
Lab 2

SQL Basics

CSE 4308
DATABASE MANAGEMENT SYSTEMS LAB

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1 Introduction

SQL stands for *Structured Query Language*. It is used to *manage data* stored in a *Relational Database Management System*. It is useful in handling *structured data*. Structured data incorporates *relations* among *entities* and *variables*.

2 Getting Started with Oracle 10g XE

Throughout the course, we will use Oracle 10g XE database. Oracle Database Express Edition is a free, smaller-footprint edition of Oracle Database. It is easy to install and manage. Using the tools provided in Oracle Database XE, you can:

- Administer the database
- Create tables, views, and other database objects
- Import, export, and view table data
- Run queries and SQL scripts

Whenever you are installing it on your own PC, make sure to remember the password. To open the SQL command line, open Command Prompt and type `sqlplus`, or Search 'run SQL command line' in the search bar.

SQLPlus is the most basic Oracle Database utility, with a basic command-line interface, commonly used by users, administrators, and programmers. Opening the SQL command line will ask you to enter the username and password. The default username for login is 'system' and the password is the one that you provided during installation. Remember that, when writing the password, the characters will not be shown as Oracle keeps even the number of characters of the password hidden so that anyone else cannot peek over your shoulder and see it.

3 Creating a New User

To perform database operations, you have to create a user. To create a new user, we need to follow a sequence of operation:

1. Log in as system
2. Create a new user with password
3. Grant sufficient permissions/privileges

The major types of privileges among some others are:

- `CREATE SESSION` → Allows user to log in
- `RESOURCE` → Allows user to manipulate tables
- `TABLESPACE` → Ensures that a user has disk space allocated in the system to create and modify tables and data
- `DBA` → Database administrator privilege

The following template statement can be used to create a new user:

```
CREATE USER username IDENTIFIED BY password;
```

Here, username and password should be replaced by your intended username and password. For example, if you want to create a user 'dbms_170042043' with password 'cse4308', the command would be:

```
CREATE USER dbms_170042043 IDENTIFIED BY cse4308 ;
```

Again, the following template statement can be used to grant different privileges to a user:

```
GRANT privilege1, privilege2, ... TO username;
```

Although not recommended in production, we can use the following query to grant all privileges to the user:

```
GRANT ALL PRIVILEGES TO username;
```

This query will allow the user to perform any operations on the database. For example, if we want to grant all privileges to 'dbms_170042043', the command would be:

```
GRANT ALL PRIVILEGES TO dbms_170042043
```

After creating the user and granting them privileges, you can connect to the database using the CONNECT command. The template for the command is:

```
CONNECT username/password;
```

Here, username should be replaced by the username of the account and password should be replaced by the password for that account. For example, to log in using 'dbms_170042043' would be:

```
CONNECT dbms_170042043 / cse4308 ;
```

Remember that, the semicolon denotes the end of a statement. It is not a part of the password or any other statement.

Alternatively, you can write:

```
CONNECT
```

Then you will be prompted to provide a username and the corresponding password to log in.

4 Creating a Table

The general syntax for creating a table is as follows:

```
CREATE TABLE table_name  
(  
attribute1 datatype [ NULL | NOT NULL ],  
attribute2 datatype [ NULL | NOT NULL ],  
...  
);
```

There exists different data types in Oracle. Some of them are as follows:

- char(*n*): value contains exactly *n* alpha-numeric characters
- varchar2(*n*): value contains at most *n* alpha-numeric characters
- number: any integer or real numbers
- date: DD-MON-YY format, like '20-JAN-22'

Assume that you want to create a table named 'TEST' with 3 attributes:

1. national_id: number type
2. name: varchar2 type
3. birth_date: date type

To create this table, you have to write the following query:

```
CREATE TABLE TEST
(
  NATIONAL_ID NUMBER NOT NULL ,
  NAME VARCHAR2(50) NOT NULL ,
  BIRTH_DATE DATE
);
```

5 Inserting Records/Rows into a Table

The general format of inserting a new record is:

```
INSERT INTO TABLE_NAME VALUES (... , ... , ...);
```

We can type the following command to insert new records into our 'TEST' table:

```
INSERT INTO TEST VALUES (2015001, 'X', '01-JAN-81');
```

6 Writing Queries

The basic SQL syntax of a query is as follows:

```
SELECT ATTRIBUTE1, ATTRIBUTE2
FROM TABLE_NAME
WHERE <CONDITIONAL CLAUSE>;
```

For example, to see the 'national_id' of all citizens from the 'TEST' table:

```
SELECT NATIONAL_ID FROM TEST;
```

To find the information of a citizen where id = 2015001:

```
SELECT NATIONAL_ID FROM TEST WHERE ID = 2015001;
```

To find all records and their information:

```
SELECT * FROM TEST;
```

7 Executing SQL Script in SQLPlus

You can create a file with .sql extension that contains your sql statements. Then you can execute it from the SQLPlus command line directly.

Suppose, you have written your SQL statements in a file 'a.sql' saved under 'd:\sample' directory. To execute that script, you have to type:

```
@d:\sample\a.sql
```

8 Lab Task

You have to write all SQL statements in an editor first and save them with .sql extension. Then execute the SQL script.

1. Create a user with user_name = <student_id> and password = **cse4308** and grant necessary privileges.
2. Write SQL statement to create a table 'INSTRUCTOR' which has 4 attributes:
 - ID
 - NAME
 - DEPT_NAME
 - SALARY
3. Write SQL statements to insert the following records into 'INSTRUCTOR' table:

ID	NAME	DEPT_NAME	SALARY
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000
33456	Gold	Physics	87000
45565	Katz	Comp. Sci.	75000
58583	Califieri	History	62000
76543	Singh	Finance	80000
76766	Crick	Biology	72000
83821	Brandt	Comp. Sci.	92000
98345	Kim	Elec. Eng.	80000

4. Write SQL statements to perform the following queries:
 - (a) Display all records of 'INSTRUCTOR' table.
 - (b) Show instructor ID and name only.
 - (c) Find name and department of instructors who have salary more than 70000.
 - (d) Find name and department of instructors who have salary in between 80000 and 10000 (inclusive).
 - (e) Find ID and name of instructors of Comp. Sci. department.
 - (f) Find name and salary of instructors of Finance department.
 - (g) Find ID and name of instructors of Comp. Sci. department or instructors who are paid more than 75000.
 - (h) Find the names of the department.