DBMS Practical no. 1 ***FS19CO042***

Title: Create a New Database and Perform Following operations on that Database.

a) Create table
b) Alter the table
c) Rename Table
d) Drop the table. (Assume your own data).

Theory:

1. CREATE DATABASE query syntax and example.

   It is a DDL command used to create new database. Later we have to 'USE' the database

   - **Syntax:** CREATE DATABASE database_name;

     USE DATABASE database_name;

   - **Example:** CREATE DATABASE students;

     USE students;

2. CREATE TABLE query syntax and example.

   CREATE TABLE is a DDL command used to create a new table.

   - **Syntax:** CREATE TABLE table_name (

     column1 datatype,

     column2 datatype,

     column3 datatype,

     ....

     );

   - **Example:** CREATE TABLE Persons (

     rollNo INT,

     lastName VARCHAR(25),

     firstName VARCHAR (25),

     address VARCHAR (255),

     birthDate DATE

     );

3. ALTER TABLE query syntax and example.

ALTER TABLE is a DDL Command use to add, delete, or modify columns in an existing table. The ALTER TABLE statement is also used to add and drop various constraints on an existing table.

- **Syntax:** ALTER TABLE *table_name*
  ADD column_name datatype;
- **Example:** ALTER TABLE Persons
  ADD email VARCHAR(255);

4. RENAME TABLE query syntax and example.

It is a DDL Command use to rename the table.

- **Syntax:** RENAME TABLE table_name TO new_name;
- **Example:** RENAME TABLE Persons TO firstYearStudents;

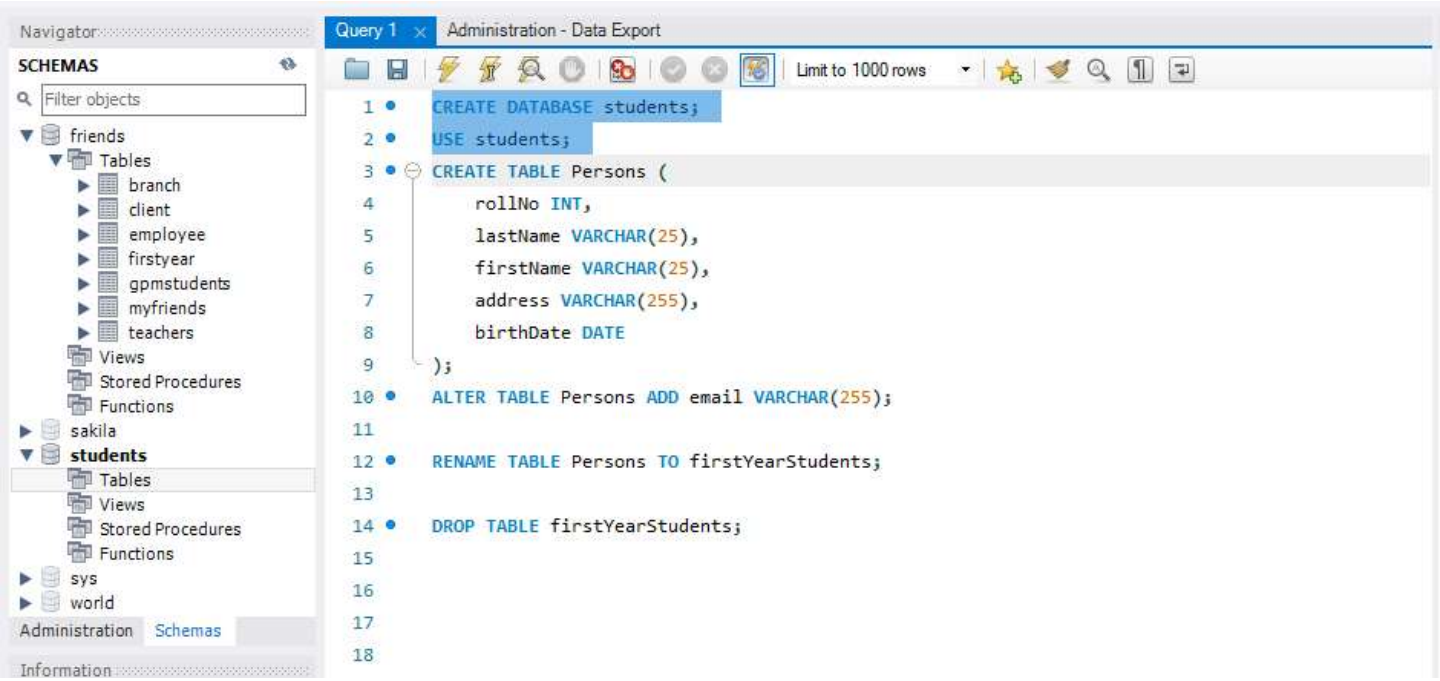
5. DROP TABLE query syntax and example.

The DROP TABLE query is used to drop an existing table in a database along with it's structure.

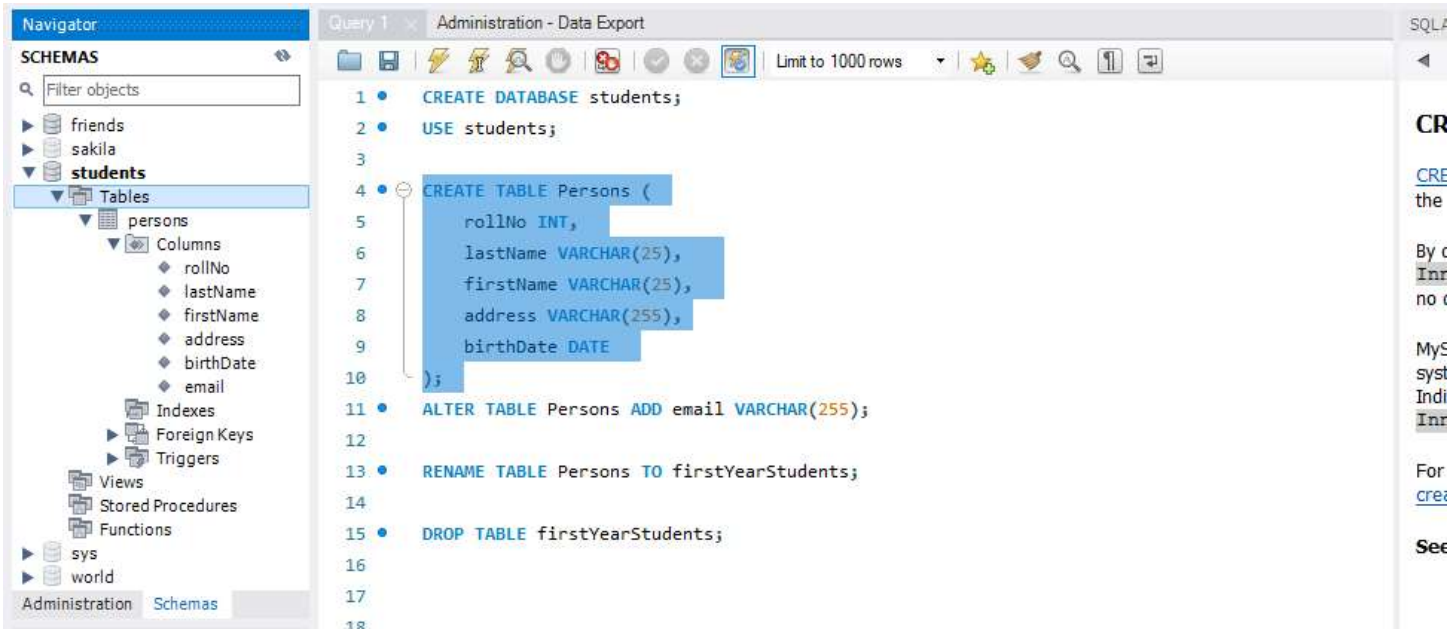
- **Syntax:** DROP TABLE *table_name*;
- **Example:** DROP TABLE firstYearStudents;

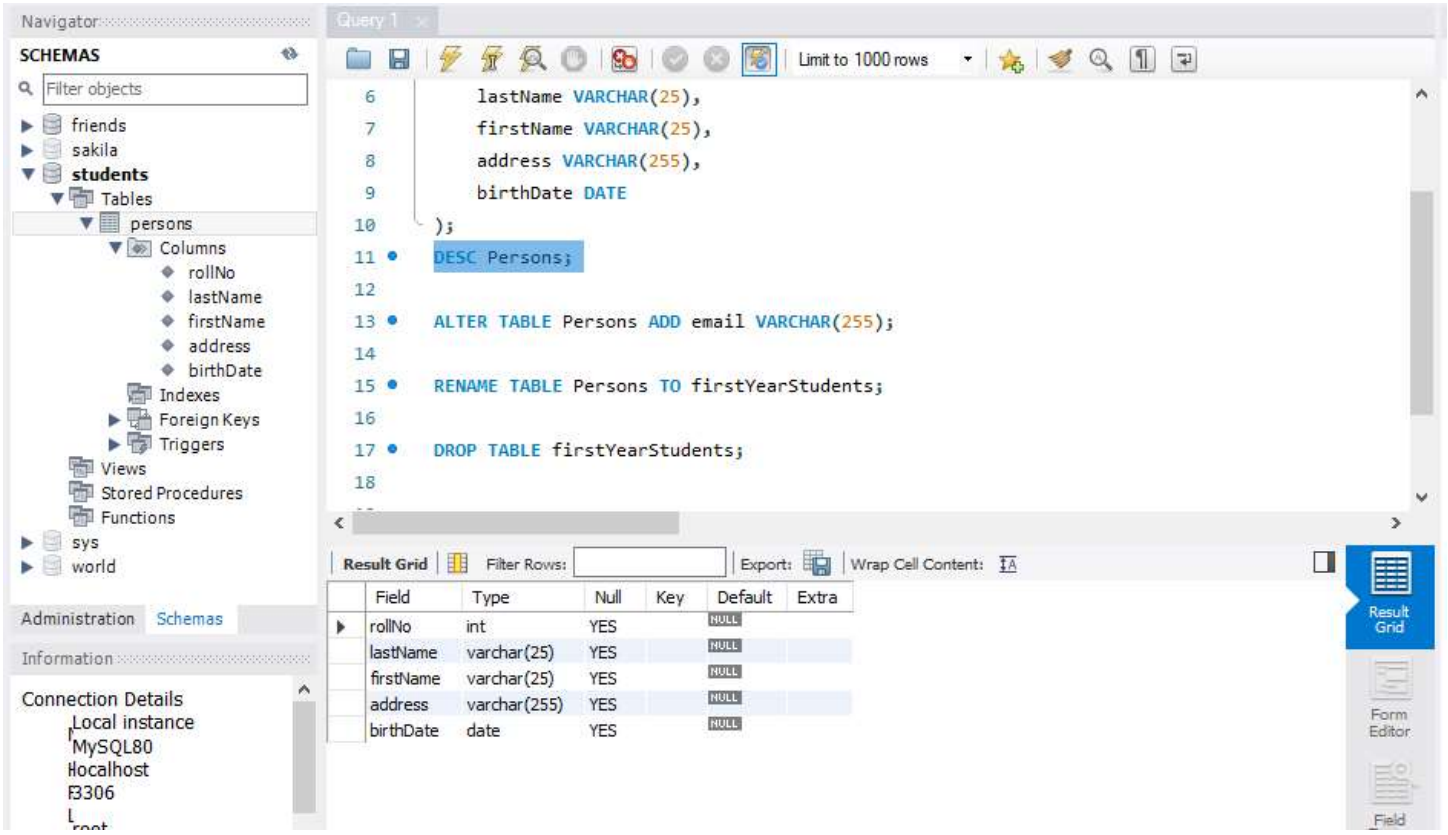
Queries and output:

