Date: 07-11-2024

Ex.no: 13   **WORKING WITH TRIGGER**

Program 1

Write a code in PL/SQL to develop a trigger that enforces referential integrity by preventing the deletion of a parent record if child records exist.

```
CREATE OR REPLACE TRIGGER prevent_parent_deletion

BEFORE DELETE ON employees

FOR EACH ROW

DECLARE    pl_dept_count NUMBER;

BEGIN SELECT

COUNT(*)

   INTO pl_dept_count

   FROM department

   WHERE dept_id = :OLD.employee_id;

   IF pl_dept_count > 0 THEN

      RAISE_APPLICATION_ERROR(-20001, 'Cannot delete employee record as  department

records exist.'); END IF;

END;



DELETE FROM employees

WHERE employee_id = 70;
```

Program 2

Write a code in PL/SQL to create a trigger that checks for duplicate values in a specific column and raises an exception if found.

```
CREATE OR REPLACE TRIGGER prevent_duplicate_manager_id
BEFORE INSERT OR UPDATE ON employees
FOR EACH ROW
DECLARE    pl_count
NUMBER; BEGIN
   SELECT COUNT(*)
   INTO pl_count
   FROM employees
   WHERE manager_id = :NEW.manager_id AND employee_id
   != :NEW.employee_id;
   IF pl_count > 0 THEN
      RAISE_APPLICATION_ERROR(-20003, 'Duplicate manager_id found: ' ||
:NEW.manager_id); END
   IF;
END;
INSERT INTO employees (employee_id, first_name, last_name, email, phone_number,
hire_date, job_id, salary, commission_pct, manager_id, department_id)
VALUES (202, 'Jane', 'Smith',
'john006@gmail.com',7383922241,'11/9/2000','ST_CLERK',10000,0.15,400,80);
```

Program 3

Write a code in PL/SQL to create a trigger that restricts the insertion of new rows if the total of a column's values exceeds a certain threshold.

```
CREATE OR REPLACE TRIGGER restrict_salary_insertion
BEFORE INSERT ON employees
FOR EACH ROW
DECLARE  total_salary NUMBER; threshold
   NUMBER
:= 100000; BEGIN

   SELECT SUM(salary)
   INTO total_salary
   FROM employees;
   IF (total_salary + :NEW.salary) > threshold THEN
      RAISE_APPLICATION_ERROR(-20004, 'Insertion denied: Total salary exceeds the
threshold of ' || threshold); END IF;
END;
INSERT INTO employees (employee_id, first_name, last_name, email, phone_number,
hire_date, job_id, salary, commission_pct, manager_id, department_id)
```

VALUES (203, 'Charlie', 'Brown', 'charlie203@gmail.com', '9122334455','03/01/2021', '#cb203',

5000, 0.20, 1000, 50);

Program 4

Write a code in PL/SQL to design a trigger that captures changes made to specific columns and

logs them in an audit table.

```
CREATE OR REPLACE TRIGGER audit_changes
AFTER UPDATE OF salary, job_id ON employees
FOR EACH ROW
BEGIN
   IF :OLD.salary != :NEW.salary OR :OLD.job_id != :NEW.job_id THEN
      INSERT INTO employee_audit ( employee_id,  old_salary,
```

AUDIT_ID	EMPLOYEE_ID	OLD_SALARY	NEW_SALARY	OLD_JOB_ID	NEW_JOB_ID	CHANGE_TIMESTAMP	CHANGED_BY
1	20	50000	55000	manager	manager	15-OCT-24 10.00.00.000000 AM	admin
2	122	60000	65000	Manager	Manager	15-OCT-24 10.15.00.000000 AM	admin
3	27	45000	47000	Analyst	Senior Analyst	15-OCT-24 10.30.00.000000 AM	user1
22	178	7500	55000	#ce005	ST_CLERK	16-OCT-24 04.25.10.252980 PM	APEX_PUBLIC_USER
3	9	70000	75000	Senior Developer	Lead Developer	15-OCT-24 10.45.00.000000 AM	user2
4	4	60000	65000	Team Lead	Project Manager	15-OCT-24 11.00.00.000000 AM	admin

6 rows returned in 0.00 seconds   Download

```
                                                       new_salary,    old_job_title,

      new_job_title,
      change_timestamp, changed_by )
      VALUES (
         :OLD.employee_id,
         :OLD.salary,
         :NEW.salary,
         :OLD.job_id,
```

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```
        :NEW.job_id,

        SYSTIMESTAMP,

        USER

    );

  END IF;

END;
```

```
UPDATE employees

SET salary = 55000, job_id = 'ST_CLERK'

WHERE employee_id = 176;
```

```
SELECT * FROM employee_audit;
```

Program 5

Implement a trigger that records user activity (inserts, updates, deletes) in

an audit log for a given set of tables.

