

Database Trigger (All Types: Row level and Statement level triggers, Before and After Triggers). Write a database trigger on Library table. The System should keep track of the records that are being updated or deleted. The old value of updated or deleted records should be added in Library_Audit table.

Perform before delete and After update trigger.

To create database triggers that keep track of updates and deletions on a Library table, you'll need to define two specific triggers: one that executes **before a record is deleted** (BEFORE DELETE) and one that executes **after a record is updated** (AFTER UPDATE). The old values from the Library table will be stored in a Library_Audit table.

Step 1: Create the Audit Table

First, make sure you have the Library_Audit table to store the old values from the Library table. Here's an example of how this audit table could be structured:

sql

Copy code

```
CREATE TABLE Library_Audit (  
    Audit_ID NUMBER GENERATED BY DEFAULT AS IDENTITY PRIMARY KEY,  
    Old_Title VARCHAR2(255),  
    Old_Author VARCHAR2(255),  
    Old_Published_Year NUMBER,  
    Old_ISBN VARCHAR2(20),  
    Action VARCHAR2(20), -- To store action type: 'UPDATE' or 'DELETE'  
    Action_Timestamp TIMESTAMP DEFAULT SYSTIMESTAMP  
);
```

Step 2: Create the Before Delete Trigger

This trigger will fire before a deletion occurs on the Library table. It captures the old values of the record that is about to be deleted.

sql

Copy code

```
CREATE OR REPLACE TRIGGER trg_Before_Delete_Library  
BEFORE DELETE ON Library  
FOR EACH ROW  
BEGIN  
    INSERT INTO Library_Audit (Old_Title, Old_Author, Old_Published_Year, Old_ISBN, Action)
```

```
VALUES (:OLD.Title, :OLD.Author, :OLD.Published_Year, :OLD.ISBN, 'DELETE');  
END;  
/
```

Step 3: Create the After Update Trigger

This trigger will fire after an update occurs on the Library table. It captures the old values of the record that has just been updated.

sql

Copy code

```
CREATE OR REPLACE TRIGGER trg_After_Update_Library  
AFTER UPDATE ON Library  
FOR EACH ROW  
BEGIN  
    INSERT INTO Library_Audit (Old_Title, Old_Author, Old_Published_Year, Old_ISBN, Action)  
    VALUES (:OLD.Title, :OLD.Author, :OLD.Published_Year, :OLD.ISBN, 'UPDATE');  
END;  
/
```

Explanation of the Triggers

1. Library_Audit Table:

- This table records old values for each update and delete operation, including the action type (either 'UPDATE' or 'DELETE') and the timestamp of when the operation occurred.

2. Before Delete Trigger (trg_Before_Delete_Library):

- This trigger captures the old values before the deletion of a record from the Library table.
- It uses the :OLD qualifier to access the old values, which are inserted into the Library_Audit table along with the action type 'DELETE'.

3. After Update Trigger (trg_After_Update_Library):

- This trigger captures the old values after a record has been updated in the Library table.
- Similarly, it uses :OLD to access the previous values, which are inserted into the Library_Audit table, but with the action type 'UPDATE'.

ANS=