**🎯 Constraints To Cover:**

1. PRIMARY KEY
2. FOREIGN KEY
3. CHECK
4. DEFAULT

**🧱 Step 1: Create Related Tables Using All Constraints**

We will create two tables:

* departments – master table for department info.
* employees – detailed table using all four constraints.

**🔹 A. departments Table (Uses: PRIMARY KEY)**

CREATE TABLE departments (

dept\_id INT PRIMARY KEY,

dept\_name VARCHAR(50) NOT NULL

);

**🔹 B. employees Table (Uses: PRIMARY KEY, FOREIGN KEY, CHECK, DEFAULT)**

CREATE TABLE employees (

emp\_id INT PRIMARY KEY,

name VARCHAR(50) NOT NULL,

age INT CHECK (age >= 18),

salary DECIMAL(10, 2) DEFAULT 30000.00,

dept\_id INT,

FOREIGN KEY (dept\_id) REFERENCES departments(dept\_id)

);

**🔍 Explanation of Each Constraint**

| **Constraint** | **Column(s)** | **Purpose** |
| --- | --- | --- |
| PRIMARY KEY | emp\_id, dept\_id | Ensures uniqueness + not null |
| FOREIGN KEY | dept\_id | Ensures referential integrity (must exist in departments) |
| CHECK | age >= 18 | Validates business rule (e.g., employee must be adult) |
| DEFAULT | salary = 30000.00 | Sets a default salary if not specified |

**🗃️ Step 2: Insert Dummy Data into departments**

INSERT INTO departments (dept\_id, dept\_name) VALUES

(1, 'HR'),

(2, 'IT'),

(3, 'Finance'),

(4, 'Marketing');

**👷 Step 3: Insert Dummy Data into employees**

INSERT INTO employees (emp\_id, name, age, salary, dept\_id) VALUES

(101, 'Ali Khan', 30, 50000.00, 1),

(102, 'Sara Ahmed', 28, 60000.00, 2),

(103, 'Bilal Raza', 40, NULL, 3), -- DEFAULT salary applied

(104, 'Ayesha Noor', 22, 45000.00, 2),

(105, 'Imran Shah', 35, 55000.00, 4),

(106, 'Zainab Tariq', 29, NULL, 3), -- DEFAULT salary applied

(107, 'Hassan Javed', 45, 65000.00, 1),

(108, 'Nida Farooq', 26, 48000.00, 2),

(109, 'Usman Latif', 31, NULL, 4), -- DEFAULT salary applied

(110, 'Farah Naz', 33, 70000.00, 3);

✅ For rows with NULL in salary, the DEFAULT value of 30000.00 will be applied.

**💥 Step 4: Example – Violating Constraints (For Understanding)**

**❌ Violate FOREIGN KEY:**

INSERT INTO employees (emp\_id, name, age, salary, dept\_id)

VALUES (111, 'New User', 30, 40000.00, 99);

🛑 Error: dept\_id 99 does not exist in departments.

**❌ Violate CHECK:**

INSERT INTO employees (emp\_id, name, age, salary, dept\_id)

VALUES (112, 'Too Young', 16, 30000.00, 1);

🛑 Error: age < 18, violates CHECK constraint.

**❌ Violate PRIMARY KEY:**

INSERT INTO employees (emp\_id, name, age, salary, dept\_id)

VALUES (101, 'Duplicate ID', 25, 40000.00, 1);

🛑 Error: emp\_id 101 already exists, violates PRIMARY KEY.

**📋 Final Summary Table**

| **Constraint** | **Example Column** | **Behavior** | **Demonstrated** |
| --- | --- | --- | --- |
| PRIMARY KEY | emp\_id, dept\_id | Uniqueness + No NULL allowed | ✅ Yes |
| FOREIGN KEY | dept\_id | Must exist in departments | ✅ Yes |
| CHECK | age | Must be ≥ 18 | ✅ Yes |
| DEFAULT | salary | Auto-assign if not provided | ✅ Yes |