1. CREATE DATABASE query syntax and example.

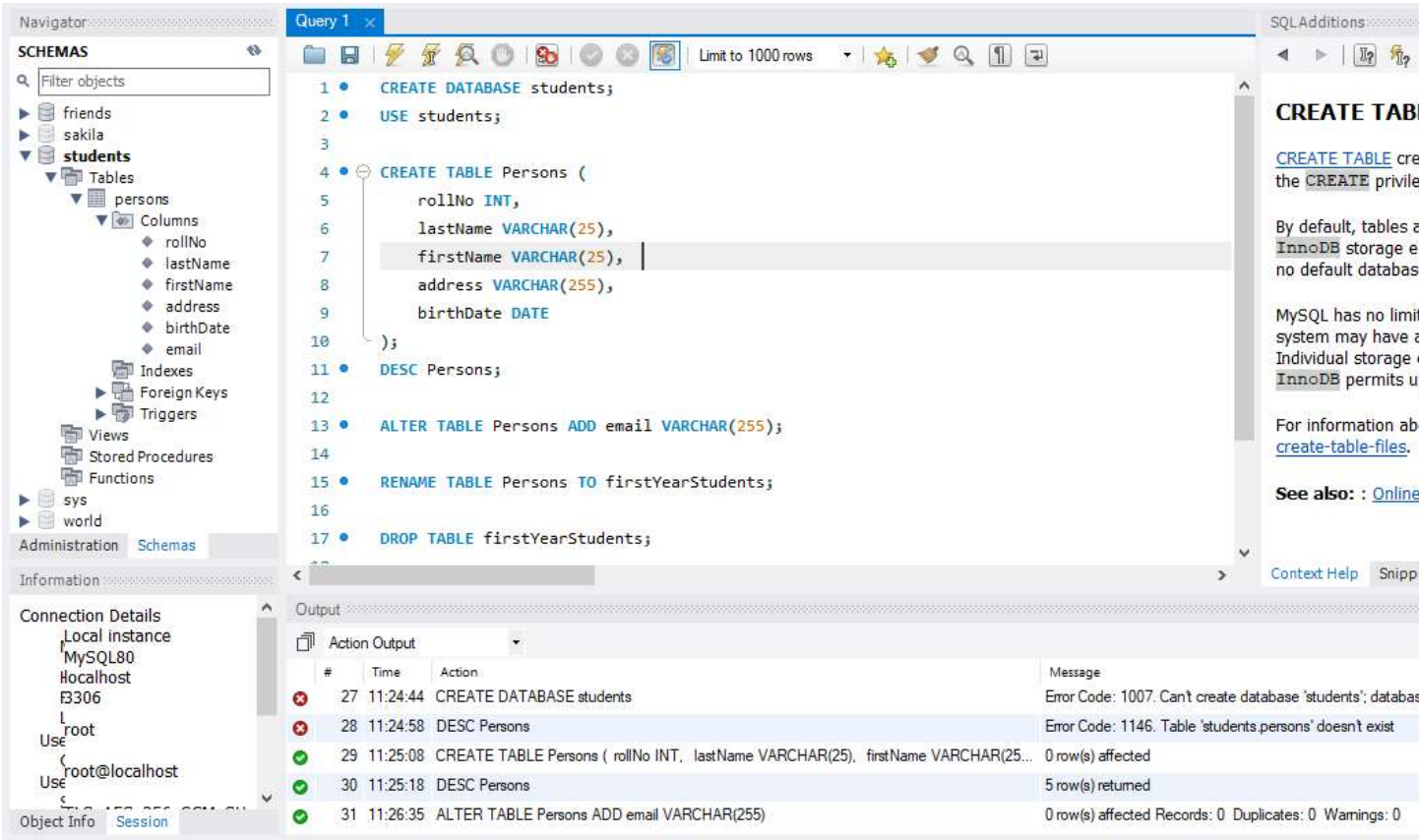


2. CREATE TABLE query syntax and example.

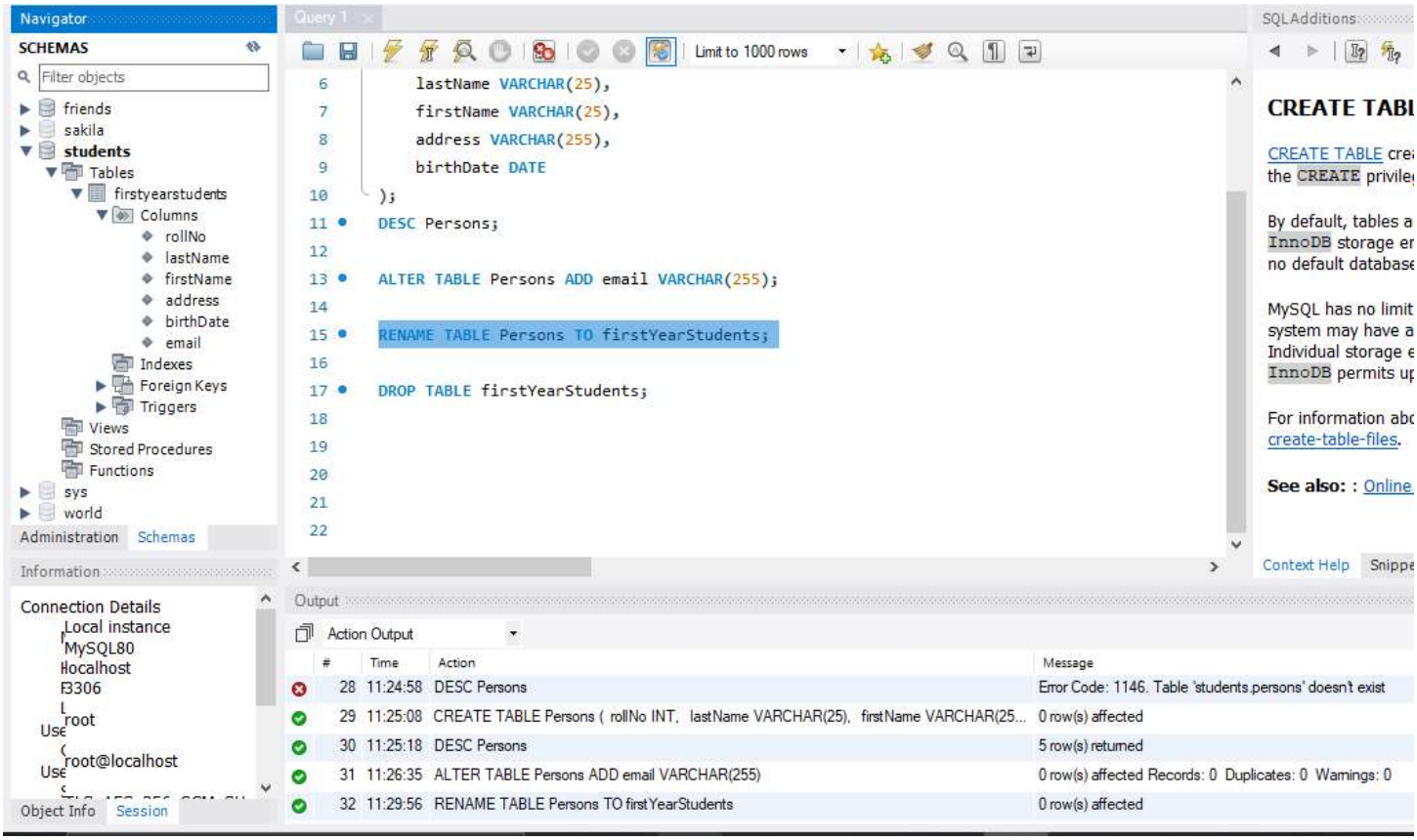




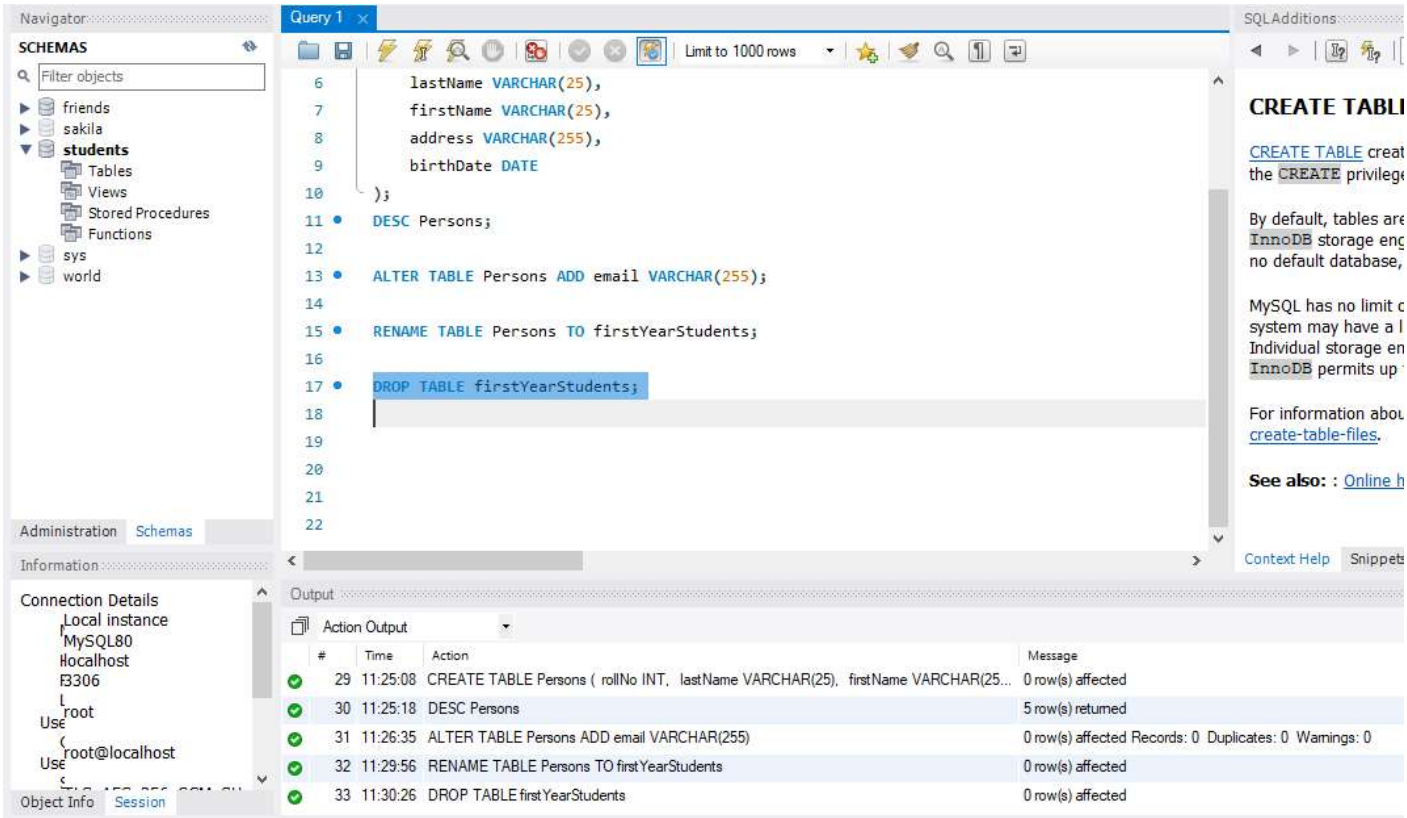
3. ALTER TABLE query syntax and example.



4. RENAME TABLE query syntax and example.



5. DROP TABLE query syntax and example.



DBMS Practical no. 2

Title: Create a New Database and Perform Following operations on that Database.

a) Create a table
b) Insert values in that table
c) Update the table
d) Delete the contents of the table

Theory:

1. INSERT query syntax and example.

The INSERT INTO query is a DML command used to insert new records in a table.

Syntax:

It is possible to write the INSERT INTO statement in two ways.

a. The first way specifies both the column names and the values to be inserted:

```
INSERT INTO table_name (column1, column2, column3, ...)
VALUES (value1, value2, value3, ...);
```

b. If you are adding values for all the columns of the table, you do not need to specify the column names in the SQL query. The INSERT INTO syntax would be as follows:

```
INSERT INTO table_name VALUES (value1, value2, value3, ...);
```

Example:

```
Insert into employee values (1, "abc", "cba");

Insert into employee (employee_id, f_name) values (1, "xyz");
```

2. UPDATE query syntax and example.

The UPDATE query is a DML command used to modify the existing records in a table.

Syntax: UPDATE *table_name*
SET *column1* = *value1*, *column2* = *value2*, ...
WHERE *condition*;

Example:

Update employee set joining_date = 01-01-2000;

update employee set l_name = "zyx" where employee_id=2;

3. DELETE query syntax and example.

The DELETE query is a DML command used to delete existing records in a table.

Syntax: DELETE FROM *table_name* WHERE *condition*;

Example: DELETE FROM employee where f_name = "abc";

4. Delete all contents of table

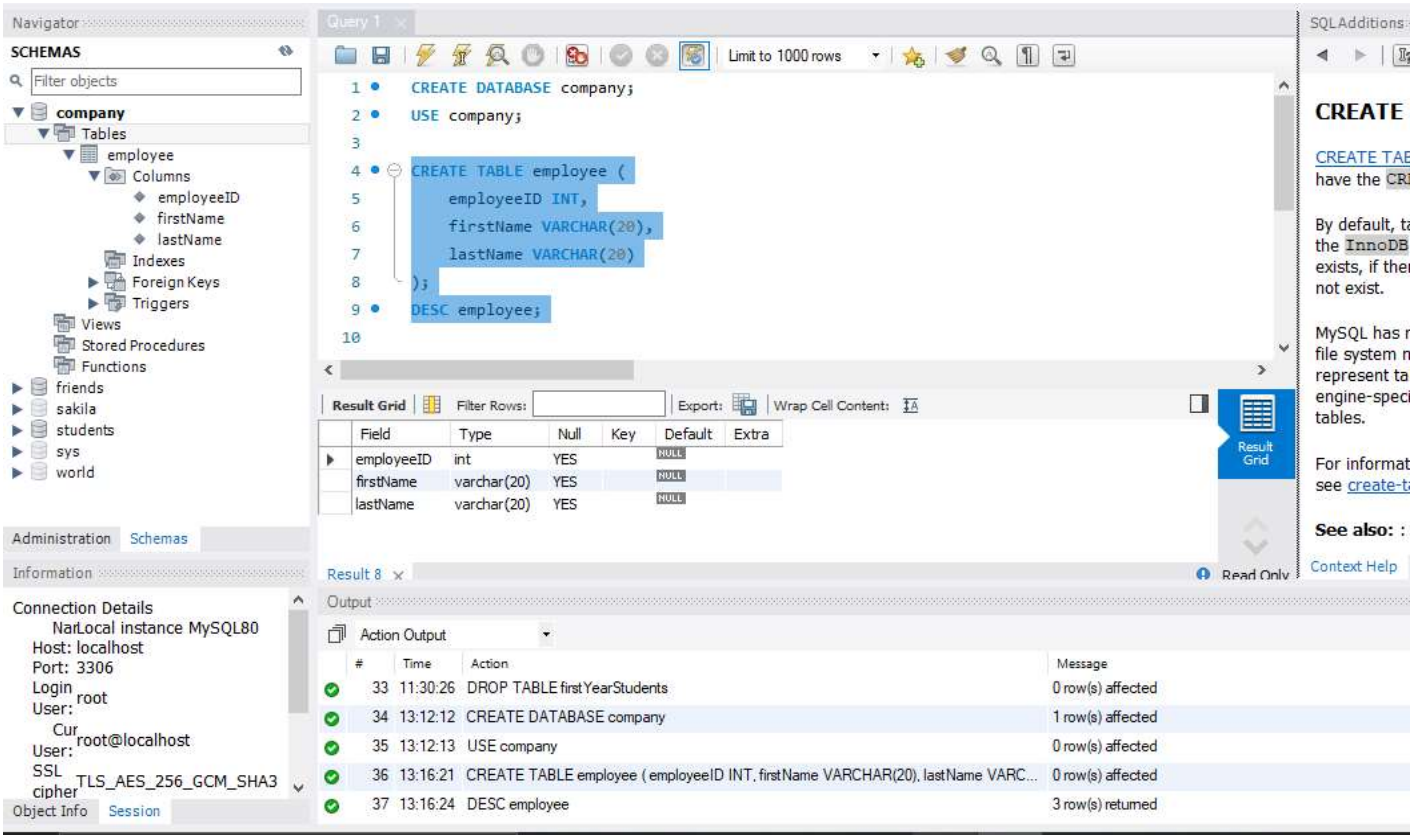
The TRUNCATE is a DDL command used to delete all rows of table, while keeping structure intact.

Syntax: TRUNCATE TABLE database_name;

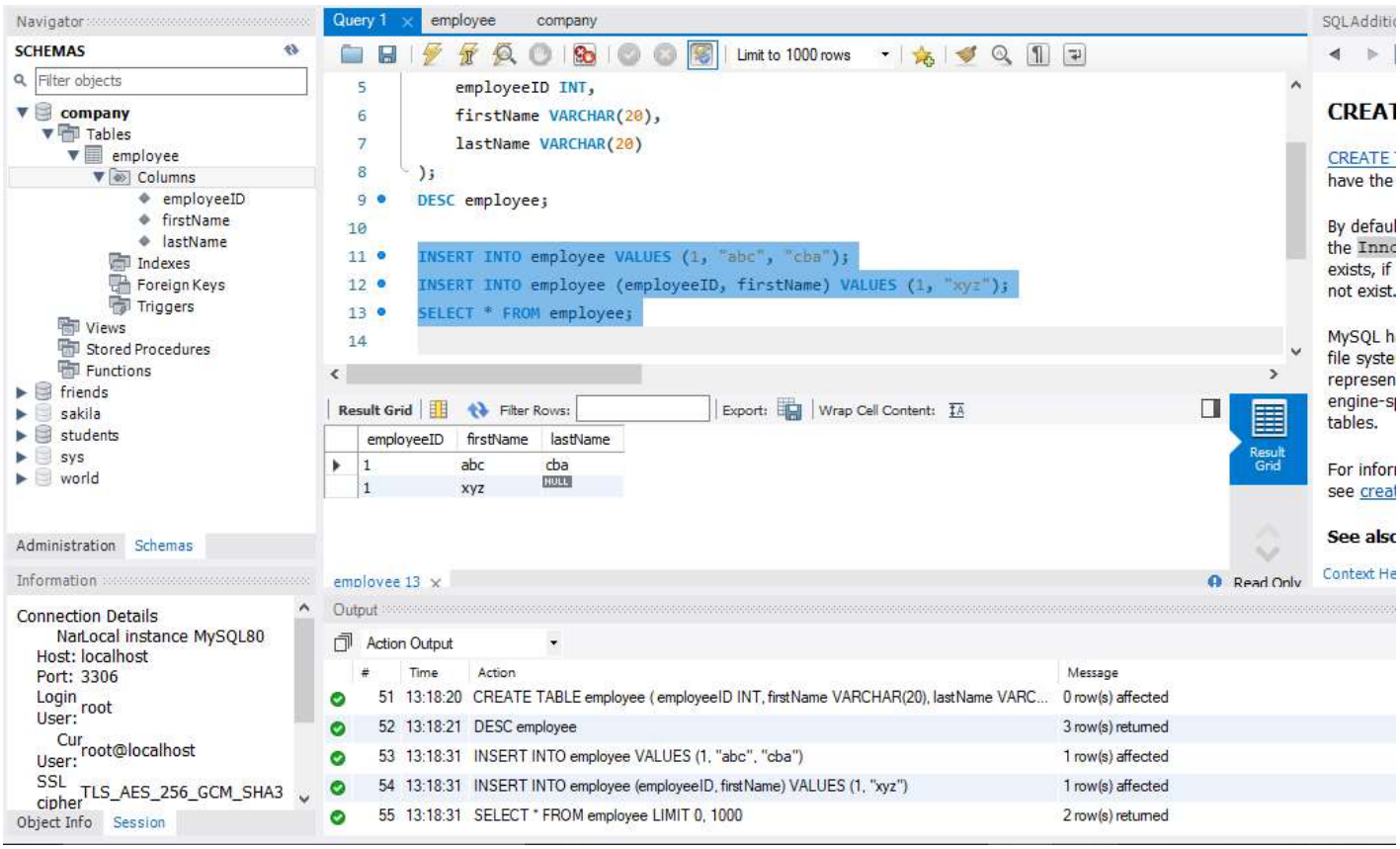
Example: TRUNCATE TABLE employee;

OUTPUT:

