WHERE condition;
```

--**DELETE statement syntax**

```
DELETE FROM table_name
WHERE condition;
```

--**INSERT statement syntax**

```
INSERT INTO table_name (column1, column2, column3, ...)
VALUES (value1, value2, value3, ...);
```

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