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NAAC GRADE A+

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Subject Name: TECHINCAL SKILLS **Subject Code:**

WORKSHEET 1.1

AIM: To design and implement a sample database system using DDL, DML, and DCL commands, including database creation, data manipulation, schema modification, and role-based access control to ensure data integrity and secure, read-only access for authorized users.

S/W Requirement: Oracle Database Express Edition and pgAdmin

OBJECTIVES:

To gain practical experience in implementing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) operations in a real database environment. This will also include implementing role-based privileges to secure data.

Given:

An organization wants to design a **sample database system** to manage **Departments, Employees, and Projects**. The database must ensure **data integrity**, **controlled access**, and **proper privilege management** for different users.

Procedure:

1. **Database Design**
    - Create multiple tables such as **Department**, **Employee**, and **Project**.
    - Define appropriate **PRIMARY KEY** and **FOREIGN KEY** constraints.
    - Enforce **NOT NULL**, **UNIQUE**, and **CHECK** constraints where necessary.
2. **Data Manipulation**
    - Insert sample records into all tables.
    - Perform **UPDATE** operations to modify existing records.
    - Perform **DELETE** operations while maintaining referential integrity.
3. **Access Control & Security**

- Create a **role/user** for a reporting staff member.
- Grant **ONLY SELECT privilege** on required tables to this role/user.
- Explicitly **REVOKE CREATE privilege** so that the user cannot create any database objects.
- Ensure the user has **read-only access** to the database.

4. **Schema Modification**
   - Use **ALTER TABLE** to add or modify a column.
   - Drop a table that is no longer required using **DROP TABLE**.

Code:

File_1: (user.sql)

```
-- 1. Create Department table
CREATE TABLE Department (
    dept_id INT PRIMARY KEY,
    dept_name VARCHAR(30) UNIQUE NOT NULL
);

-- 2. Create Employee table
CREATE TABLE Employee (
    emp_id INT PRIMARY KEY,
    emp_name VARCHAR(30) NOT NULL,
    emp_email VARCHAR(40) UNIQUE NOT NULL,
    emp_phone VARCHAR(15) UNIQUE NOT NULL,
    emp_address VARCHAR(50),
    dept_id INT,
    FOREIGN KEY (dept_id) REFERENCES Department(dept_id)
    ON UPDATE CASCADE
    ON DELETE SET NULL
);

-- 3. Create Project table
CREATE TABLE Project (
    project_id INT PRIMARY KEY,
    project_name VARCHAR(40) NOT NULL,
    start_date DATE NOT NULL,
    end_date DATE NOT NULL,
    assigned_emp INT,
    FOREIGN KEY (assigned_emp) REFERENCES Employee(emp_id)
    ON UPDATE CASCADE
    ON DELETE SET NULL
);
```

```
-- 4. Insert values into Department
INSERT INTO Department VALUES
(11, 'AI Research'),
(22, 'Software Development'),
(33, 'Marketing'),
(44, 'Administration');

-- 5. Insert values into Employee
INSERT INTO Employee VALUES
(301, 'Sahil Gupta', 'sahil.gupta@gmail.com', '9811111111', 'Chandigarh', 22),
(302, 'Aman Verma', 'aman@gmail.com', '9822222222', 'Delhi', 22),
(303, 'Riya Sharma', 'riya@gmail.com', '9833333333', 'Jaipur', 33),
(304, 'Neha Singh', 'neha@gmail.com', '9844444444', 'Bhopal', 11),
(305, 'Karan Malhotra', 'karan@gmail.com', '9855555555', 'Noida', 44);

-- 6. Insert values into Project
INSERT INTO Project VALUES
(101, 'AI Chatbot System', '2026-01-10', '2026-06-30', 301),
(102, 'Online Learning Platform', '2026-02-15', '2026-07-20', 302),
(103, 'Marketing Analytics Tool', '2026-03-01', '2026-05-31', 303),
(104, 'Research Data Portal', '2026-01-25', '2026-04-30', 304),
(105, 'Office Automation System', '2026-02-05', '2026-08-10', 305);

-- 7. Display tables
SELECT * FROM Department;
SELECT * FROM Employee;
SELECT * FROM Project;

-- 8. Update employee department
UPDATE Employee
SET dept_id = 44
WHERE emp_id = 303;

-- 9. Delete an employee
DELETE FROM Employee WHERE emp_id = 305;

-- 10. Create role and grant permissions
CREATE ROLE HR LOGIN PASSWORD 'HR';

GRANT SELECT, INSERT, UPDATE ON Employee TO HR;
GRANT SELECT ON Department TO HR;
GRANT SELECT, INSERT, UPDATE ON Project TO HR;

-- 11. Revoke permissions
REVOKE SELECT ON Employee FROM HR;
REVOKE UPDATE ON Employee FROM HR;
```