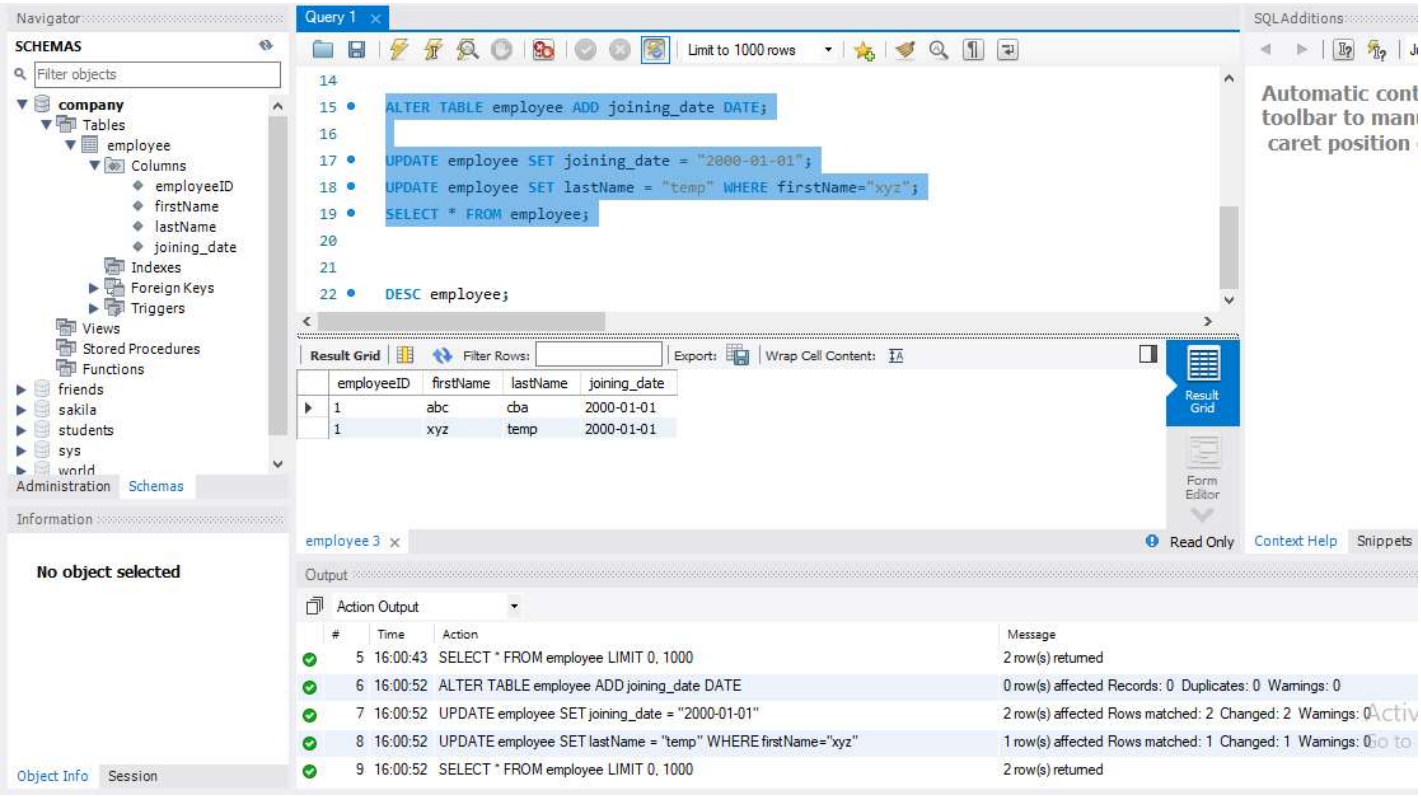
1. Create a Table



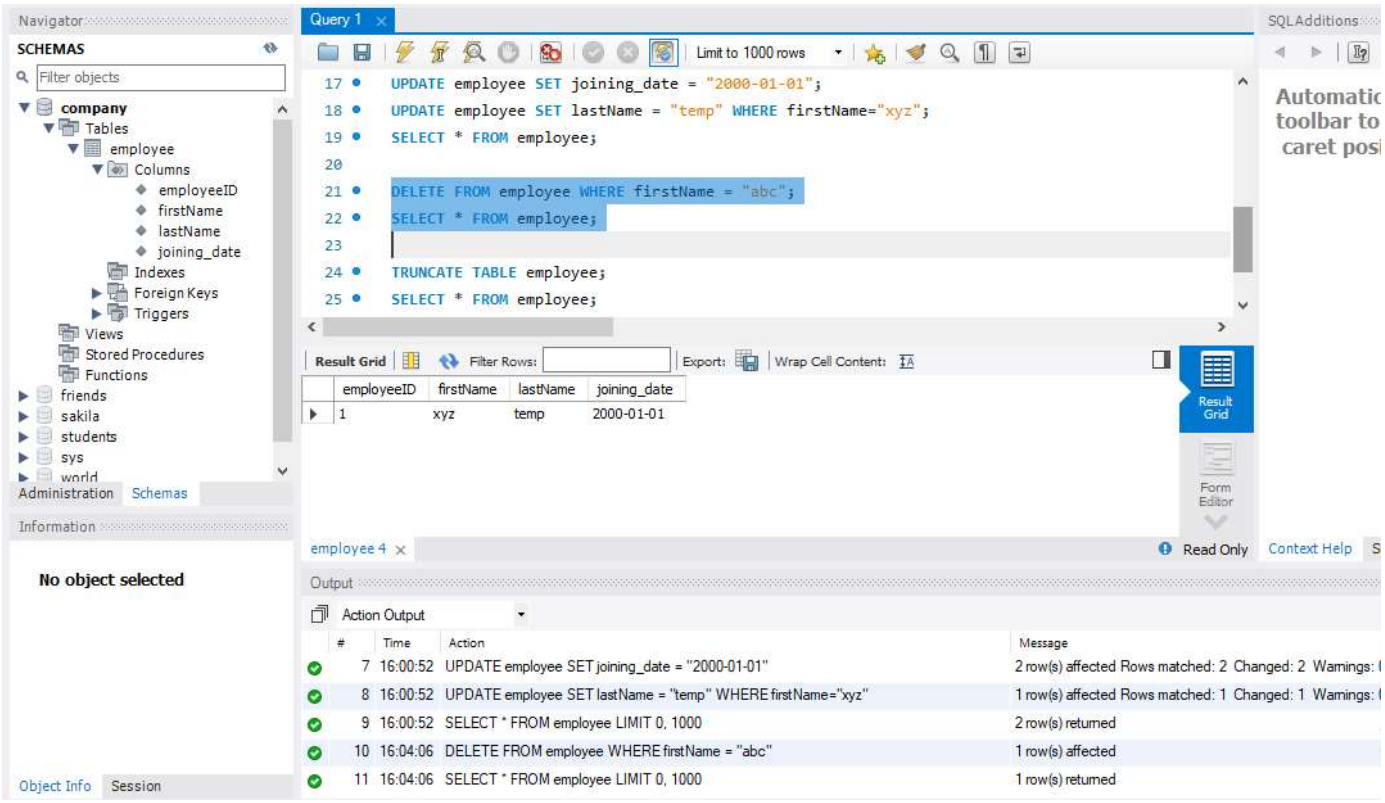
2. Insert Values in the table



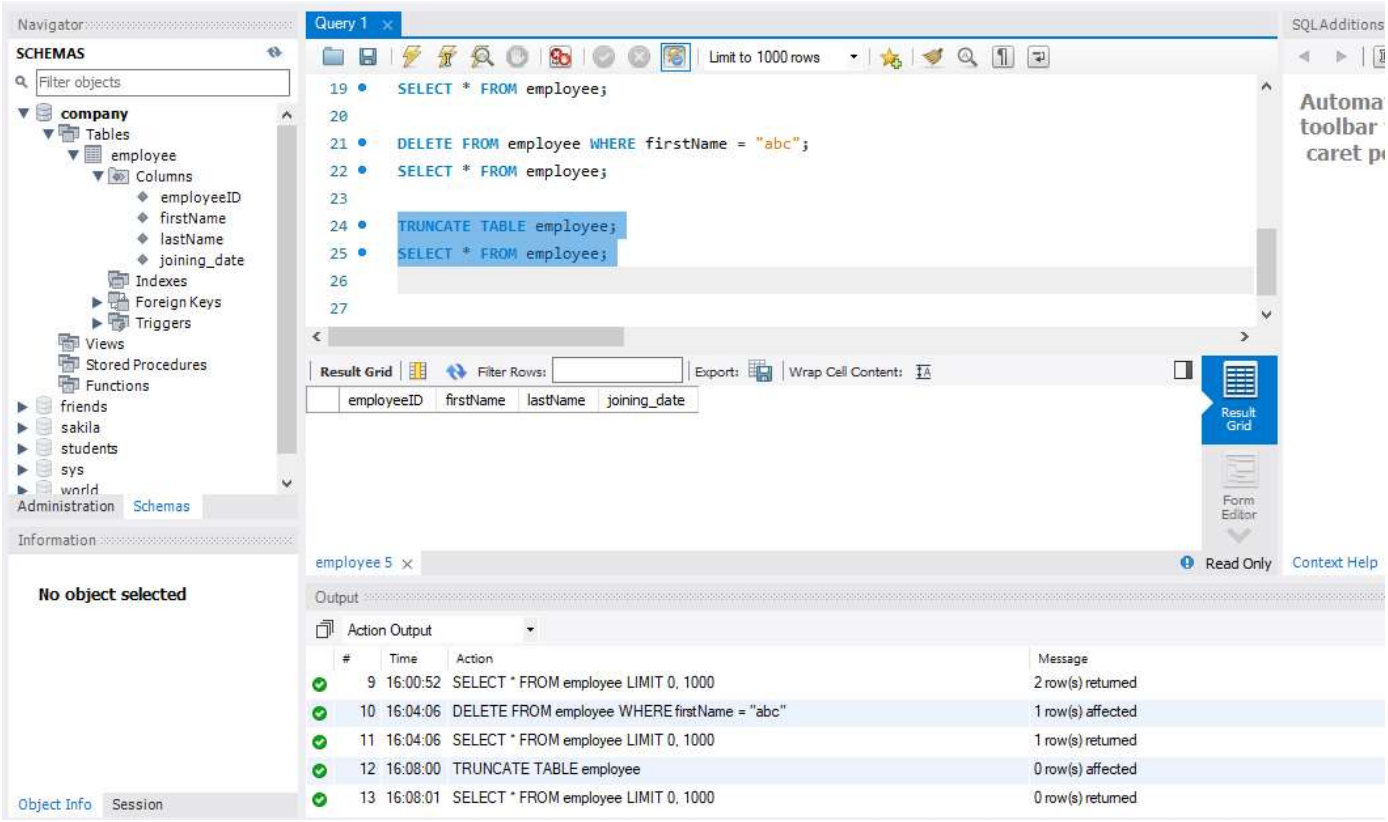
3. **Update the table**



4. Delete specific row/s



5. Delete all the rows of the table



DBMS Practical no. 3

Title: Create a table and apply following clauses on it: Where , Having ,Group by, Order by clauses.

Theory:

1. Where Clause :

Where clause is used to specify the condition of DDL and DMl queries .

Syntax : SELECT column1, column2, ...

FROM table_name

WHERE condition;

Example : SELECT * FROM employee

```
WHERE dept="IT";
```

2. Having Clause :

Having clause is used with aggregate functions instead of Where clause.

Syntax :
```
SELECT column_name(s)  FROM table_name
GROUP BY column_name(s)
HAVING condition;
```

Example :
```
SELECT dept, count(emp_id) FROM employee
GROUP BY dept HAVING COUNT(*)>=2;
```

3. Group By Clause :

This group by clause groups all rows that have the same values into summary rows. It is often used with aggregate functions to group the result -set by one or more columns.

Syntax:
```
SELECT column1, column2  FROM table_name WHERE condition
ORDER BY column1, column2... ASC|DESC
```

Example :
```
SELECT count(*), dept FROM employee GROUP BY dept;
```

4. Order by clause :

The order by is used to sort result set in ascending or descending order. It sorts record in ascending order by default .to sort record in descending order we used desc keyword .

Example :
```
SELECT emp_name, dept, salary FROM employee ORDER BY salary;
SELECT emp_name, dept, salary FROM employee ORDER BY salary DESC;
```

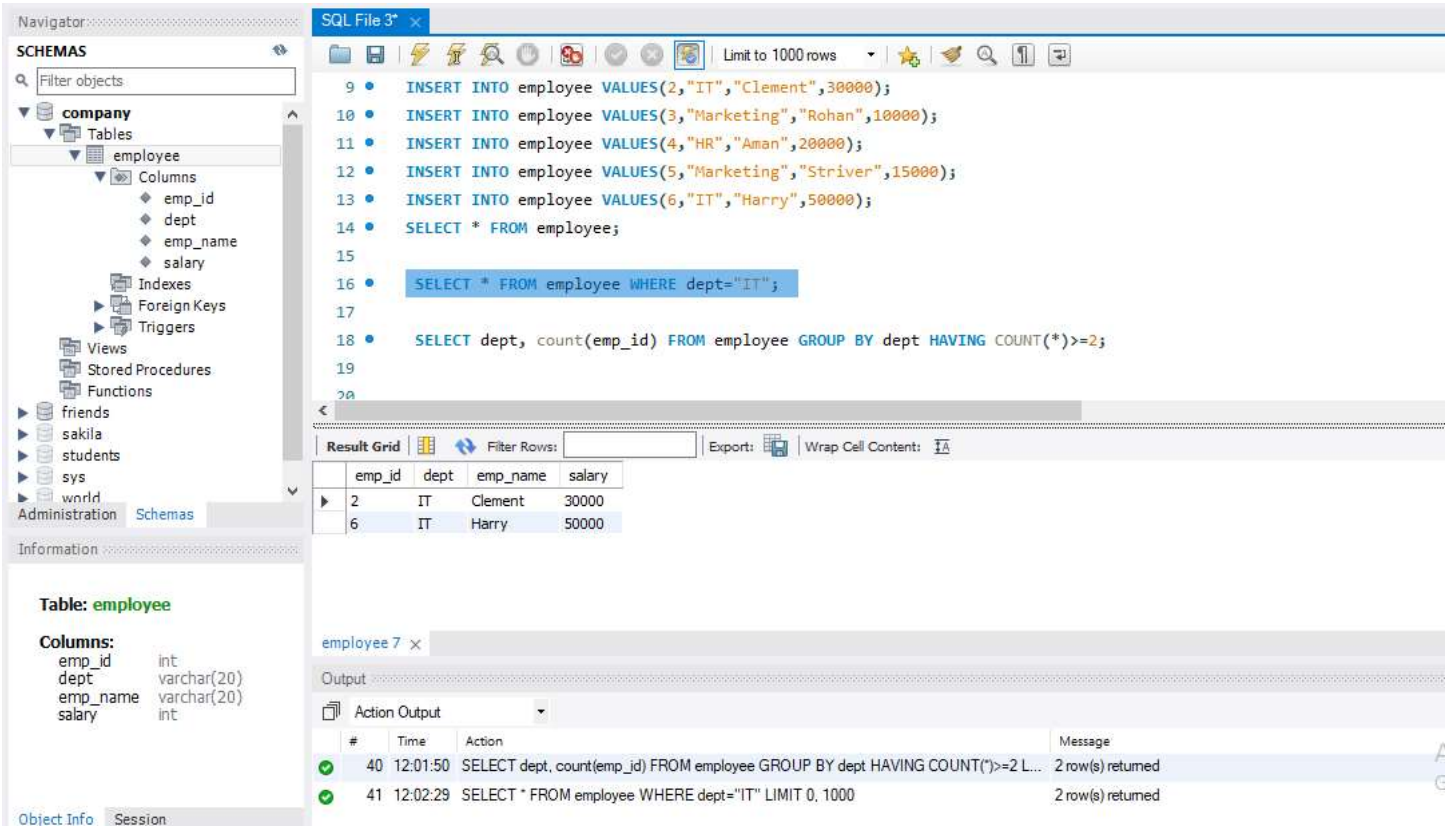
Output:

Table state:

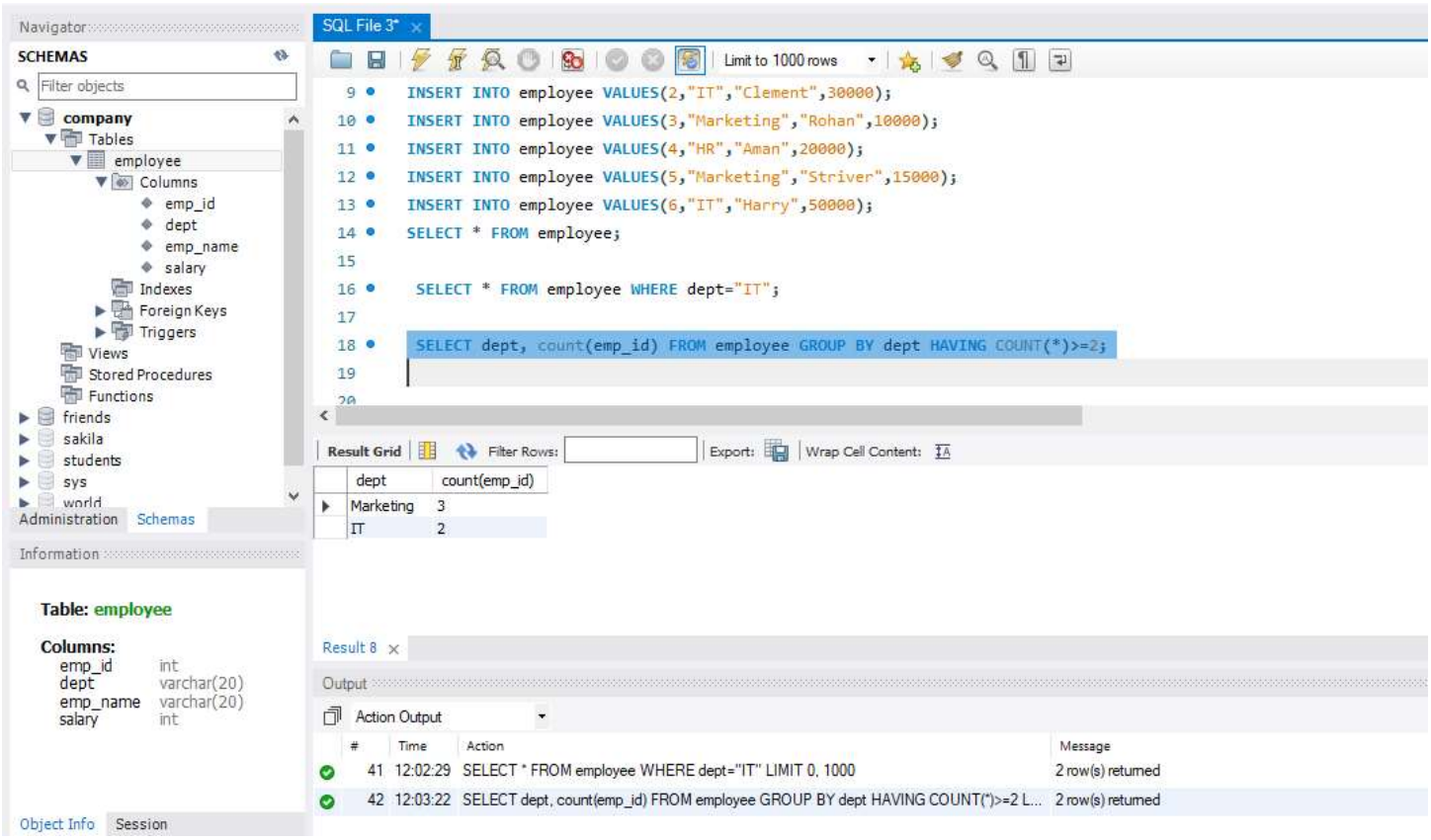
Result Grid | Filter Rows: | Export: | Wrap

emp_id	dept	emp_name	salary
1	Marketing	Sam	10000
2	IT	Clement	30000
3	Marketing	Rohan	10000
4	HR	Aman	20000
5	Marketing	Striver	15000
6	IT	Harry	50000

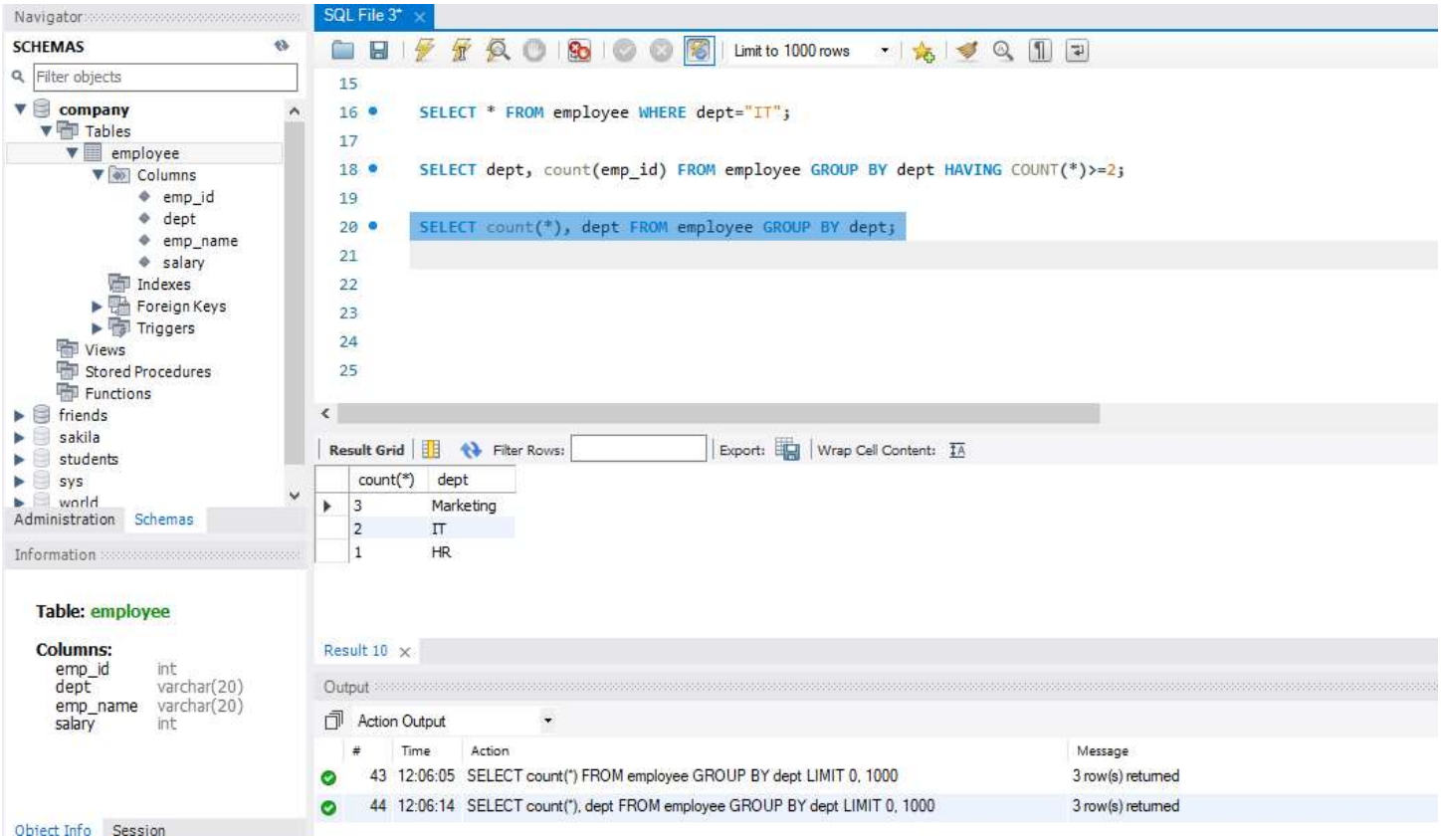
1. Example of query using where clause.



