

CS103P Database Systems Lab

SQL Data Manipulation Language - SELECT

SQL is a non-procedural relational database language. SQL mainly contains two main sub-components: Data Definition Language (DDL) and Data Manipulation Language (DML).

DML is useful working with the actual data. DML is comprised of the following:

- SELECT
- INSERT
- UPDATE
- DELETE

The focus for this lab session is SELECT statements.

Tasks to be completed

Using accompanying SQL DML tutorial for reference, write SQL queries for the following retrievals on the COMPANYDB database.

1. Unconditional Select:
 - a. Retrieve all columns and all rows from EMPLOYEE table using wild-card column name
 - b. Retrieve all columns and all rows from EMPLOYEE table using explicit column names
 - c. Retrieve a subset of columns and all rows from EMPLOYEE using column alias
 - d. Retrieve a subset of columns and all rows from EMPLOYEE using table alias
2. Distinct values:
 - a. Retrieve all Essn values from WORKS_ON (how many rows are there?)
 - b. Retrieve DISTINCT Essn values from WORKS_ON (how many rows are there?)
 - c. Retrieve DISTINCT Essn, Pno values from WORKS_ON (how many rows are there?)
3. Calculated fields:
 - a. Display essn, monthly salary of all employees (use column aliases – SSN, Monthly Salary)
 - b. Display ssn, full name of employee and Bdate of all employees (use column aliases – SSN, Full Name, Date of Birth)
4. Conditional retrieval:
 - a. Simple condition: Essn of those working in project whose Pno is 2
 - b. Compound Condition: All details of male dependents of essn 333445555
 - c. Compound Condition: Full names of employees who belong to Dno 5 OR Dno 1
5. Range condition
 - a. Essn and annual salary details of all employees whose salary is in the range [30,000 – 50,000]. Does SQL do “closed interval” or “open interval”?
 - b. Essn and monthly salary details of all employees whose MONTHLY salary is in the range [3,000 – 4,000] (Note: Assume the given salary is ANNUAL salary)
6. Set membership
 - a. All employee SSN whose supervisors are in the set (333445555, 987654321)

- b. All employee SSN who are NOT supervised by those in the set (333445555, 987654321)
- 7. Pattern matching
 - a. All Pnames of projects that begin with the string "Product"
- 8. NULL search condition
 - a. Employee ssn who does NOT have a supervisor (NULL value for super_ssn)
 - b. SSn of employee who work in Pno 20 and has Hours value as NULL
 - c. Employee ssn who have a supervisor assigned (no NULL value for super_ssn)
- 9. Sorting
 - a. Display SSn and full name of employees sorted by salary in ascending order
 - b. Display SSn and full name of employees sorted by salary in descending order
 - c. Display SSn, Dno, Monthly salary of employees sorted by Dno, monthly salary in descending order
- 10. Aggregate functions (COUNT, SUM, MIN, MAX, AVG)
 - a. Try out aggregate functions on annual salary and monthly salary of employees
 - b. What happens to aggregate functions when a column being aggregated has NULL values?
 - c. Count the number of employees who do not have a supervisor (super_ssn is NULL) in two ways: Using Count(*) and using Count(super_ssn).
 - d. How many unique projects (Pnos) are there in Works_On table?
 - e. Compare the output of the following queries:
 - i. Select sum(hours) from works_on;
 - ii. Select sum(distinct hours) from works_on;
 - iii. Select min(hours) from works_on;
 - iv. Select min(distinct hours) from works_on;
 - f. Display the number of employees, total salary, and average salary from employee table.
- 11. Grouping
 - a. Display project-wise total hours spent on projects from WORKS_ON table
 - b. Display employee-wise number of dependents from DEPENDENT table
- 12. Conditional Grouping
 - a. Display dno and average salary of only those departments whose average salary is above 35000
 - b. Display the Pno of only those projects that have at least three employees working in it
- 13. Subqueries
 - a. Essn of employees who are working on project named ProductX
 - b. Full name of employees who are working a minimum of 10 hours in specific projects
 - c. Full name of employees whose average project hours is at least 10 hours
 - d. Essn of employees who are working in projects whose name begins with "Product"
 - e. Details of employees whose salary is higher than any of the people working DNO=5 (Note: Write it in two ways – one using MIN and another one use ANY)
 - f. Details of employees whose salary is higher than all the employees working in DNO=5 (Note: Write it in two ways – one using MAX and another one use ALL)
- 14. Correlated Subqueries

- a. List of employees who do not have any dependents (Note: Write it in three ways: Outer join, set membership operators (IN, NOT IN), and existential operators (EXIST, NOT EXIST))
 - b. List of employees whose salary is greater than their department average.
- 15. Cartesian product
 - a. Perform Cartesian product between department and dept_locations tables. Display only Dnumber, Dname and Dlocation. How many rows do you see?
- 16. Inner JOINS (Try multiple ways of performing these joins as given in the tutorial slides)
 - a. Perform two-way join between Employee and Department
 - b. Perform three-way join between Employee, Department, Dept_locations
 - c. Perform three-way join between Employee, Works_on, Project
 - d. Perform two-way join between EMPLOYEE and EMPLOYEE
- 17. Outer join
 - a. Display Essn, Fname, Dependent_name of all employees using inner join
 - b. Display Essn, Fname, Dependent_name of all employees using left outer join
 - c. Using inner join, display a report containing two columns of output: Essn, Number of dependents
 - d. Using outer join, display a report containing two columns of output: Essn, Number of dependents
- 18. Other set operations (UNION, INTERSECT, MINUS, etc)
 - a. Display names of all those locations where there is a department OR there is a project running in that location. (Use UNION, UNION ALL)
 - b. Display names of all those locations where there is a department AND there is a project running in that location. (mysql does not have INTERSECT operator!)
 - c. Display names of those department locations where there is no project (NOTE: mysql does not have MINUS operator!)