```
CREATE OR REPLACE TRIGGER trg_audit_employees

AFTER INSERT OR UPDATE OR DELETE ON employees

FOR EACH ROW

DECLARE v_old_values

  CLOB; v_new_values

  CLOB;

BEGIN

  IF INSERTING THEN v_old_values := NULL; v_new_values :=

    'employee_id: ' || :NEW.employee_id || ', ' ||
```

```
                    'first_name: ' || :NEW.first_name || ', ' ||

                    'salary: ' || :NEW.salary;


        INSERT INTO audit_log (action, table_name, record_id, changed_by, new_values)
        VALUES ('INSERT', 'employees', :NEW.employee_id, USER, v_new_values);

    ELSIF UPDATING THEN
        v_old_values := 'employee_id: ' || :OLD.employee_id || ', ' ||

                    'first_name: ' || :OLD.first_name || ', ' ||

                    'salary:    '    ||    :OLD.salary;    v_new_values    :=
        'employee_id: ' || :NEW.employee_id || ', ' ||

                    'first_name: ' || :NEW.first_name || ', ' ||

                    'salary: ' || :NEW.salary;


        INSERT INTO audit_log (action, table_name, record_id, changed_by, old_values,
new_values)
```

```
 VALUES ('UPDATE', 'employees', :NEW.employee_id, USER, v_old_values, v_new_values);

   ELSIF DELETING THEN
     v_old_values := 'employee_id: ' || :OLD.employee_id || ', ' ||
               'first_name: ' || :OLD.first_name || ', ' ||
               'salary: ' || :OLD.salary; v_new_values :=
     NULL;

     INSERT INTO audit_log (action, table_name, record_id, changed_by, old_values)
     VALUES ('DELETE', 'employees', :OLD.employee_id, USER, v_old_values); END
   IF;
END trg_audit_employees;

INSERT INTO employees (employee_id, first_name, salary)
VALUES (3, 'Ball', 50000);
```
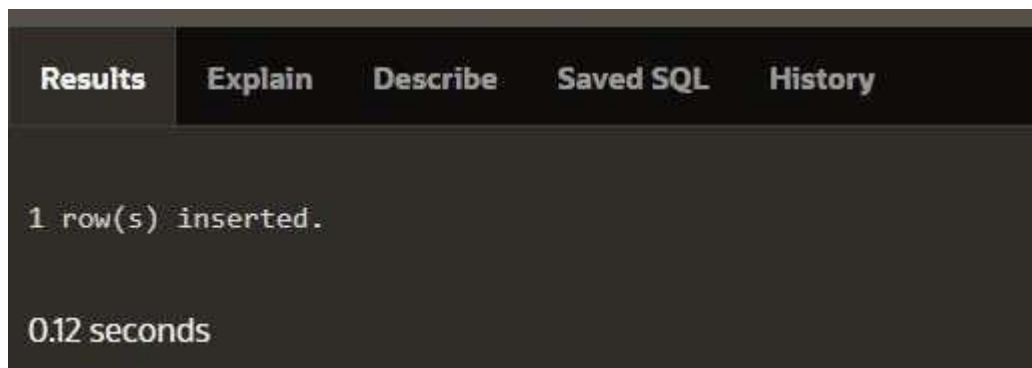
Results	Explain	Describe	Saved SQL	History

1 row(s) inserted.

0.12 seconds

```
UPDATE employees
SET salary = 55000
WHERE employee_id = 3;
```

```
1 row(s) updated.

0.06 seconds
```

DELETE FROM employees WHERE employee_id

= 3;

SELECT * FROM audit_log;

AUDIT_ID	ACTION	TABLE_NAME	RECORD_ID	CHANGED_BY	CHANGE_TIMESTAMP	OLD_VALUES	NEW_VALUES
1	INSERT	employees	5	APEX_PUBLIC_USER	16-OCT-24 04.39.19.273135 PM	-	employee_id: 3, first_name: Bell, salary: 50000
3	DELETE	employees	5	APEX_PUBLIC_USER	16-OCT-24 04.41.49.077071 PM	employee_id: 3, first_name: Bell, salary: 55000	-
2	UPDATE	employees	5	APEX_PUBLIC_USER	16-OCT-24 04.40.05.703618 PM	employee_id: 3, first_name: Bell, salary: 50000	employee_id: 3, first_name: Bell, salary: 55000

3 rows returned in 0.00 seconds   Download

Program 7

Implement a trigger that automatically calculates and updates a

running total column for a table whenever new rows are inserted.