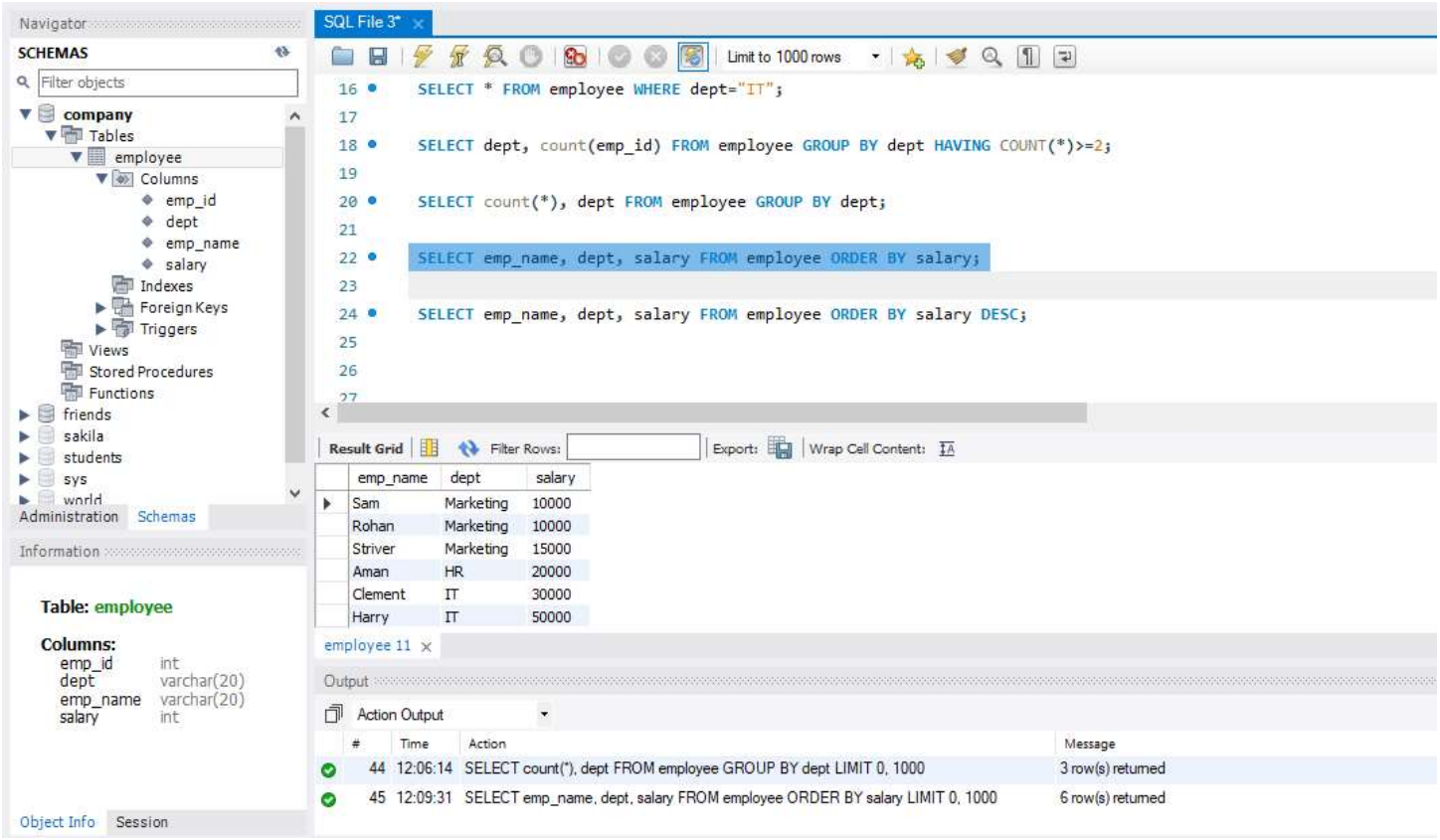
2. Example of query using having clause

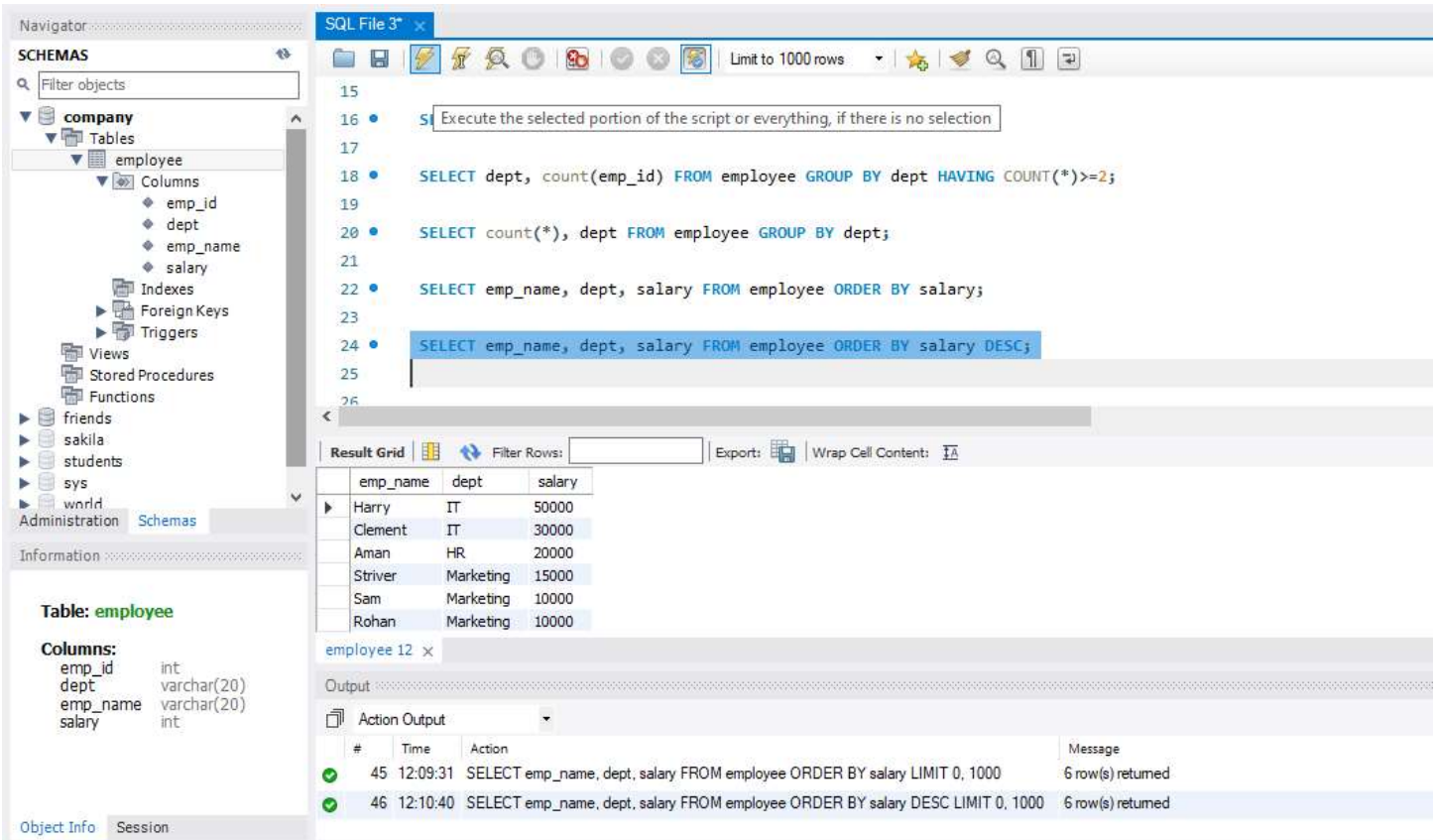


3. Example of query using Group by clause.



4. Example of query using order by clause.





DBMS Practical no. 4

Title: Implement the following Functions in SQL a) Date functions b) Time functions c) String functions d) Aggregate functions.

Theory:

A. Date and Time function :

Date Function :

```
SELECT NOW();

SELECT CURDATE();

SELECT DATE(SYSDATE());

SELECT DATE_FORMAT("2020-10-18", "%d/%M/%Y");

SELECT DATEDIFF("2020-10-18", "2003-03-12");

SELECT CURTIME();

SELECT DATE_ADD("2020-10-18", INTERVAL 10 DAY);

SELECT DATE_SUB("2020-10-18", INTERVAL 10 DAY);

SELECT TIME(SYSDATE());

SELECT DAYNAME("2020-10-18");
```

Time Function :

```
SELECT current_time();

SELECT TIME_TO_SEC("19:30:10");
```

B. String Function :

```
SELECT ASCII("R");

SELECT CHAR(82);

SELECT LENGTH(emp_name), emp_name from employee;

SELECT BIT_LENGTH("Samuel"), emp_name from employee;

SELECT CONCAT(emp_name, " works in ", dept) from employee;
```

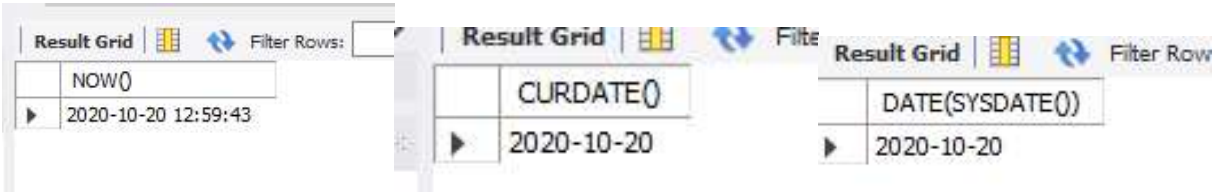
```
SELECT FIELD("s", "h", "a", "r", "p"), emp_name from employee;
SELECT FORMAT(88.38439, 2), emp_name from employee;
SELECT LOWER(emp_name), emp_name from employee;
SELECT UPPER(emp_name), emp_name from employee;
SELECT LEFT(emp_name, 3), emp_name from employee;
```

C. Aggregate functions :

```
SELECT MIN(salary) FROM employee;
SELECT MIN(salary) FROM employee WHERE dept="IT";

SELECT MAX(salary) FROM employee;
SELECT MAX(salary) FROM employee WHERE dept="Marketing";

SELECT AVG(salary) FROM employee;
SELECT AVG(salary) FROM employee WHERE dept IN("HR", "IT");

SELECT SUM(salary) FROM employee;
SELECT SUM(salary) FROM employee WHERE dept="Marketing";

SELECT COUNT(*) FROM employee;
SELECT COUNT(*) FROM employee WHERE dept != "HR";
```

Output:

1. **Date and time functions:**



Result Grid | Filter Rows:

DATE_FORMAT("2020-10-18", "%d/%M/%Y")
18/October/2020

DATEDIFF("2020-10-18", "2003-03-12")
6430

CURTIME()
12:59:43

DATE_ADD("2020-10-18", INTERVAL 10 DAY)
2020-10-28

DATE_SUB("2020-10-18", INTERVAL 10 DAY)
2020-10-08

TIME(SYSDATE())
12:59:44

DAYNAME("2020-10-18")
Sunday

current_time()
13:10:40

TIME_TO_SEC("19:30:10")
70210

2. String functions:

Result Grid

ASCII("R")
82

CHAR(82)
BLOB

Result Grid | Filter Rows:

LENGTH(emp_name)	emp_name
3	Sam
7	Clement
5	Rohan
4	Aman
7	Striver

BIT_LENGTH("Samuel")	emp_name
48	Sam
48	Clement
48	Rohan
48	Aman
48	Striver

CONCAT(emp_name, " works in ", dept)
Sam works in Marketing
Clement works in IT
Rohan works in Marketing
Aman works in HR
Striver works in Marketing

FIELD("s", "h", "a", "r", "p")	emp_name
0	Sam
0	Clement
0	Rohan
0	Aman
0	Striver

FORMAT(88.38439, 2)	emp_name
88.38	Sam
88.38	Clement
88.38	Rohan
88.38	Aman
88.38	Striver

LOWER(emp_name)	emp_name
sam	Sam
clement	Clement
rohan	Rohan
aman	Aman
striver	Striver

UPPER(emp_name)	emp_name
SAM	Sam
CLEMENT	Clement
ROHAN	Rohan
AMAN	Aman
STRIVER	Striver

LEFT(emp_name, 3)	emp_name
Sam	Sam
Cle	Clement
Roh	Rohan
Ama	Aman
Str	Striver

3. Aggregate functions:

Employee table:

emp_id	dept	emp_name	salary
1	Marketing	Sam	10000
2	IT	Clement	30000
3	Marketing	Rohan	10000
4	HR	Aman	20000
5	Marketing	Striver	15000
6	IT	Harry	50000

```
SELECT MIN(salary) FROM employee;
SELECT MIN(salary) FROM employee WHERE dept="IT";
```

MIN(salary)
10000

```
SELECT MIN(salary) FROM employee;
SELECT MIN(salary) FROM employee WHERE dept="IT";
```

MIN(salary)
30000

```
SELECT MAX(salary) FROM employee;
SELECT MAX(salary) FROM employee WH
```

MAX(salary)
50000

```
SELECT MAX(salary) FROM employee WHERE dept="Marketing";
```

MAX(salary)
15000

```
SELECT AVG(salary) FROM employee WHERE dept IN("HR", "IT");
```

AVG(salary)
22500.0000

```
SELECT SUM(salary) FROM employee;
```

SUM(salary)
135000

```
SELECT COUNT(*) FROM employee;
```

COUNT(*)
6

```
SELECT SUM(salary) FROM employee WHERE dept="Marketing";
```

SUM(salary)
35000

```
SELECT COUNT(*) FROM employee WHERE dept != "HR";
```

COUNT(*)
5

DBMS Practical no. 5

Title: Implementation of all types of Joins.

Theory:

1. Example of query using INNER JOIN.

   The inner join keyword selects records that have same values in both tables.

   Syntax : Select column_name() from table_name inner join table_name2

   on table_name.column_name=table_name2.column_name;

   Example : SELECT id, loanID, branch, amount FROM customer INNER JOIN loans ON id=loans.cID;

2. Example of query using LEFT OUTER JOIN.

   Left join keyword returns all records from the table (table1) , and the matched records from the right table(table2). The results is NULL from the right side if there is no match.

   Syntax : Select column_name() from table_name left join table_name2

   on table_name.column_name=table_name2.column_name;

   Example : SELECT id, custName, loanID, branch, amount FROM customer LEFT OUTER JOIN loans ON customer.ID=loans.cID;

3. Example of query using RIGHT OUTER JOIN.

   The right join keyword returns all records from the right table (table2) , and the matched records from the left table(table1). The results is NULL from the left side if there is no match.

   Syntax : Select column_name() from table_name1 right join table_name2 on

   table_name1.column_name=table_name2.column_name;

   Example : SELECT id, custName, loanID, branch, amount FROM customer RIGHT OUTER JOIN loans ON customer.ID=loans.cID;

4. Example of query using FULL OUTER JOIN.

   The full outer join keyword returns all records when there ia a match in left(table1) or right(table2) table records.

   Syntax : Select column_name(s) from table_name1 full join table_name2

on table_name1.column_name=table_name2.column_name where condition;

Example : SELECT id, custName, loanID, branch, amount FROM customer FULL OUTER JOIN loans ON customer.ID=loans.cID;

Output:

Customer table:

Result Grid | Filter Rows:

id	custName	loanID	balance
1	Max	1	200000
2	Merry	2	180000
3	Michal	3	250000
4	Jimmy	NULL	400000
NULL	NULL	NULL	NULL

Loan table:

Result Grid | Filter Rows:

loanIDs	cID	branch	amount
1	1	Bangalore	100000
2	3	Mumbai	150000
3	2	Banglore	80000
NULL	NULL	NULL	NULL

1. Inner join

Result Grid | Filter Rows:

id	loanID	branch	amount
1	1	Bangalore	100000
3	3	Mumbai	150000
2	2	Banglore	80000

2. Left outer join:

id	custName	loanID	branch	amount
1	Max	1	Bangalore	100000
2	Merry	2	Banglore	80000
3	Michal	3	Mumbai	150000
4	Jimmy	NULL	NULL	NULL

3. Right outer join

Result Grid | Filter Rows: | Exp

id	custName	loanID	branch	amount
1	Max	1	Bangalore	100000
3	Michal	3	Mumbai	150000
2	Merry	2	Banglore	80000

Practical no. 6 ***FS19CO042***

Title: Create table and Apply constraints such as NOT NULL, UNIQUE, Check, Default, Primary key ,Foreign key, on the table.

