SubQuery Assignment

a) What is Subquery?State different Types of Subqueries.

A subquery (or inner query) is a SQL query nested inside another query (main query).
It can appear in the SELECT, FROM, WHERE, or HAVING clause.
The main query uses the result of the subquery to filter or calculate results.

General Syntax:

SELECT column1, column2

FROM table1

WHERE columnX = (SELECT columnY FROM table2 WHERE condition);

- **Types of Subqueries**

1. **Single Row Subquery**
   - Returns only one row and one column.
   - Often used with operators like =, >, <, >=, <=.

SELECT name, salary

FROM Employee

WHERE salary > (SELECT AVG(salary) FROM Employee);

2. **Multiple Row Subquery**
   - Returns multiple rows.
   - Used with IN, ANY, ALL.

SELECT name

FROM Employee

WHERE dept_id IN (SELECT dept_id FROM Department WHERE location = 'Pune');

3. **Multiple Column Subquery**
   - Returns multiple columns.
   - Usually compared with tuples.

SELECT name, dept_id

FROM Employee

WHERE (dept_id, salary) IN (SELECT dept_id, MAX(salary) FROM Employee GROUP BY dept_id);

4. **Correlated Subquery**
    - Inner query depends on values from outer query.
    - Runs row by row.

```
SELECT e1.name, e1.salary
FROM Employee e1
WHERE salary > (SELECT AVG(salary)
                FROM Employee e2
                WHERE e1.dept_id = e2.dept_id);
```

5. **Nested Subquery**

    A subquery inside another subquery.

```
SELECT name
FROM Employee
WHERE dept_id = (SELECT dept_id
                 FROM Department
                     WHERE manager_id = (SELECT id FROM Employee WHERE name='John'));
```

b) Can we update or delete record using Subquery? Explain with Example.

✅ Yes, subqueries can be used inside UPDATE or DELETE.
They are mostly used in the WHERE clause to filter records.

Example 1: UPDATE using Subquery

```
UPDATE Employee
SET salary = salary * 1.10
WHERE dept_id = (SELECT dept_id FROM Department WHERE name = 'HR');
```

👉 This increases salary by 10% for all employees in the HR department.

Example 2: DELETE using Subquery

```
DELETE FROM Employee
WHERE dept_id IN (SELECT dept_id FROM Department WHERE location = 'Mumbai');
```

👉 This deletes all employees working in Mumbai-based departments.

c) What are the limitations of Subquery?

- **Performance Issues**

- Subqueries can be slower than JOINs since they may execute multiple times (especially correlated subqueries).

- **Complexity**

- Nested subqueries can be hard to read and maintain.

- **Limited Support in Some Databases**

- Not all databases support subqueries in the FROM clause (inline views).

- **Returns Error if Wrong Result Type**

- Single-row subqueries must return only one row; if multiple rows are returned, it causes an error.

- **Optimization Restrictions**

- Database optimizers may not rewrite subqueries as efficiently as JOINs.