File-2: role.sql

```
ALTER TABLE Project
ADD project_status VARCHAR(20);

-- Update values in new column
UPDATE Project
SET project_status = 'In Progress';

-- Verify change
SELECT * FROM Project;

--Droping the table (project)
Drop table project;
```

OUTPUT:

	dept_id [PK] integer	dept_name character varying (30)
1	11	AI Research
2	22	Software Development
3	33	Marketing
4	44	Administration

Dept. table

Showing rows: 1 to

	emp_id [PK] integer	emp_name character varying (30)	emp_email character varying (40)	emp_phone character varying (15)	emp_address character varying (50)	dept_id integer
1	301	Sahil Gupta	sahil.gupta@gmail.com	9811111111	Chandigarh	22
2	302	Aman Verma	aman@gmail.com	9822222222	Delhi	22
3	303	Riya Sharma	riya@gmail.com	9833333333	Jaipur	33
4	304	Neha Singh	neha@gmail.com	9844444444	Bhopal	11
5	305	Karan Malhotra	karan@gmail.com	9855555555	Noida	44

EMPLOYEE Table

	project_id [PK] integer	project_name character varying (40)	start_date date	end_date date	assigned_emp integer
1	101	AI Chatbot System	2026-01-10	2026-06-30	301
2	102	Online Learning Platform	2026-02-15	2026-07-20	302
3	103	Marketing Analytics Tool	2026-03-01	2026-05-31	303
4	104	Research Data Portal	2026-01-25	2026-04-30	304
5	105	Office Automation Syst...	2026-02-05	2026-08-10	305

Project table

```
UPDATE 1

Query returned successfully in 54 msec.
```

```
DELETE 1

Query returned successfully in 39 msec.
```

DML Commands

Showing rows: 1 to 4

	emp_id [PK] integer	emp_name character varying (30)	emp_email character varying (40)	emp_phone character varying (15)	emp_address character varying (50)	dept_id integer
1	301	Sahil Gupta	sahil.gupta@gmail.com	9811111111	Chandigarh	22
2	302	Aman Verma	aman@gmail.com	9822222222	Delhi	22
3	304	Neha Singh	neha@gmail.com	9844444444	Bhopal	11
4	303	Riya Sharma	riya@gmail.com	9833333333	Jaipur	44

After DML Operations (Employee table)

Data Output | Messages | Notifications

```
GRANT

Query returned successfully in 37 msec.
```

```
REVOKE

Query returned successfully in 42 msec.
```

DCL commands for providing permissions to the role

```
ERROR:  permission denied for table employee

SQL state: 42501
```

Role(HR) tries to access data from employee table after revoke

	dept_id [PK] integer	dept_name character varying (30)
1	11	AI Research
2	22	Software Development
3	33	Marketing
4	44	Administration

Role(HR) tries to select table from the user file(dept.table)

	project_id [PK] integer	project_name character varying (40)	start_date date	end_date date	assigned_emp integer	project_status character varying (20)
1	101	AI Chatbot System	2026-01-10	2026-06-30	301	In Progress
2	102	Online Learning Platform	2026-02-15	2026-07-20	302	In Progress
3	103	Marketing Analytics Tool	2026-03-01	2026-05-31	303	In Progress
4	104	Research Data Portal	2026-01-25	2026-04-30	304	In Progress
5	105	Office Automation Syst...	2026-02-05	2026-08-10	[null]	In Progress

Alter the table using by adding a new column (project status)

```
DROP TABLE

Query returned successfully in 42 msec.
```

Drop the project table using Drop Command

Learning Outcomes:

1. Understood the basics of **relational database design** using tables, keys, and relationships.
2. Learned to apply **primary key and foreign key constraints** to maintain data integrity.
3. Gained hands-on experience with **INSERT, UPDATE, and DELETE** operations safely.
4. Understood how **roles and privileges** control access to database objects.
5. Learned to use **GRANT and REVOKE** for implementing **read-only users**.