Theory:

- Creating Table:- Tables can be created inside Database which is under use.

```
CREATE TABLE table_name (
    column1 datatype,
    column2 datatype,
    column3 datatype,
    ....
);
```

```
Eg. CREATE TABLE firstYear(
      firstName varchar(20),
      lastName varchar(20),
      enrolmentNo varchar(9),
      birthDate DATE,
      CoursesEnrolled int
    );
```

- Constraints possible for columns of table:
  - NOT NULL: States that column with this constraint cannot be null.
  - DEFAULT: Sets a default value for column if value not specified.
  - CHECK: Gives a condition which must be satisfied by the value to be placed.
  - UNIQUE: Ensures that all values in a column are different.
  - PRIMARY KEY: Ensures that value is Unique and NOT NULL, It is used to uniquely identify the row
  - FOREIGN KEY: Refers to PRIMARY KEY of another table i.e. uniquely identify a row in other table.

```
Eg. CREATE TABLE firstYear(
      firstName varchar(20) NOT NULL,
      lastName varchar(20),
      enrolmentNo varchar(9) PRIMARY KEY,
      age INT NOT NULL,
      coursesEnrolled INT DEFAULT 0,
      libraryID INT UNIQUE,
      favCourse VARCHAR(20),
      CHECK (age>=15)
    );
```

Example of queries:

- `INSERT INTO firstyear VALUES("Omkar", "Phansopkar", "FS19CO042", 15, 5, 2042, "Java");`
  -- This query is valid

- `INSERT INTO firstyear VALUES("Sam", "Johnson", "FS19CO067", 13, 8, 2067, "Python");`
  -- This query is not valid, since the age is 13 I.e. less than 15

- `INSERT INTO firstyear(firstName, enrolmentNo, age, libraryID, favCourse)`
  `VALUES("Lokey", "FS19CO070", 20, 9, "DBMS")`
  -- This query is valid

- `INSERT INTO firstyear(firstName, lastName, enrolmentNo, age, libraryID, favCourse)`
  `VALUES("Josh", "Hazlewood", "FS19CO070", 15, 15, "JS");`
  -- This query is not valid since the enrolmentNo which is primary key, has been given a duplicate value same as that of Lokey

- `INSERT INTO firstyear(firstName, lastName, enrolmentNo, age, libraryID, favCourse)`
  `VALUES("Sam", "Curran", "FS19CO080", 20, 15, "MP");`
  -- This query is valid

Exported CSV form of table:

```
firstName, lastName,        enrolmentNo,  age,   coursesEnrolled,     libraryID,    favCourse
Omkar,     Phansopkar,   FS19CO042,  15,    5,                   2042,         Java
Lokey,     ,             FS19CO070,  20,    0,                   9,            DBMS
Sam,       Curran,       FS19CO080,  20,    0,                   15,           MP
```

Queries:

```
3   CREATE TABLE firstyear(
4       firstName VARCHAR(20) NOT NULL,
5       lastName VARCHAR(20),
6       enrolmentNo VARCHAR(9) PRIMARY KEY,
7       age INT NOT NULL,
8       coursesEnrolled INT DEFAULT 0,
9       libraryID INT UNIQUE,
10      favCourse VARCHAR(20) DEFAULT "NONE",
11      CHECK (age>=15)
12  );
13
14  DESC TABLE firstyear;
15
16  INSERT INTO firstyear VALUES("Omkar", "Phansopkar", "FS19CO042", 15, 5, 2042, "Java");
17
18  INSERT INTO firstyear VALUES("Sam", "Johnson", "FS19CO067", 13, 8, 2067, "Python");
19
20  INSERT INTO firstyear(firstName, enrolmentNo, age, libraryID, favCourse)
21      VALUES("Lokey", "FS19CO070", 20, 9, "DBMS");
22
23  INSERT INTO firstyear(firstName, lastName, enrolmentNo, age, libraryID, favCourse)
24      VALUES("Josh", "Hazlewood", "FS19CO070", 15, 15, "JS");
25
26  INSERT INTO firstyear(firstName, lastName, enrolmentNo, age, libraryID, favCourse)
27      VALUES("Sam", "Curran", "FS19CO080", 20, 15, "MP");
28
29
30  SELECT * FROM firstyear;
31
```

Output:

Success

1:03 PM

2.08 seconds

Explore | SQL | Data | Chart | Export

Rows affected: 0

Success

1:03 PM

1 rows

0.688 seconds

Explore | SQL | Data | Chart | Export

id	select_type	table	partitions	type	possible_keys	key	key_len	ref
1	SIMPLE	firstyear	NULL	ALL	NULL	NULL	NULL	NULL

Success

1:03 PM

1.403 seconds

Explore | SQL | Data | Chart | Export

Rows affected: 1

Failed

1:03 PM

Explore | SQL | Data | Chart | Export

```
UNKNOWN_CODE_PLEASE_REPORT: Check constraint 'firstyear_chk_1' is violated.
```

Success

1:03 PM

1.403 seconds

Explore | SQL | Data | Chart | Export

Rows affected: 1

Failed

1:04 PM

Explore | SQL | Data | Chart | Export

```
ER_DUP_ENTRY: Duplicate entry 'FS19CO070' for key 'firstyear.PRIMARY'
```

Success

1:03 PM

1.403 seconds

Explore | SQL | Data | Chart | Export

Rows affected: 1

Success

3 rows

1:04 PM

0.717 seconds

Explore | SQL | Data | Chart | Export

firstName	lastName	enrolmentNo	age	coursesEnrolled	libraryID	favCourse
Omkar	Phansopkar	FS19CO042	15	5	2042	Java
Lokey	NULL	FS19CO070	20	0	9	DBMS
Sam	Curran	FS19CO080	20	0	15	MP

Experiment 7 *FS19CO042*

Title: Write SQL code for creating of View. Perform Insert ,Modify, Delete records through view, Delete the View. Working with Nested -Query.

Theory:

1. Simple View

➔Simple View in SQL is the view created by involving only single table. In other words we can say that there is only one base table in case of Simple View in SQL

Syntax : CREATE VIEW view-name AS
SELECT column-name
FROM table-name
WHERE condition

Example : CREATE VIEW Brazil_Customers AS
SELECT CustomerName, ContactName
FROM Customers
WHERE Country = 'Brazil';

2. Complex view

➔On other hand, Complex View is created by involving more than one table i.e., multiple tables get projected in Complex view.

Syntax : CREATE VIEW view-name AS
SELECT column-name
FROM table-name
JOIN aggregate-function
GROUP BY column-name

Example : CREATE VIEW dept_income AS
SELECT d.Name as DepartmentName, sum(e.salary) as TotalSalary
FROM Employees e
JOIN Departments d on e.DepartmentId = d.id
GROUP BY d.Name

3. INSERT query syntax and example.

➔ *INSERT* command is used to insert data into the row of a table.

Syntax : INSERT INTO TABLE_NAME (col1, col2, col3,. ...col N)
VALUES (value1, value2, value3, ... valueN);

Example : INSERT INTO fyfs (name, roll) VALUES ("Rupesh", "FS43");

4. UPDATE query syntax and example**.**

➔*UPDATE* command is used to update or modify the value of a column in the table.

Syntax : UPDATE table_name SET [column_name1=value1] [WHERE CONDITION]

Example : UPDATE students SET User_Name = "Rupesh" WHERE Student_Id = '43'

5. DELETE query syntax and example**.**

➔ *DELETE* is used to remove one or more row from a table.

Syntax : DELETE FROM table_name [WHERE condition];

Example : DELETE FROM javatpoint WHERE Author="Rupesh";

6. DROP VIEW

➔*DROP VIEW* command is used to delete the view

Syntax : DROP VIEW *view_name*

Example : DROP VIEW [Brazil Customers]

7. NESTED QUERY

➔Query written inside a query is called as SQL Nested Query

Syntax : SELECT Column1,Column2… From Table_Name
WHERE Column_Name Operator(Select Column1,Column From Table_Name_2)
Operator (Select Column1,Column2…..From Table_Name_3)

Example : *SELECT Model FROM Product*
WHERE ManufacturerID IN (SELECT ManufacturerID FROM
Manufacturer
WHERE Manufacturer = 'Dell')

Outputs:
Initial tables setup:

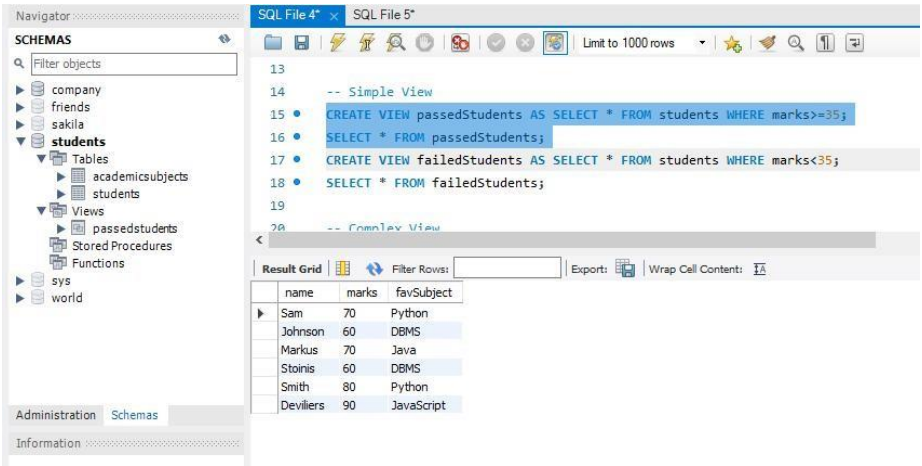
Students table:

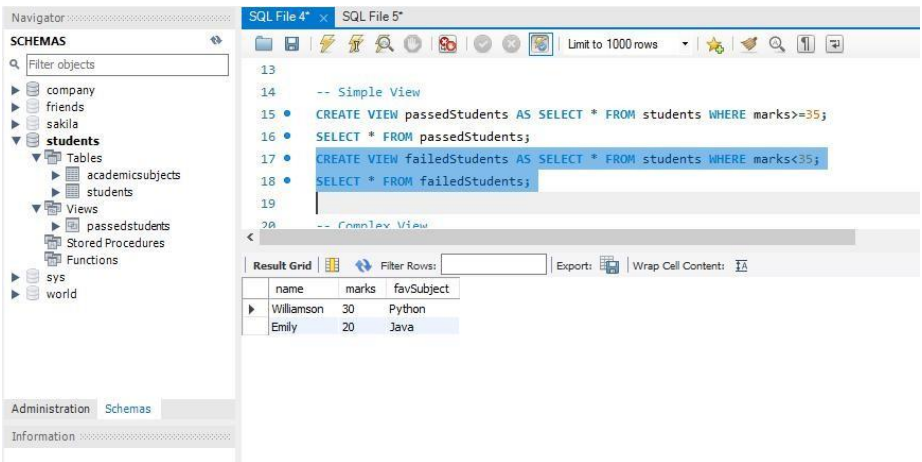
name	marks	favSubject
Sam	70	Python
Johnson	60	DBMS
Markus	70	Java
Stoinis	60	DBMS
Smith	80	Python
Williamson	30	Python
Emily	20	Java
Deviliers	90	JavaScript

academicSubjects table:

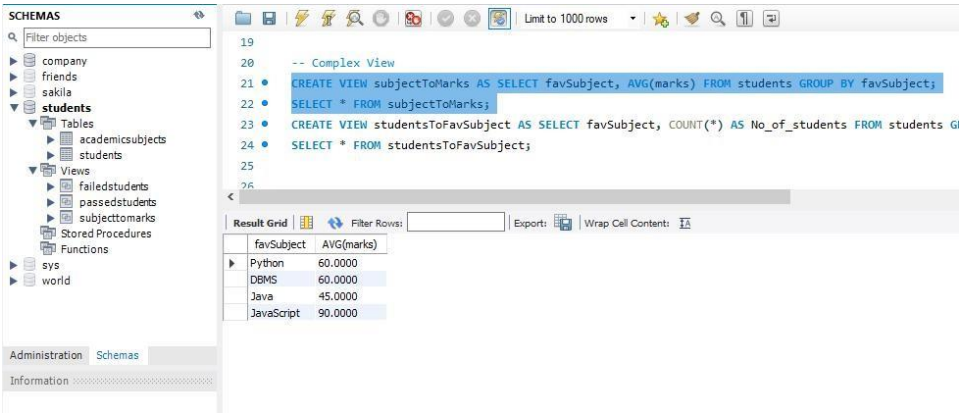
sub_name	studentRating	teachingSemester
DBMS	6.5	3
Java	7	3
Javascript	7.9	4
Python	8.5	3
NULL	NULL	NULL

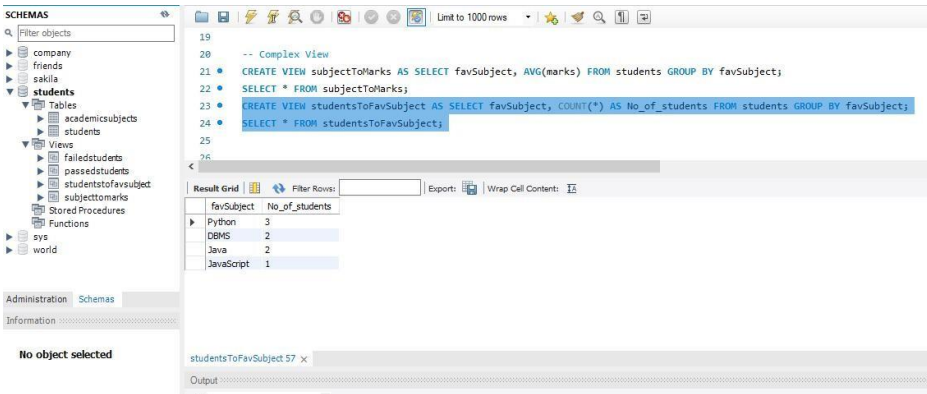
Creating Simple view:



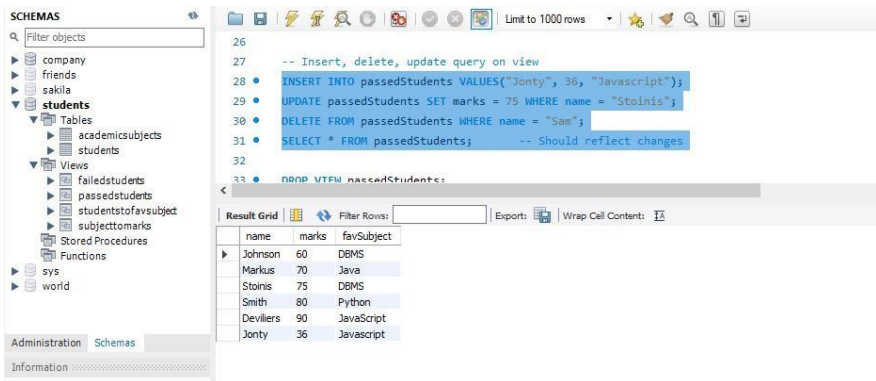


Creating complex view:

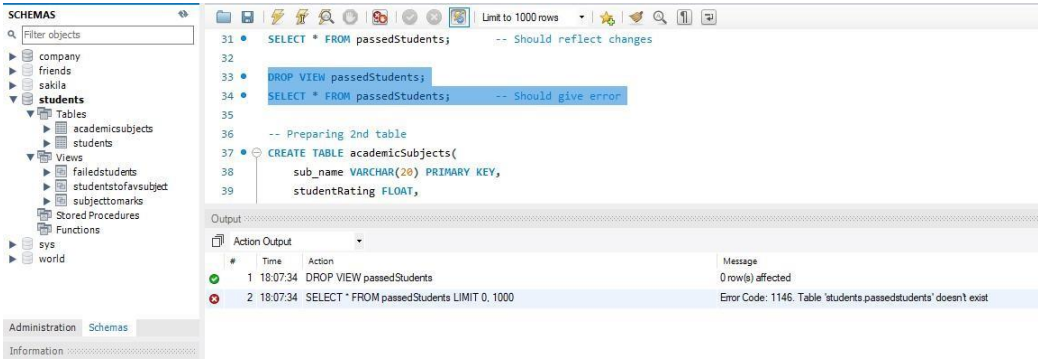




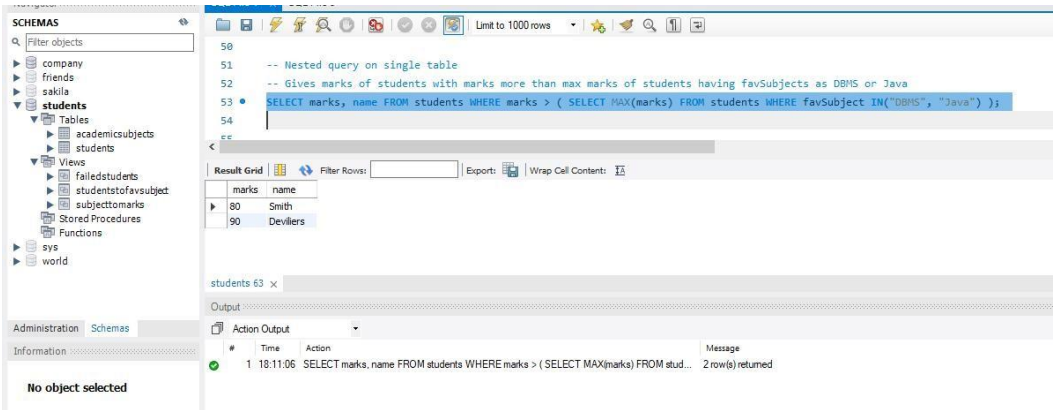
Insert delete and update on view:



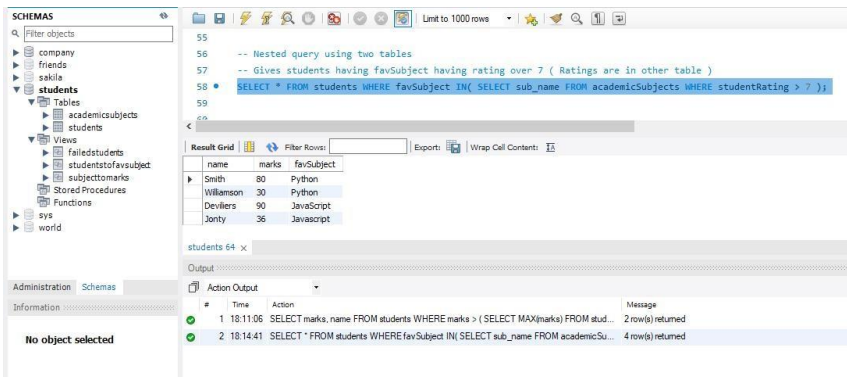
Drop view:



Nested query on single table:



Nested query using two tables:



Conclusion: Thus, we created, modified(Inserted updated deleted) and deleted views

Practical no. 8 FS19CO042

Title : Implementation of DCL commands

- **GRANT**
- **REVOKE**

Implementation of TCL commands

- **COMMIT**
- **ROLLBACK**
- **SAVEPOINT**

Theory :

1. DCL :

DCL is the abstract of Data Control Language. Data Control Language includes commands such as GRANT, and is concerned with rights, permissions, and other controls of the database system. DCL is used to grant/revoke permissions on databases and their contents. DCL is simple, but MySQL permissions are a bit complex. DCL is about security. DCL is used to control the database transaction. DCL statements allow you to control who has access to a specific object in your database.

1. GRANT

2. REVOKE

GRANT:

It provides the user's access privileges to the database. The MySQL database offers both the administrator and user a great extent of the control options. The administration side of the process includes the possibility for the administrators to control certain user privileges over the MySQL server by restricting their access to an entire database or usage limiting permissions for a specific table. It creates an entry in the security system that allows a user in the current database to work with data in the current database or execute specific statements.

Syntax :

Statement permissions:

```
GRANT { ALL | statement [ ,...n ] }
TO security_account [ ,...n ]
```

Normally, a database administrator first uses CREATE USER to create an account, then GRANT to define its privileges and characteristics.

For example:

```
CREATE USER vatsa@'localhost' IDENTIFIED BY 'mypass';
GRANT ALL ON MY_TABLE TO vatsa@'localhost';
GRANT SELECT ON Users TO vatsa@'localhost';
```

REVOKE:

The REVOKE statement enables system administrators and to revoke (back permission) the privileges from MySQL accounts.

Syntax:

```
REVOKE
priv_type [(column_list)]
[, priv_type [(column_list)]] ...
ON [object_type] priv_level
FROM user [, user] ...
REVOKE ALL PRIVILEGES, GRANT OPTION
FROM user [, user] ...
```

For example:

```
REVOKE INSERT ON *.* FROM 'vatsa'@'localhost';
```

2. TCL :

Transaction Control Language(TCL) commands are used to manage transactions in the database. These are used to manage the changes made to the data in a table by DML statements. It also allows statements to be grouped together into logical transactions.

