TITLE:- RELATIONAL ALGEBRA

THEORY:-

Relational algebra is a query language used to retrieve data from relational databases. It consists of operations like select, project, union, join, intersection etc. In this lab, we are going to learn about these operations.

1.) Use of the select operation:-

The select operation is denoted by 'σ' and it is used to retrieve all the fields from a table based on some conditions.

Examples:-

a) Select the employee tuples whose department is 10 or those whose salary is greater than 50,000.

$$\sigma_{dno=10 \vee salary>50000}(EMPLOYEE)$$

b) Select the tuples for all employees who either work in department 4 and salary over 25,000 or work in department 5 and salary over 30,000

$$\sigma_{(dno=4 \wedge salary>25000) \vee (dno=5 \wedge salary>30000)}(EMPLOYEE)$$

2.) Use of the project operation:-

The project operation is denoted by π and is used to retrieve specific columns from a table.

Examples:-

a) List each employee's firstname, last name, and salary.

$$\pi_{(fname, lname, salary)}(Employee)$$

3) Use of the select and project operation:-

The select operation filters the rows based on a condition, and the project operation retrieves specific columns.

Example:-

a) Retrieve the first name, last name, and salary of all employees who work in department 5.

$$\pi_{fname, lname, salary}(\sigma_{dno=5}(EMPLOYEE))$$

4) Use of union, intersection, and minus operations:-

Union combines the result of two relations eliminating duplicates.

Intersection returns tuples that are present in both relations.

minus returns tuples present in the first relation but not in the second.

Examples:-

a) Retrieve the ssn of all employees who either work in department 5 or directly supervise an employee who works in department 5.

$$Dept5\_Emp = \sigma_{dno=5}(EMPLOYEE)$$

$$Dept5\_ssn = \pi_{ssn}(Dept5\_Emp)$$

$$Supervisors = \sigma_{super\_ssn \in Dept5\_ssn}(EMPLOYEE)$$

$$Supers\_ssn = \pi_{ssn}(Supervisors)$$

$$Result = Dept5\_ssn \cup Supers\_ssn$$

b) List the names of managers who have at least one dependent.

$$\Pi_{fname, lname}(\sigma_{ssn=essn}(EMPLOYEE \bowtie DEPENDENT))$$

c) Retrieve the names of employees who have no dependent.

$$Emp = \Pi_{fname, lname}(EMPLOYEE)$$

$$Emp\_Dep = \Pi_{fname, lname}(EMPLOYEE \bowtie DEPENDENT)$$

$$Result = Emp - Emp\_Dep$$

5) Use of cartesian product operation:

The cartesian product operation is denoted by X. It combines every tuple from one relation with every tuple from another relation.

Example:-

a) Retrieve a list of names of each female employee's dependent.

$$F\_Emp\_Dep = \sigma_{sex='F'}(EMPLOYEE \times DEPENDENT)$$

~~$Result = \Pi_{employee.fname, employee.lname, dependent.}$~~

$$Result = \Pi_{employee.fname, employee.lname, dependent.dependent\_name}(F\_Emp\_Dep)$$

6.) Use of join operation:-

The join operation is denoted by ⋈ and is used to combine two relations based on a common attribute.

Example :-

a.) Retrieve the name of the manager of each department

$$\Pi_{dname, fname, lname}(DEPARTMENT \bowtie_{mgr\text{-}ssn = ssn} EMPLOYEE)$$

CONCLUSION :-

In this lab, we have explored different operations like join, project, select, minus etc. in relational algebra.