```
CREATE      TABLE       transactions (
   transaction_id NUMBER PRIMARY KEY, amount
       NUMBER,    running_total
   NUMBER
);

CREATE OR REPLACE TRIGGER update_running_total
FOR INSERT ON transactions
COMPOUND TRIGGER
```

```
TYPE amount_array IS TABLE OF NUMBER INDEX BY PLS_INTEGER; new_amounts
amount_array;

BEFORE EACH ROW IS
BEGIN        new_amounts(:NEW.transaction_id)         :=
   :NEW.amount;
END BEFORE EACH ROW;

AFTER STATEMENT IS
BEGIN
  DECLARE        v_total
     NUMBER;
  BEGIN
    SELECT NVL(MAX(running_total), 0)
    INTO v_total
    FROM transactions;

    FOR i IN new_amounts.FIRST .. new_amounts.LAST LOOP v_total :=
       v_total + new_amounts(i); UPDATE transactions
       SET running_total = v_total
       WHERE transaction_id = i;
    END LOOP;
  END;
  END AFTER STATEMENT;

END update_running_total;
INSERT INTO transactions (transaction_id, amount) VALUES
```

(1, 10000);

INSERT INTO transactions (transaction_id, amount)

VALUES (2, 20000);

Program 8

create a trigger that validates the availability of items before allowing an

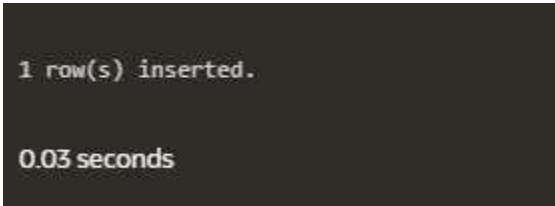order to be placed, considering stock levels and pending orders.

CREATE TABLE inventory (item_id NUMBER PRIMARY KEY, item_name

VARCHAR2(100), stock_level NUMBER

);

CREATE TABLE orders (order_id NUMBER

   PRIMARY KEY, item_id NUMBER,

      quantity   NUMBER,

   order_status VARCHAR2(20),

   CONSTRAINT fk_item FOREIGN KEY (item_id) REFERENCES inventory(item_id)

);

CREATE   OR   REPLACE

   TRIGGER

```
   validate_stock_before_order
BEFORE     INSERT     ON
  ordersDECLARE v_stock_level
       NUMBER;
  v_pending_orders NUMBER;
BEGIN
  SELECT stock_level
  INTO v_stock_level
  FROM inventory
  WHERE item_id = :NEW.item_id;
  SELECT NVL(SUM(quantity), 0)
  INTO v_pending_orders
  FROM orders
  WHERE item_id = :NEW.item_id
   AND order_status = 'Pending';
  IF (:NEW.quantity + v_pending_orders) > v_stock_level THEN
       RAISE_APPLICATION_ERROR(-20001, 'Insufficient stock for item: ' || :NEW.item_id);
  END IF;
END;
INSERT INTO orders (order_id, item_id, quantity, order_status) VALUES (1, 101,
5, 'Pending');
```

```
1 row(s) inserted.

0.03 seconds
```

```
INSERT INTO orders (order_id, item_id, quantity, order_status)
VALUES (2, 103, 20, 'Pending');
```

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```
ORA-20001: Insufficient stock for item: 103
ORA-06512: at "WKSP_SHRIRAM154.VALIDATE_STOCK_BEFORE_ORDER", line 15
ORA-04088: error during execution of trigger
'WKSP_SHRIRAM154.VALIDATE_STOCK_BEFORE_ORDER'


1. INSERT INTO orders (order_id, item_id, quantity, order_status)
2. VALUES (2, 103, 20, 'Pending');
```

ITEM_ID	ITEM_NAME	STOCK_LEVEL
101	Monitor	10
102	Keyboard	20
103	Mouse	5

rows returned in 0.01 seconds   Download

ORDER_ID	ITEM_ID	QUANTITY	ORDER_STATUS
1	101	1	Pending

1 rows returned in 0.01 seconds   Download