COMMIT:

COMMIT command is used to permanently save any transaction into the database.

When we use any DML command like INSERT, UPDATE or DELETE, the changes made by these commands are not permanent, until the current session is closed, the changes made by these commands can be rolled back.

To avoid that, we use the COMMIT command to mark the changes as permanent.

Following is commit command's syntax,

Syntax:

```
commit;
```

ROLLBACK:

This command restores the database to the last committed state. It is also used with the SAVEPOINT command to jump to a savepoint in an ongoing transaction.

If we have used the UPDATE command to make some changes into the database, and realise that those changes were not required, then we can use the ROLLBACK command to rollback those changes, if they were not committed using the COMMIT command.

Following is rollback command's syntax,

Syntax:

```
ROLLBACK TO savepoint_name;
```

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SAVEPOINT:

SAVEPOINT command is used to temporarily save a transaction so that you can rollback to that point whenever required.

Following is savepoint command's syntax,

Syntax:

```
SAVEPOINT savepoint_name;
```

OUTPUT :

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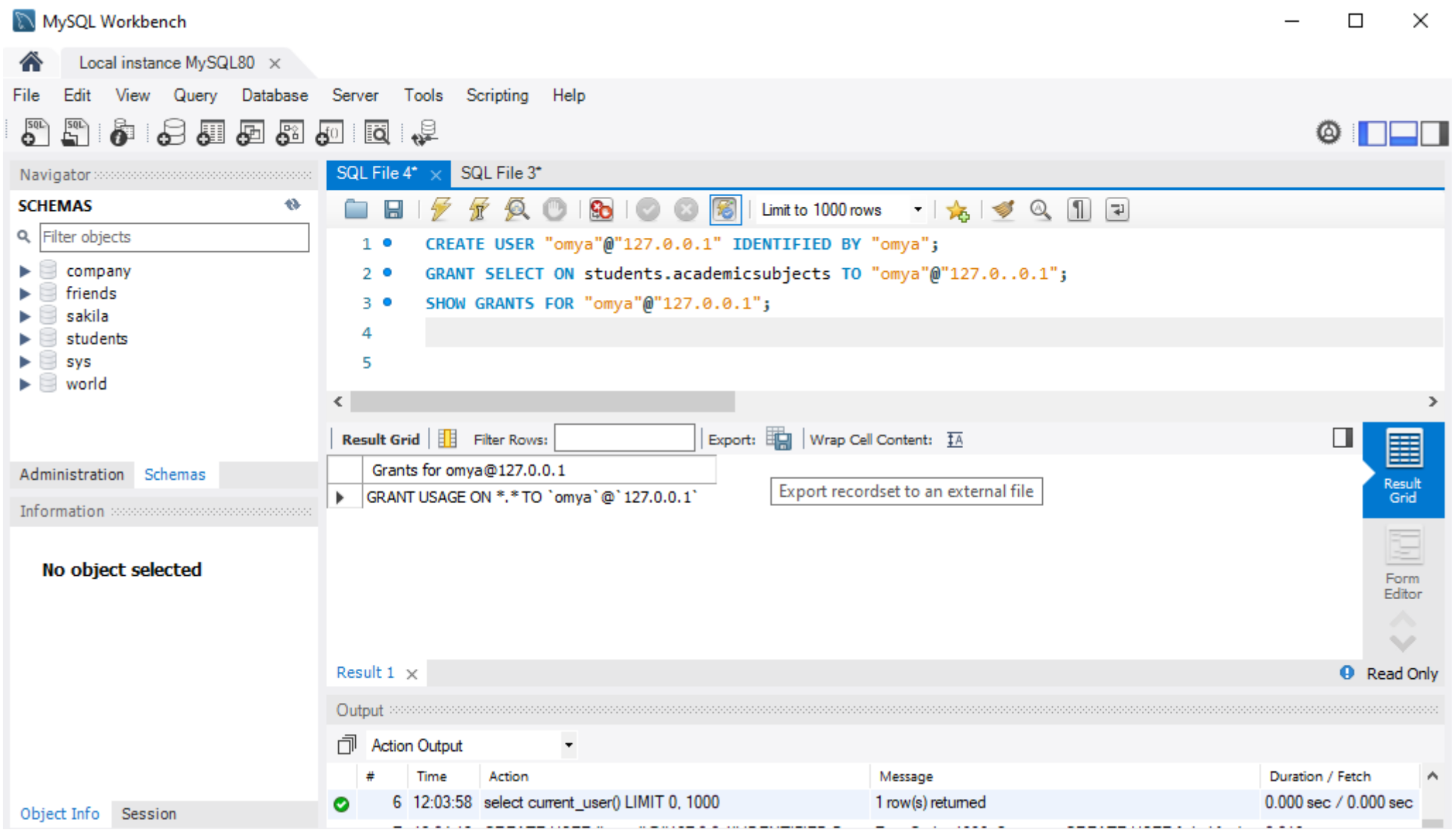
1. Practical no. 9 DCL

1) GRANT

01. Creating user

02. Granting permissions



03. Making new connection

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MySQL Workbench

Local instance MySQL80

File Edit View

Setup New Connection

Connection Name: Omya — Type a name for the connection

Connection Method: Standard (TCP/IP) — Method to use to connect to the RDBMS

Parameters | SSL | Advanced

Hostname: 127.0.0.1 Port: 3306 — Name or IP address of the server host - and TCP/IP port.

Username: omya — Name of the user to connect with.

Password: Store in Vault ... Clear — The user's password. Will be requested later if it's not set.

Default Schema: — The schema to use as default schema. Leave blank to select it later.

Configure Server Management... Test Connection Cancel OK

localhost:3306

MySQL Workbench

Local instance MySQL80 | Omya

File Edit View Query Database Server Tools Scripting Help

Navigator

SCHEMAS

Filter objects

Administration Schemas

Information

No object selected

Object Info Session

Query 1

Limit to 1000 rows

1

Output

Action Output

#	Time	Action	Message	Duration / Fetch

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04. Use allowed commands

Automatically synchronize your data using Data Sync Tool : Reason #28 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
```

1 Result | 2 Profiler | 3 Messages | 4 Table Data | 5 Info

(Read Only) | Limit rows | First row 0 | # of rows 1000

customerId	customerName	productId
1	Rupesh	2
2	Rohan	4
3	Omkar	3
4	Anniruddha	1
5	Rahul	*(NULL)*

select * from customertable LIMIT 0, 1000

Total: 0.002 sec | 5 row(s) | Ln 2, Col 28 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Build complex queries using drag-n-drop interface : Reason #13 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   INSERT INTO customertable VALUES (6, "Ram", 4)
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 0 success, 1 errors, 0 warnings

Query: insert into customertable values (6, "Ram", 4)

Error Code: 1142
INSERT command denied to user 'rupesh2'@'localhost' for table 'customertable'

Execution Time : 0 sec
Transfer Time  : 0 sec
Total Time     : 0.044 sec
```

All

: 0 sec | Total: 0.044 sec | Ln 3, Col 47 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

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Data Sync tool helps restore missing or damaged data at table, row or column level : Reason #34 to upgrade

Query 1 | History

```
1   CREATE USER "rupesh2"@"127.0.0.1" IDENTIFIED BY "rupesh"
2   GRANT SELECT ON gpm.customertable TO "rupesh2"@"127.0.0.1"
3   SHOW GRANTS FOR "rupesh2"@"127.0.0.1"
4   GRANT INSERT ON gpm.customertable TO "rupesh2"@"127.0.0.1"
5
6
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: grant insert on gpm.customertable to "rupesh2"@"127.0.0.1"

0 row(s) affected

Execution Time : 0.124 sec
Transfer Time  : 0 sec
Total Time     : 0.124 sec
```

All

Total: 0.124 sec | Ln 4, Col 59 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Print your database schema using Visual Schema Designer : Reason #9 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   INSERT INTO customertable VALUES (6, "Ram", 4)
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: insert into customertable values (6, "Ram", 4)

1 row(s) affected

Execution Time : 0.208 sec
Transfer Time  : 0 sec
Total Time     : 0.209 sec
```

All

Total: 0.209 sec | Ln 3, Col 47 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

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Print your database schema using Visual Schema Designer : Reason #9 to upgrade

Query 1 | History

```
1    USE gpm
2    SELECT * FROM customertable
3    INSERT INTO customertable VALUES (6, "Ram", 4)
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: insert into customertable values (6, "Ram", 4)

1 row(s) affected

Execution Time : 0.208 sec
Transfer Time  : 0 sec
Total Time     : 0.209 sec
```

All

Total: 0.209 sec | Ln 3, Col 47 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Import external data at scheduled intervals : Reason #40 to upgrade

Query 1 | History

```
1    USE gpm
2    SELECT * FROM customertable
3    INSERT INTO customertable VALUES (6, "Ram", 4)
```

1 Result | 2 Profiler | 3 Messages | 4 Table Data | 5 Info

(Read Only) | Limit rows | First row 0 | # of rows 1000

customerId	customerName	productId
1	Rupesh	2
2	Rohan	4
3	Omkar	3
4	Anniruddha	1
5	Rahul	*(NULL)*
6	Ram	4

select * from customertable LIMIT 0, 1000

Total: 0.003 sec | 6 row(s) | Ln 3, Col 47 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

2. REVOKE

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Compare the contents of two databases using Data Sync Tool : Reason #27 to upgrade

Query 1 | History

```
1    CREATE USER "rupesh2"@"127.0.0.1" IDENTIFIED BY "rupesh"
2    GRANT SELECT ON gpm.customertable TO "rupesh2"@"127.0.0.1"
3    SHOW GRANTS FOR "rupesh2"@"127.0.0.1"
4    GRANT INSERT ON gpm.customertable TO "rupesh2"@"127.0.0.1"
5    REVOKE INSERT ON gpm.customertable FROM "rupesh2"@"127.0.0.1"
6
7
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: revoke insert on gpm.customertable FROm "rupesh2"@"127.0.0.1"

0 row(s) affected

Execution Time : 0.120 sec
Transfer Time  : 0 sec
Total Time     : 0.121 sec
```

All

Total: 0.121 sec | Ln 5, Col 62 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Create schema visually using Visual Schema Designer : Reason #5 to upgrade

Query 1 | History

```
1    USE gpm
2    SELECT * FROM customertable
3    INSERT INTO customertable VALUES (6, "Ram", 4)
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 0 success, 1 errors, 0 warnings

Query: insert into customertable values (6, "Ram", 4)

Error Code: 1142
INSERT command denied to user 'rupesh2'@'localhost' for table 'customertable'

Execution Time : 0 sec
Transfer Time  : 0 sec
Total Time     : 0 sec
```

All

Total: 0 sec | Ln 3, Col 47 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

2. TCL

1) COMMIT

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Schema Optimizer helps fit more data into memory thereby improving response times : Reason #66 to upgrade

Query 1 | History

```
1    USE gpm
2    SELECT * FROM customertable
3    INSERT INTO customertable VALUES (6, "Ram", 4)
4    COMMIT
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: commit

0 row(s) affected

Execution Time : 0 sec
Transfer Time  : 0 sec
Total Time     : 0.001 sec
```

All

Total: 0.001 sec | Ln 4, Col 7 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

2) SAVEPOINT

Schema Sync tool brings two or more schemas in complete sync : Reason #26 to upgrade

Query 1 | History

```
1    USE gpm
2    SELECT * FROM customertable
3    START TRANSACTION
4    SAVEPOINT A
5    INSERT INTO customertable VALUES (6, "Ram", 4)
6    SAVEPOINT B
7    INSERT INTO customertable VALUES (7, "Sham", 3)
8    SAVEPOINT C
9    ROLLBACK TO A
10   COMMIT
11
12
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: Start transaction

0 row(s) affected

Execution Time : 0.114 sec
Transfer Time  : 0 sec
Total Time     : 0.114 sec
```

All

:c Total: 0.114 sec | Ln 3, Col 18 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

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Data Sync can be scheduled : Reason #29 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: savepoint A

0 row(s) affected

Execution Time : 0 sec
Transfer Time  : 0 sec
Total Time     : 0 sec
```

All

Total: 0 sec | Ln 4, Col 12 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Data Sync can be scheduled : Reason #29 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Result | 2 Profiler | 3 Messages | 4 Table Data | 5 Info

(Read Only) | Limit rows | First row 0 | # of rows 1000

customerId	customerName	productId
1	Rupesh	2
2	Rohan	4
3	Omkar	3
4	Anniruddha	1
5	Rahul	*(NULL)*
6	Ram	4

SELECT * FROM customertable LIMIT 0, 1000

c Total: 0.070 sec | 6 row(s) | Ln 5, Col 47 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

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FS19CO042

3) ROLLBACK

Data Sync can be scheduled : Reason #29 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: savepoint B

0 row(s) affected

Execution Time : 0 sec
Transfer Time  : 0.004 sec
Total Time     : 0.004 sec
```

All

Total: 0.004 sec | Ln 6, Col 12 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Schema Sync tool brings two or more schemas in complete sync : Reason #26 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Result | 2 Profiler | 3 Messages | 4 Table Data | 5 Info

(Read Only) | Limit rows | First row 0 | # of rows 1000

customerId	customerName	productId
1	Rupesh	2
2	Rohan	4
3	Omkar	3
4	Anniruddha	1
5	Rahul	*(NULL)*

SELECT * FROM customertable LIMIT 0, 1000

Total: 0.002 sec | 5 row(s) | Ln 2, Col 28 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Omkar Phansopkar
FS19CO042

Schema Sync tool brings two or more schemas in complete sync : Reason #26 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: Start transaction

0 row(s) affected

Execution Time : 0.114 sec
Transfer Time  : 0 sec
Total Time     : 0.114 sec
```

All

Total: 0.114 sec | Ln 3, Col 18 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Data Sync can be scheduled : Reason #29 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: savepoint A

0 row(s) affected

Execution Time : 0 sec
Transfer Time  : 0 sec
Total Time     : 0 sec
```

All

Total: 0 sec | Ln 4, Col 12 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Omkar Phansopkar
FS19CO042

Data Sync can be scheduled : Reason #29 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Result | 2 Profiler | 3 Messages | 4 Table Data | 5 Info

(Read Only) | Limit rows | First row 0 | # of rows 1000

customerId	customerName	productId
1	Rupesh	2
2	Rohan	4
3	Omkar	3
4	Anniruddha	1
5	Rahul	*(NULL)*
6	Ram	4

SELECT * FROM customertable LIMIT 0, 1000

Total: 0.070 sec | 6 row(s) | Ln 5, Col 47 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Data Sync can be scheduled : Reason #29 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: savepoint B

0 row(s) affected

Execution Time : 0 sec
Transfer Time  : 0.004 sec
Total Time     : 0.004 sec
```

All

Total: 0.004 sec | Ln 6, Col 12 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Omkar Phansopkar
FS19CO042

Generate schema change histories, ideal for database versioning : Reason #24 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Result | 2 Profiler | 3 Messages | 4 Table Data | 5 Info

(Read Only) | Limit rows | First row 0 | # of rows 1000

customerId	customerName	productId
1	Rupesh	2
2	Rohan	4
3	Omkar	3
4	Anniruddha	1
5	Rahul	*(NULL)*
6	Ram	4
7	Sham	3

SELECT * FROM customertable LIMIT 0, 1000

Total: 0.002 sec | 7 row(s) | Ln 7, Col 48 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Generate schema change histories, ideal for database versioning : Reason #24 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: savepoint C

0 row(s) affected

Execution Time : 0 sec
Transfer Time  : 0 sec
Total Time     : 0.001 sec
```

All

Total: 0.001 sec | Ln 8, Col 12 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Omkar Phansopkar
FS19CO042

Generate schema change histories, ideal for database versioning : Reason #24 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO B
10  COMMIT
11
12
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: ROLLBACK to B

0 row(s) affected

Execution Time : 0.043 sec
Transfer Time  : 0 sec
Total Time     : 0.044 sec
```

All

Total: 0.044 sec | Ln 9, Col 14 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Generate schema change histories, ideal for database versioning : Reason #24 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO B
10  COMMIT
11
12
```

1 Result | 2 Profiler | 3 Messages | 4 Table Data | 5 Info

(Read Only) | Limit rows | First row 0 | # of rows 1000

customerId	customerName	productId
1	Rupesh	2
2	Rohan	4
3	Omkar	3
4	Anniruddha	1
5	Rahul	(NULL)
6	Ram	4

SELECT * FROM customertable LIMIT 0, 1000

Total: 0.003 sec | 6 row(s) | Ln 2, Col 28 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

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FS19CO042

Generate schema change histories, ideal for database versioning : Reason #24 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Messages | 2 Table Data | 3 Info

```
1 queries executed, 1 success, 0 errors, 0 warnings

Query: ROLLBACK to A

0 row(s) affected

Execution Time : 0 sec
Transfer Time  : 0 sec
Total Time     : 0 sec
```

All

Total: 0 sec | Ln 9, Col 14 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Generate schema change histories, ideal for database versioning : Reason #24 to upgrade

Query 1 | History

```
1   USE gpm
2   SELECT * FROM customertable
3   START TRANSACTION
4   SAVEPOINT A
5   INSERT INTO customertable VALUES (6, "Ram", 4)
6   SAVEPOINT B
7   INSERT INTO customertable VALUES (7, "Sham", 3)
8   SAVEPOINT C
9   ROLLBACK TO A
10  COMMIT
11
12
```

1 Result | 2 Profiler | 3 Messages | 4 Table Data | 5 Info

(Read Only) | Limit rows | First row 0 | # of rows 1000

customerId	customerName	productId
1	Rupesh	2
2	Rohan	4
3	Omkar	3
4	Anniruddha	1
5	Rahul	*(NULL)*

SELECT * FROM customertable LIMIT 0, 1000

Total: 0.038 sec | 5 row(s) | Ln 2, Col 28 | Connections: 2 | Upgrade to SQLyog Professional/Enterprise/Ultimate

Conclusion: Thus, we understood and implemented DCL AND TCL commands to manipulate users and permissions.

Omkar FS19CO042

Practical no. 9

Title: Write a PL/SQL programs using if then else, for, while, nested loop

Theory:

1. IF-THEN Statement

It is the simplest form of the IF control statement, frequently used in decision-making and changing the control flow of the program execution. The IF statement associates a condition with a sequence of statements enclosed by the keywords THEN and END IF. If the condition is TRUE, the statements get executed, and if the condition is FALSE or NULL, then the IF statement does nothing.

Syntax :

