

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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Worksheet 7

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Subject Name: ADBMS

Subject Code: 23CSP-333

1. Aim:

1. Design a PostgreSQL trigger that performs the following task:
 - a. Whenever a new record is inserted into the student table, the inserted row should be displayed on the output console.
 - b. Similarly, when a record is deleted from the student table, the deleted row should also be displayed on the console.
2. Create PostgreSQL triggers to maintain an audit log for employee actions.
 - a. Whenever a new employee is inserted into `tbl_employee`, a record should be inserted into `tbl_employee_audit` with the message:"Employee name `<emp_name>` has been added at `<current_time>`"
 - b. Whenever an employee is deleted from `tbl_employee`, a record should be inserted into `tbl_employee_audit` with the message:"Employee name `<emp_name>` has been deleted at `<current_time>`"

2. Objective:

- Maintain a complete and reliable record of all employee insertions and deletions for accountability and auditing purposes.
- Automatically insert descriptive audit messages into `tbl_employee_audit` whenever changes occur in `tbl_employee`, without requiring manual input.
- Guarantee that every change in the employee table is consistently tracked in real-time, reducing the risk of unrecorded modifications.
- Store timestamps and employee names in the audit log to create a chronological history of employee activity for future reference and compliance checks.
- Increase visibility into employee-related database actions, supporting internal monitoring, troubleshooting, and security reviews.

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3. Code:

1.

```
-- Create the student table
CREATE TABLE student (
    id SERIAL PRIMARY KEY,
    name VARCHAR(100),
    age INT,
    class VARCHAR(50)
);

-- Create the trigger function
CREATE OR REPLACE FUNCTION fn_student_audit()
RETURNS TRIGGER
LANGUAGE plpgsql
AS
$$
BEGIN
    IF TG_OP = 'INSERT' THEN
        RAISE NOTICE 'Inserted Row -> ID: %, Name: %, Age: %, Class: %',
                      NEW.id, NEW.name, NEW.age, NEW.class;
        RETURN NEW;
    ELSIF TG_OP = 'DELETE' THEN
        RAISE NOTICE 'Deleted Row -> ID: %, Name: %, Age: %, Class: %',
                      OLD.id, OLD.name, OLD.age, OLD.class;
        RETURN OLD;
    END IF;

    RETURN NULL;
END;
$$;

-- Create the trigger
CREATE TRIGGER trg_student_audit
AFTER INSERT OR DELETE
ON student
FOR EACH ROW
EXECUTE FUNCTION fn_student_audit();

-- Test the trigger

-- Insert records
INSERT INTO student(name, age, class) VALUES ('Shivanshu', 20, 'B.Tech');
INSERT INTO student(name, age, class) VALUES ('Tanya', 21, 'B.Tech');
INSERT INTO student(name, age, class) VALUES ('Devanshu', 19, 'Non-CSE');

-- Delete a record
DELETE FROM student WHERE name = 'Devanshu';

SELECT * FROM student;
```

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2.

-- Create employee and audit tables

```
CREATE TABLE tbl_employee (
    emp_id SERIAL PRIMARY KEY,
    emp_name VARCHAR(100) NOT NULL,
    emp_salary NUMERIC
);
```

```
CREATE TABLE tbl_employee_audit (
```

```
    sno SERIAL PRIMARY KEY,
    message TEXT
);
```

-- Create the trigger function

```
CREATE OR REPLACE FUNCTION audit_employee_changes()
RETURNS TRIGGER
LANGUAGE plpgsql
AS
$$
BEGIN
    IF TG_OP = 'INSERT' THEN
        INSERT INTO tbl_employee_audit(message)
        VALUES ('Employee name ' || NEW.emp_name || ' has been added at ' || NOW());
        RETURN NEW;
    ELSIF TG_OP = 'DELETE' THEN
        INSERT INTO tbl_employee_audit(message)
        VALUES ('Employee name ' || OLD.emp_name || ' has been deleted at ' || NOW());
        RETURN OLD;
    END IF;

    RETURN NULL;
END;
$$;
```

-- Create the trigger

```
CREATE TRIGGER trg_employee_audit
AFTER INSERT OR DELETE
ON tbl_employee
FOR EACH ROW
EXECUTE FUNCTION audit_employee_changes();
```

-- Test the trigger

-- Insert employees

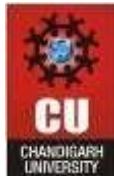
```
INSERT INTO tbl_employee(emp_name, emp_salary) VALUES ('Shivanshu', 90000);
INSERT INTO tbl_employee(emp_name, emp_salary) VALUES ('Tanya', 95000);
INSERT INTO tbl_employee(emp_name, emp_salary) VALUES ('Karan', 100000);
```

-- Delete one employee

```
DELETE FROM tbl_employee WHERE emp_name = 'Karan';
```

```
SELECT * FROM tbl_employee;
```

```
SELECT * FROM tbl_employee_audit;
```



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4. Output:

(1)

Output:

```
CREATE TABLE
CREATE FUNCTION
CREATE TRIGGER
INSERT 0 1
INSERT 0 1
INSERT 0 1
DELETE 1
id | name      | age | class
---+---+---+---
 1 | Shivanshu | 20 | B.Tech
 2 | Tanya     | 21 | B.Tech
(2 rows)
```

```
psql:commands.sql:41: NOTICE: Inserted Row -> ID: 1, Name: Shivanshu, Age: 20, Class: B.Tech
psql:commands.sql:42: NOTICE: Inserted Row -> ID: 2, Name: Tanya, Age: 21, Class: B.Tech
psql:commands.sql:43: NOTICE: Inserted Row -> ID: 3, Name: Devanshu, Age: 19, Class: Non-CSE
psql:commands.sql:46: NOTICE: Deleted Row -> ID: 3, Name: Devanshu, Age: 19, Class: Non-CSE
```

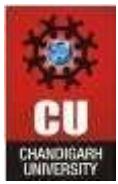
(2)

Output:

```
CREATE TABLE
CREATE TABLE
CREATE FUNCTION
CREATE TRIGGER
INSERT 0 1
INSERT 0 1
INSERT 0 1
DELETE 1
emp_id | emp_name    | emp_salary
---+---+---
 1 | Shivanshu   |      90000
 2 | Tanya       |      95000
(2 rows)
```

sno	message
1	Employee name Shivanshu has been added at 2025-10-17 09:32:51.612426+00
2	Employee name Tanya has been added at 2025-10-17 09:32:51.61611+00
3	Employee name Karan has been added at 2025-10-17 09:32:51.618558+00
4	Employee name Karan has been deleted at 2025-10-17 09:32:51.620008+00

```
(4 rows)
```



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5. Learning Outcomes:

- Understanding Trigger Mechanisms
- Practical Use of Trigger Functions
- Implementing Auditing and Logging
- Event-driven Automation in Databases