```
IF condition THEN
   S;
END IF;
```

2. IF-THEN-ELSE Statement

A sequence of IF-THEN statements can be followed by an optional sequence of ELSE statements, which execute when the condition is FALSE.

Syntax :

```
IF condition THEN
   S1;
ELSE
   S2;
END IF;
```

3. Basic Loop Statement

Basic loop structure encloses sequence of statements in between the LOOP and END LOOP statements. With each iteration, the sequence of statements is executed and then control resumes at the top of the loop.

Syntax :

```
LOOP
   Sequence of statements;
END LOOP;
```

4. FOR LOOP Statement

A FOR LOOP is a repetition control structure that allows you to efficiently write a loop that needs to execute a specific number of times.

Syntax :

```
FOR counter IN initial_value .. final_value LOOP
   sequence_of_statements;
END LOOP;
```

5. WHILE LOOP Statement

A WHILE LOOP statement in PL/SQL programming language repeatedly executes a target statement as long as a given condition is true.

Syntax:

```
WHILE condition LOOP
   sequence_of_statements
END LOOP;
```

6. Nested Loops

PL/SQL allows using one loop inside another loop. Following section shows a few examples to illustrate the concept.

Syntax :

```
LOOP
   Sequence of statements1
   LOOP
      Sequence of statements2
   END LOOP;
END LOOP;
```

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Query and output:

```
DECLARE
    a number(2) := 93;
    c number(2) := 4;
    i number(3) := 2;
    j number(3);
BEGIN
    -- If condition demo
    dbms_output.put_line('If condition demo:');
    IF(a >= 30) THEN
        dbms_output.put_line('A is greater than 30');
    ELSE
        dbms_output.put_line('A is smaller than 30');
    END IF;

    -- For loop demo
    dbms_output.put_line('');
    dbms_output.put_line('For loop demo: ');
    FOR i in 1..5 LOOP
        dbms_output.put_line('i: '||i);
    END LOOP;

    -- While loop demo
    dbms_output.put_line('');
    dbms_output.put_line('While loop demo: ');
    WHILE c>=0 LOOP
        dbms_output.put_line('c: '||c);
        c := c-1;
    END LOOP;

    -- Nested loop demo with example of prime nos
    dbms_output.put_line('');
    dbms_output.put_line('Nested loop demo, Prime nos from 2 to 20: ');
    LOOP
        j := 2;
        LOOP
            exit WHEN ((mod(i,j)=0) or (j=i));
            j := j+1;
        END LOOP;
    IF (j=i)   THEN
        dbms_output.put_line(i || ' is prime no.');
    ELSE
        dbms_output.put_line(i || ' is not prime');
    END IF;
    i := i+1;
    exit WHEN i=20;
    END LOOP;
END;
```

```
Results  Explain  Describe  Saved SQL  History

If condition demo:
A is greater than 30

For loop demo:
i: 1
i: 2
i: 3
i: 4
i: 5

While loop demo:
c: 4
c: 3
c: 2
c: 1
c: 0

Nested loop demo, Prime nos from 2 to 20:
2 is prime no.
3 is prime no.
4 is not prime
5 is prime no.
6 is not prime
7 is prime no.
8 is not prime
9 is not prime
10 is not prime
11 is prime no.
12 is not prime
13 is prime no.
14 is not prime
15 is not prime
16 is not prime
17 is prime no.
18 is not prime
19 is prime no.

Statement processed.

0.01 seconds
```

Conclusion: Thus, we implemented PL/SQL programs using if then else, for, while, nested loop

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Practical no. 10

FS19CO042

Title: Write a PL/SQL code to implement implicit and explicit cursors.

Theory:

1. **Cursor :**

A cursor is a pointer to this context area. PL/SQL controls the context area through a cursor. A cursor holds the rows (one or more) returned by a SQL statement. The set of rows the cursor holds is referred to as the active set.

2. **Implicit Cursor :**

Implicit cursors are automatically created by Oracle whenever an SQL statement is executed, when there is no explicit cursor for the statement. Programmers cannot control the implicit cursors and the information in it.
Whenever a DML statement (INSERT, UPDATE and DELETE) is issued, an implicit cursor is associated with this statement. For INSERT operations, the cursor holds the data that needs to be inserted. For UPDATE and DELETE operations, the cursor identifies the rows that would be affected.
In PL/SQL, you can refer to the most recent implicit cursor as the SQL cursor, which always has attributes such as %FOUND, %ISOPEN, %NOTFOUND, and %ROWCOUNT. The SQL cursor has additional attributes, %BULK_ROWCOUNT and %BULK_EXCEPTIONS, designed for use with the FORALL statement.

3. **Explicit Cursor**

Explicit cursors are programmer-defined cursors for gaining more control over the context area. An explicit cursor should be defined in the declaration section of the PL/SQL Block. It is created on a SELECT Statement which returns more than one row.
Syntax :

CURSOR cursor_name IS select_statement;

Output :

1. **Implicit Cursor :**

CUSTOMERS table :

Results Explain Describe Saved SQL History

ID	NAME	AGE	ADDRESS	SALARY
1	Aniruddha	32	Ahmedabad	2000
2	Rupesh	25	Delhi	1500
3	Omkar	23	Kota	2000
4	Devang	25	Mumbai	6500
5	Arpan	27	Bhopal	8500
6	Rishabh	22	MP	4500

6 rows returned in 0.01 seconds Download

The following program will update the table and increase the salary of each customer by 500 and use the SQL%ROWCOUNT attribute to determine the number of rows affected

```
DECLARE
   total_rows number(2);
BEGIN
   UPDATE customers
   SET salary = salary + 500;
   IF sql%notfound THEN
      dbms_output.put_line('no customers selected');
   ELSIF sql%found THEN
      total_rows := sql%rowcount;
      dbms_output.put_line( total_rows || ' customers selected ');
   END IF;
END;
```

When the above code is executed at the SQL prompt, it produces the following result:

Results Explain Describe Saved SQL History

```
6 customers selected
```

If you check the records in customers table, you will find that the rows have been updated

Customers Table :

Results | Explain | Describe | Saved SQL | History

ID	NAME	AGE	ADDRESS	SALARY
1	Aniruddha	32	Ahmedabad	2500
2	Rupesh	25	Delhi	2000
3	Omkar	23	Kota	2500
4	Devang	25	Mumbai	7000
5	Arpan	27	Bhopal	9000
6	Rishabh	22	MP	5000

6 rows returned in 0.00 seconds Download

2. Explicit Cursor

Following is a complete example to illustrate the concepts of explicit cursors

```
DECLARE
   c_id customers.id%type;
   c_name customers.name%type;
   c_addr customers.address%type;
   CURSOR c_customers is
      SELECT id, name, address FROM customers;
BEGIN
   OPEN c_customers;
   LOOP
   FETCH c_customers into c_id, c_name, c_addr;
      EXIT WHEN c_customers%notfound;
      dbms_output.put_line(c_id || ' ' || c_name || ' ' || c_addr);
   END LOOP;
   CLOSE c_customers;
END;
```

When the above code is executed at the SQL prompt, it produces the following result

Results | Explain | Describe | Saved SQL | History

```
4 Devang Mumbai
1 Aniruddha Ahmedabad
2 Rupesh Delhi
5 Arpan Bhopal
6 Rishabh MP
3 Omkar Kota

Statement processed.
```

Conclusion: Thus we understood and implemented implicit and explicit cursors.

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FS19CO042

Practical no. 11

Title: Write a PL/SQL code to create procedure and function.

Theory:

A subprogram created inside a package is a packaged subprogram. It is stored in the database and can be deleted only when the package is deleted with the DROP PACKAGE statement. We will discuss packages in the chapter 'PL/SQL - Packages'.

PL/SQL subprograms are named PL/SQL blocks that can be invoked with a set of parameters. PL/SQL provides two kinds of subprograms –

1. **Functions :**
   These subprograms return a single value; mainly used to compute and return a value.
2. **Procedures :**
   These subprograms do not return a value directly; mainly used to perform an action.

1. Procedure

A procedure is created with the CREATE OR REPLACE PROCEDURE statement. The procedure contains a header and a body.

Header :

The header contains the name of the procedure and the parameters or variables passed to the procedure.

Body :

The body contains a declaration section, execution section and exception section similar to a general PL/SQL block.

Three ways to pass parameters in procedure:

1. **IN parameters: The IN parameter can be referenced by the procedure or function. The value of the parameter cannot be overwritten by the procedure or the function.**
2. **OUT parameters: The OUT parameter cannot be referenced by the procedure or function, but the value of the parameter can be overwritten by the procedure or function.**
3. **INOUT parameters: The INOUT parameter can be referenced by the procedure or function and the value of the parameter can be overwritten by the procedure or function.**

The simplified syntax for the CREATE OR REPLACE PROCEDURE statement is as follows :

```
CREATE [OR REPLACE] PROCEDURE procedure_name

[(parameter_name [IN | OUT | IN OUT] type [, ...])]

{IS | AS}

BEGIN

  < procedure_body >

END procedure_name;
```

2. Function

The PL/SQL Function is very similar to PL/SQL Procedure. The main difference between procedure and a function is, a function must always return a value, and on the other hand a procedure may or may not return a value. Except this, all the other things of PL/SQL procedure are true for PL/SQL function too. A standalone function is created using the CREATE FUNCTION statement.

The function must contain a return statement.

RETURN clause specifies that data type you are going to return from the function.

Function_body contains the executable part.

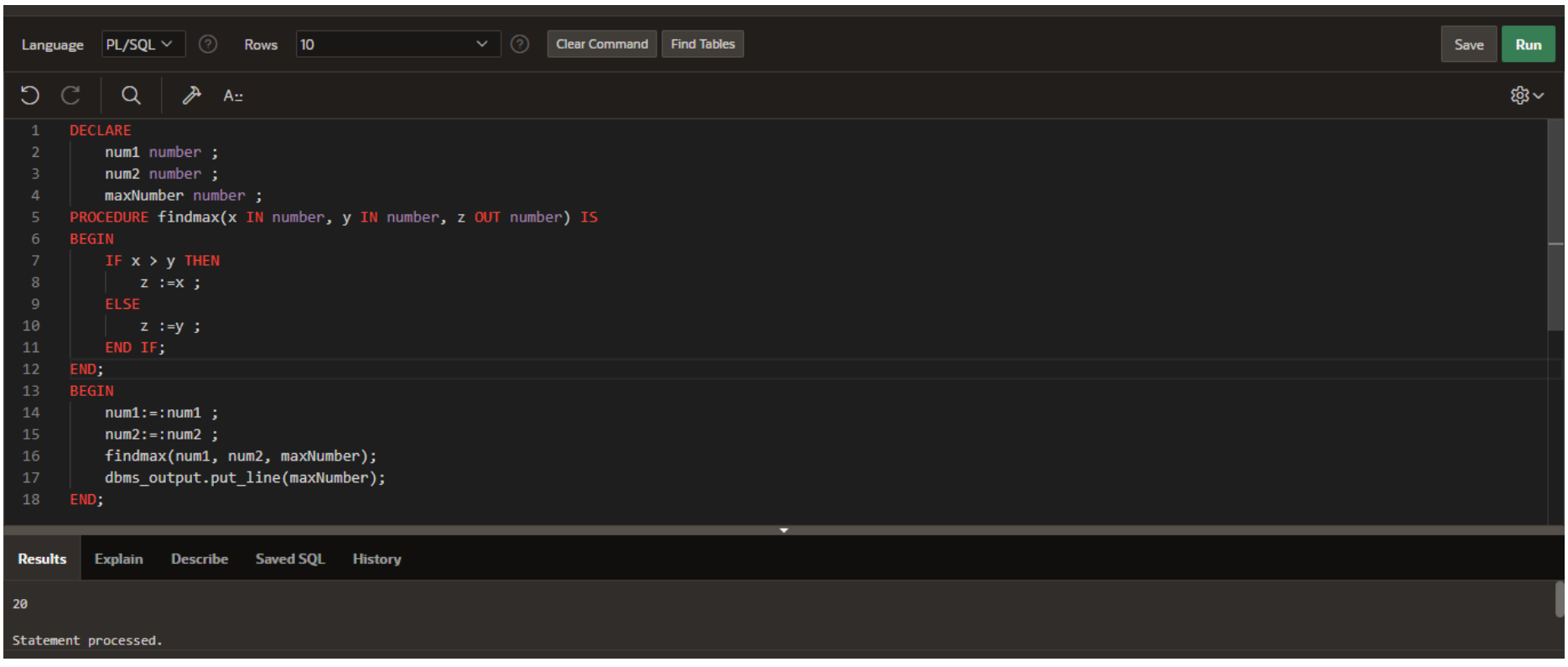
The AS keyword is used instead of the IS keyword for creating a standalone function

The simplified syntax for the CREATE OR REPLACE PROCEDURE statement is as follows –

```
CREATE [OR REPLACE] FUNCTION function_name
[(parameter_name [IN | OUT | IN OUT] type [, ...])]
RETURN return_datatype
{IS | AS}
BEGIN
  < function_body >
END [function_name];
```

Output:

1. **Procedure :**



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Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
1  DECLARE
2      num1 number ;
3      num2 number ;
4      maxNumber number ;
5  PROCEDURE findmax(x IN number, y IN number, z OUT number) IS
6  BEGIN
7      IF x > y THEN
8          z :=x ;
9      ELSE
10         z :=y ;
11     END IF;
12 END;
13 BEGIN
14     num1:=:num1 ;
15     num2:=:num2 ;
16     findmax(num1, num2, maxNumber);
17     dbms_output.put_line(maxNumber);
18 END;
```

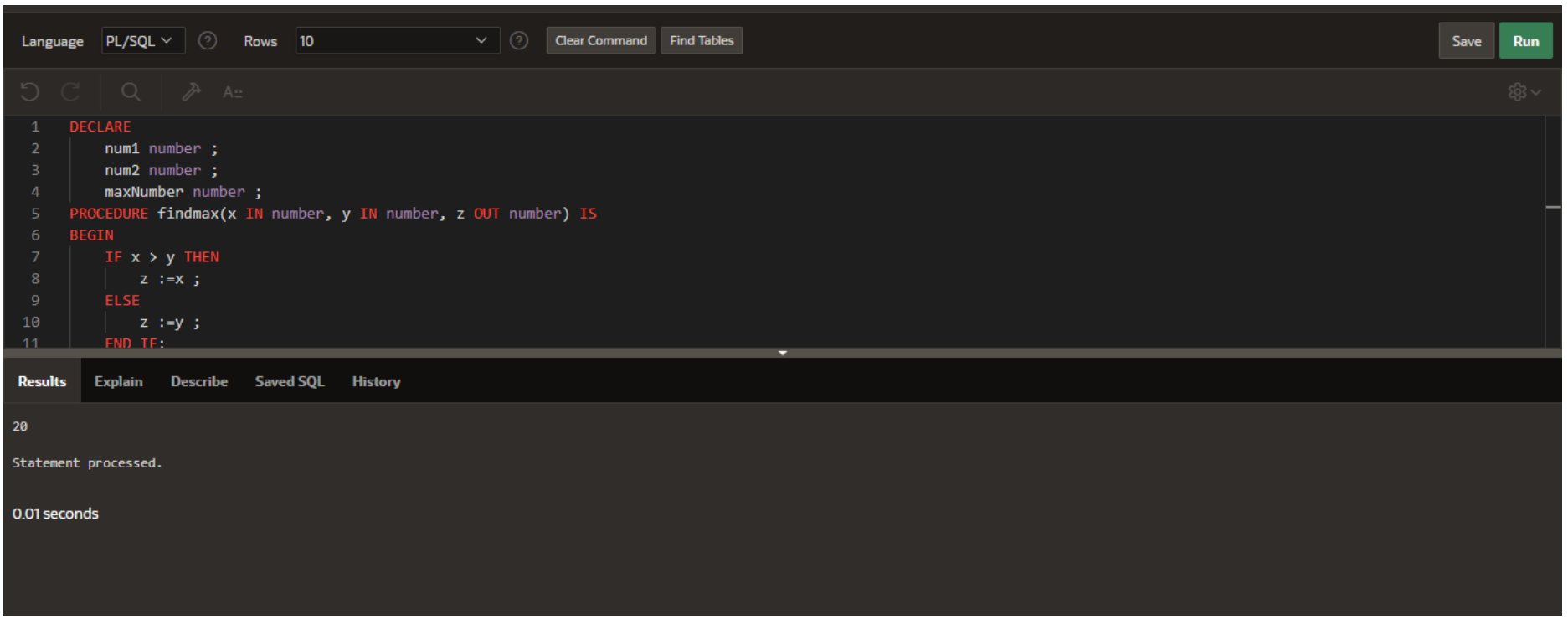
Enter Bind Variables - Google Chrome

apex.oracle.com/pls/apex/f?p=4500:138:16374790941979:::

Submit

Bind Variable	Value
:NUM1	10
:NUM2	20

Results Explain Describe Saved SQL History



2. Function :

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Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
1  DECLARE
2      num1 number ;
3      num2 number ;
4      maxNumber number ;
5  FUNCTION findmax(x IN number, y IN number)RETURN number IS z number ;
6  BEGIN
7      IF x > y THEN
8          z :=x ;
9      ELSE
10         z :=y ;
11     END IF;
12     RETURN z;
13 END;
14 BEGIN
15     num1:=:num1 ;
16     num2:=:num2 ;
17     maxNumber:= findmax(num1, num2);
18     dbms_output.put_line(maxNumber);
19 END;
```

Results Explain Describe Saved SQL History

```
20

Statement processed.
```

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
1  DECLARE
2      num1 number ;
3      num2 number ;
4      maxNumber number ;
5  FUNCTION findmax(x IN number, y IN number)RETURN number IS z number ;
6  BEGIN
7      IF x > y THEN
8          z :=x ;
9      ELSE
10         z :=y ;
11     END IF;
12     RETURN z;
13 END;
14 BEGIN
15     num1:=:num1 ;
16     num2:=:num2 ;
17     maxNumber:= findmax(num1, num2);
18     dbms_output.put_line(maxNumber);
19 END;
```

Enter Bind Variables - Google Chrome

apex.oracle.com/pls/apex/f?p=4500:138:16374790941979:::

Submit

Bind Variable	Value
:NUM1	10
:NUM2	20

Results Explain Describe Saved SQL History

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Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
1  DECLARE
2      num1 number ;
3      num2 number ;
4      maxNumber number ;
5  FUNCTION findmax(x IN number, y IN number)RETURN number IS z number ;
6  BEGIN
7      IF x > y THEN
8          z :=x ;
9      ELSE
10         z :=y ;
11     END IF;
12     RETURN z;
13 END;
14 BEGIN
15     num1:=:num1 ;
```

Results Explain Describe Saved SQL History

```
20

Statement processed.

0.00 seconds
```

Conclusion: Thus, we defined and used procedures and functions in PL/SQL.

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Practical no. 12

FS19CO042

Title: Write a PL/SQL code to create triggers on given database

Theory:

Triggers :

Trigger is invoked by Oracle engine automatically whenever a specified event occurs.Trigger is stored into database and invoked repeatedly, when specific condition matches. Triggers are stored programs, which are automatically executed or fired when some event occurs.

Triggers can be defined on the table, view, schema, or database with which the event is associated.

Benefits of Triggers

Triggers can be written for the following purposes –

1. **Generating some derived column values automatically**
2. **Enforcing referential integrity**
3. **Event logging and storing information on table access**
4. **Auditing**
5. **Synchronous replication of tables**
6. **Imposing security authorizations**
7. **Preventing invalid transactions**

Syntax :

```
CREATE [OR REPLACE ] TRIGGER trigger_name
{BEFORE | AFTER | INSTEAD OF }
{INSERT [OR] | UPDATE [OR] | DELETE}
[OF col_name]
ON table_name
[REFERENCING OLD AS o NEW AS n]
[FOR EACH ROW]
WHEN (condition)
DECLARE
   Declaration-statements
BEGIN
   Executable-statements
EXCEPTION
   Exception-handling-statements
END;
```

Output :

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
1  create table account(
2      accNumber number,
3      name varchar(20),
4      balance number
5  );
6
7  create table transactions(
8      accNumber number,
9      name varchar(20),
10     amount number,
11     balance number,
12     transactionDate date
13 );
14
15 create sequence acc_seq;
16
17 create trigger triggerTransaction after update on account for each row
18 begin
19     insert into transactions values(:new.accNumber, :old.name, abs(:new.balance - :old.balance), :new.balance, sysdate);
```

Results Explain Describe Saved SQL History

Find Go

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
14
15 create sequence acc_seq;
16
17 create trigger triggerTransaction after update on account for each row
18 begin
19     insert into transactions values(:new.accNumber, :old.name, abs(:new.balance - :old.balance), :new.balance, sysdate);
20 end;
21
22 insert into account values(1, 'Rupesh Raut', 0);
23 insert into account values(2, 'Aniruddha Shriwant', 0);
24 insert into account values(3, 'Omkar Phansopkar', 0);
25
26 update table set balance = balance + 4000 where accNumber = 1;
27 update table set balance = balance + 9000 where accNumber = 2;
28 update table set balance = balance + 10000 where accNumber = 3;
29
30 select * from account order by accNumber asc;
31 select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

Find Go

Omkar Phansopkar
FS19CO042

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
1  create table account(
2      accNumber number,
3      name varchar(20),
4      balance number
5  );
6
7  create table transactions(
8      accNumber number,
9      name varchar(20),
10     amount number,
11     balance number,
12     transactionDate date
13 );
14
15 create sequence acc_seq;
```

Results Explain Describe Saved SQL History

```
Table created.
```

0.04 seconds

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
1  create table account(
2      accNumber number,
3      name varchar(20),
4      balance number
5  );
6
7  create table transactions(
8      accNumber number,
9      name varchar(20),
10     amount number,
11     balance number,
12     transactionDate date
13 );
14
15 create sequence acc_seq;
```

Results Explain Describe Saved SQL History

```
Table created.
```

0.03 seconds

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Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
    name varchar(20),
    amount number,
    balance number,
    transactionDate date
);

create sequence acc_seq;

create trigger triggerTransaction after update on account for each row
begin
    insert into transactions values(:new.accNumber, :old.name, abs(:new.balance - :old.balance), :new.balance, sysdate);
end;

insert into account values(1, 'Rupesh Raut', 0);
insert into account values(2, 'Aniruddha Shriwant', 0);
insert into account values(3, 'Omkar Phansopkar', 0);
```

Results Explain Describe Saved SQL History

```
Sequence created.
```

0.04 seconds

```
create trigger triggerTransaction after update on account for each row
begin
    insert into transactions values(:new.accNumber, :old.name, abs(:new.balance - :old.balance), :new.balance, sysdate);
end;

insert into account values(1, 'Rupesh Raut', 0);
insert into account values(2, 'Aniruddha Shriwant', 0);
insert into account values(3, 'Omkar Phansopkar', 0);
```

Results Explain Describe Saved SQL History

```
Trigger created.
```

0.10 seconds

```
create trigger triggerTransaction after update on account for each row
begin
    insert into transactions values(:new.accNumber, :old.name, abs(:new.balance - :old.balance), :new.balance, sysdate);
end;

insert into account values(1, 'Rupesh Raut', 0);
insert into account values(2, 'Aniruddha Shriwant', 0);
insert into account values(3, 'Omkar Phansopkar', 0);

update table set balance = balance + 4000 where accNumber = 1;
update table set balance = balance + 9000 where accNumber = 2;
update table set balance = balance + 10000 where accNumber = 3;

select * from account order by accNumber asc;
select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

```
1 row(s) inserted.
```

0.03 seconds

Omkar Phansopkar
FS19CO042

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
21
22  insert into account values(1, 'Rupesh Raut', 0);
23  insert into account values(2, 'Aniruddha Shriwant', 0);
24  insert into account values(3, 'Omkar Phansopkar', 0);
25
26  update table set balance = balance + 4000 where accNumber = 1;
27  update table set balance = balance + 9000 where accNumber = 2;
28  update table set balance = balance + 10000 where accNumber = 3;
29
30  select * from account order by accNumber asc;
31  select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

ACCNUMBER	NAME	BALANCE
1	Rupesh Raut	0
2	Aniruddha Shriwant	0
3	Omkar Phansopkar	0

3 rows returned in 0.02 seconds Download

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
21
22  insert into account values(1, 'Rupesh Raut', 0);
23  insert into account values(2, 'Aniruddha Shriwant', 0);
24  insert into account values(3, 'Omkar Phansopkar', 0);
25
26  update table set balance = balance + 4000 where accNumber = 1;
27  update table set balance = balance + 9000 where accNumber = 2;
28  update table set balance = balance + 10000 where accNumber = 3;
29
30  select * from account order by accNumber asc;
31  select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

no data found

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
18  begin
19      insert into transactions values(:new.accNumber, :old.name, abs(:new.balance - :old.balance), :new.balance, sysdate);
20  end;
21
22  insert into account values(1, 'Rupesh Raut', 0);
23  insert into account values(2, 'Aniruddha Shriwant', 0);
24  insert into account values(3, 'Omkar Phansopkar', 0);
25
26  update account set balance = balance + 4000 where accNumber = 1;
27  update account set balance = balance + 9000 where accNumber = 2;
28  update account set balance = balance + 10000 where accNumber = 3;
29
30  select * from account order by accNumber asc;
31  select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

```
1 row(s) updated.
```

0.04 seconds

Omkar Phansopkar
FS19CO042

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
20  end;
21
22  insert into account values(1, 'Rupesh Raut', 0);
23  insert into account values(2, 'Aniruddha Shriwant', 0);
24  insert into account values(3, 'Omkar Phansopkar', 0);
25
26  update account set balance = balance + 4000 where accNumber = 1;
27  update account set balance = balance + 9000 where accNumber = 2;
28  update account set balance = balance + 10000 where accNumber = 3;
29
30  select * from account order by accNumber asc;
31  select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

ACCNUMBER	NAME	AMOUNT	BALANCE	TRANSACTIONDATE
1	Rupesh Raut	4000	4000	01/30/2021

1 rows returned in 0.01 seconds Download

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
20  end;
21
22  insert into account values(1, 'Rupesh Raut', 0);
23  insert into account values(2, 'Aniruddha Shriwant', 0);
24  insert into account values(3, 'Omkar Phansopkar', 0);
25
26  update account set balance = balance + 4000 where accNumber = 1;
27  update account set balance = balance + 9000 where accNumber = 2;
28  update account set balance = balance + 10000 where accNumber = 3;
29
30  select * from account order by accNumber asc;
31  select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

```
1 row(s) updated.
```

0.01 seconds

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
20  end;
21
22  insert into account values(1, 'Rupesh Raut', 0);
23  insert into account values(2, 'Aniruddha Shriwant', 0);
24  insert into account values(3, 'Omkar Phansopkar', 0);
25
26  update account set balance = balance + 4000 where accNumber = 1;
27  update account set balance = balance + 9000 where accNumber = 2;
28  update account set balance = balance + 10000 where accNumber = 3;
29
30  select * from account order by accNumber asc;
31  select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

```
1 row(s) updated.
```

0.02 seconds

Omkar Phansopkar
FS19CO042

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
21
22  insert into account values(1, 'Rupesh Raut', 0);
23  insert into account values(2, 'Aniruddha Shriwant', 0);
24  insert into account values(3, 'Omkar Phansopkar', 0);
25
26  update account set balance = balance + 4000 where accNumber = 1;
27  update account set balance = balance + 9000 where accNumber = 2;
28  update account set balance = balance + 10000 where accNumber = 3;
29
30  select * from account order by accNumber asc;
31  select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

ACCNUMBER	NAME	BALANCE
1	Rupesh Raut	4000
2	Aniruddha Shriwant	9000
3	Omkar Phansopkar	10000

3 rows returned in 0.01 seconds Download

Language PL/SQL Rows 10 Clear Command Find Tables Save Run

```
21
22  insert into account values(1, 'Rupesh Raut', 0);
23  insert into account values(2, 'Aniruddha Shriwant', 0);
24  insert into account values(3, 'Omkar Phansopkar', 0);
25
26  update account set balance = balance + 4000 where accNumber = 1;
27  update account set balance = balance + 9000 where accNumber = 2;
28  update account set balance = balance + 10000 where accNumber = 3;
29
30  select * from account order by accNumber asc;
31  select * from transactions order by transactionDate asc;
```

Results Explain Describe Saved SQL History

ACCNUMBER	NAME	AMOUNT	BALANCE	TRANSACTIONDATE
1	Rupesh Raut	4000	4000	01/30/2021
2	Aniruddha Shriwant	9000	9000	01/30/2021
3	Omkar Phansopkar	10000	10000	01/30/2021

3 rows returned in 0.00 seconds Download

Conclusion: Thus, we created triggers on database.

Omkar Phansopkar
FS19CO042

Experiment 13

Title: Case Study on ER Model and EER Model.

Theory:

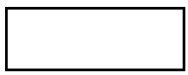
- Purpose of ER diagram

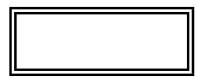
ENTITY RELATIONAL (ER) MODEL is a high-level conceptual data model diagram for database. ER modeling helps to analyze data requirements systematically to produce a well-designed database.

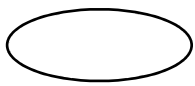
The Entity-Relation model represents real-world entities and the relationship between them. It is considered best practice to complete ER modeling before implementing your database.

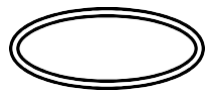
ER model can be converted to any other data model like relational or network model for actual database implementation.

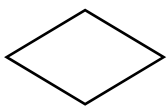
- Symbols used to represent components of ER diagram.

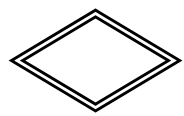
Entity 

Weak Entity 

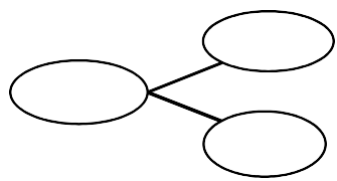
Simple Attribute 

Multivalued Attribute 

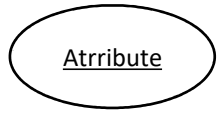
Relationship 

Weak Relationship 

Connecting line

Composite attribute 

Derived Attribute 

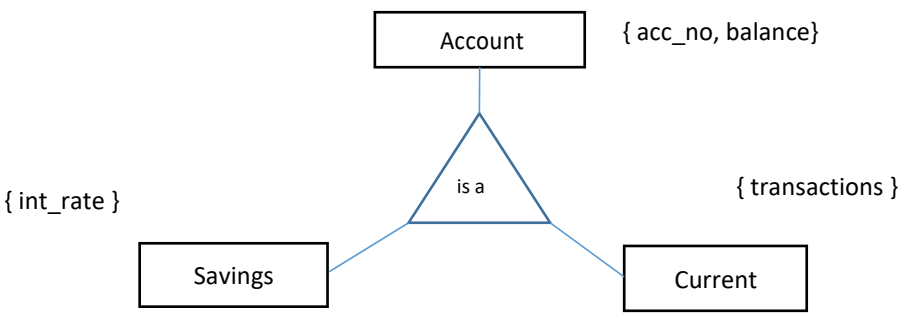
Key/single valued attribute 

- Purpose of EER diagram.

  Enhanced entity-relationship (EER) diagrams are basically an expanded upon version of ER diagrams. EER models are helpful tools for designing databases with high-level models.
  With their enhanced features, you can plan databases more thoroughly by delving into the properties and constraints with more precision.
  EER mainly used to display following relationship concepts:
  1. Super and sub class
  2. Specialization and Generalization
  3. Aggregation

- Generalization and Specialization concepts with example

  Generalization: In generalization, two or more lower level entities are combined together to form one higher level entity. I.e. Subclasses are combine together to form a super class
  It is a bottom to up approach.
  One higher level entity can also be combined with other lower level entities to form another higher level entity.
  Common properties among lower level entities to form higher level entity.
  For example,
  Savings and current accounts are both accounts with added special properties.

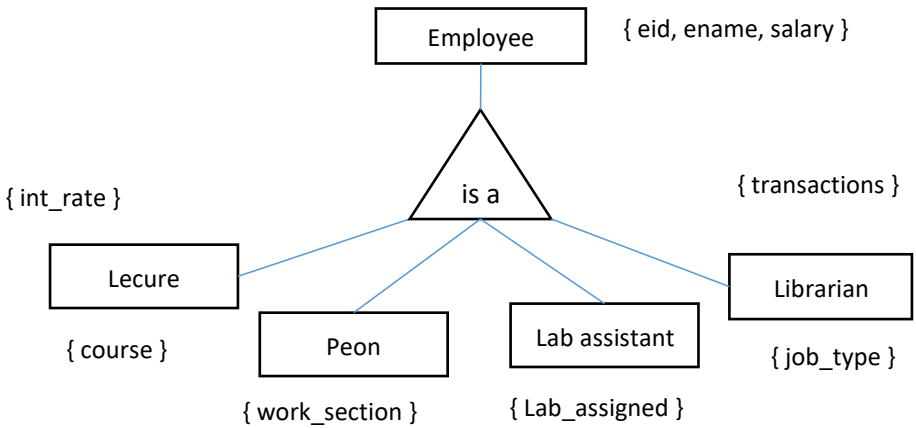


Specialization: In specialization, higher level entity is divided into two or more lower level entities. I.e. Super class is divided to form two or more subclasses.

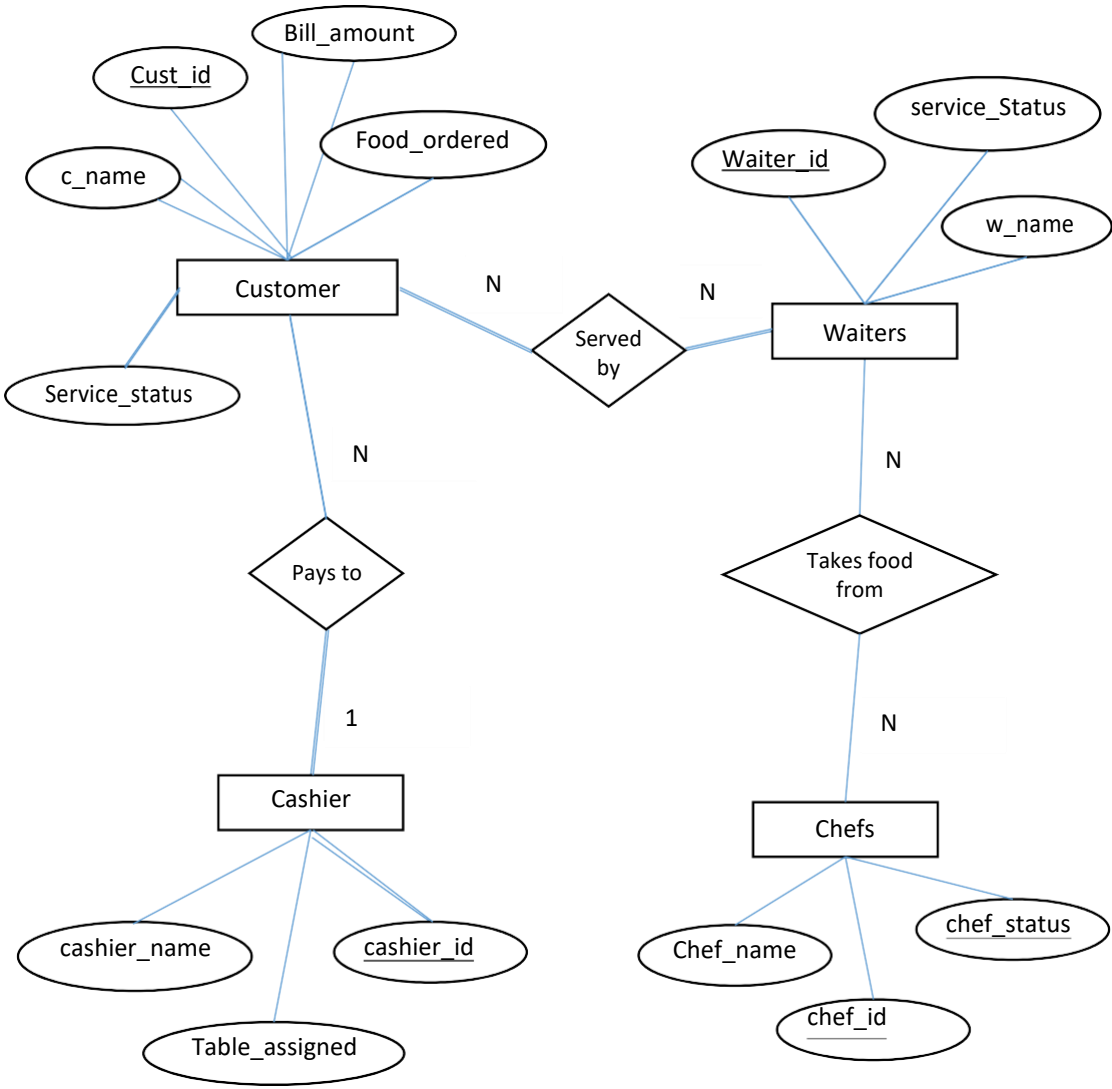
It is a top-down approach.

This division is done on the basis of specialized properties in entity.

For example,



ER diagram of restaurant management system:



Conclusion: In this exp, we studied ER and EER models and made few exemplary diagrams.