



REVA
UNIVERSITY
Bengaluru, India

**SCHOOL OF COMPUTING AND INFORMATION
TECHNOLOGY**

Database Applications Laboratory (DBMS LAB)

B18CS4060

for

FOURTH Semester

B. Tech in Computer Science and Engineering

NAME	
SRN	
SEM	
SECTION	
BRANCH	
ACADEMIC YEAR	

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Evaluation Sheet

Name of the I/C Faculty:

Name of the Lab with Code

Program/Expt. No	Title of the Program/Expt.	Date of Execution	Max. Marks	Marks Obtained	Signature of the Faculty I/C
1			2		
2			2		
3			2		
4			2		
5			2		
Internal Assessment-1 (IA-1) Consolidated Marks			10		

Program/Expt. No	Name of the Program/Expt.	Date of Execution	Max. Marks	Marks Obtained	Signature of the Faculty I/C
6			2		
7			2		
8			2		
9			2		
10			2		
Internal Assessment-2 (IA-2) Consolidated Marks			10		
Remarks:		IA	Max Marks	Marks Obtained	Signature of the Faculty
		IA-1	10		
		IA-2	10		
		IA-1 + IA-2	20		

Signature of the Faculty-In charge with Date

Semester End Lab Examination Evaluation Procedure 2017-18

Name of the Lab (only Part A) : Database Applications Lab			
Question	Parameters to be Considered		Marks Distribution
A	Write Up	Database design	05
		Solution for all the Queries of Database	05
	Conduction & Results	Part A and Results	10 + 05
	Viva		05
	Total		30

Note:

(a) Lab Course is Conducted for a total of 50 Marks :

- a. 20 Marks Continuous Evaluation
- b. 30 Marks Semester End Examination

(b) Passing Criterion :

- a. 08 / 30 in Semester End Examination
- b. 20 / 50 overall

1. Lab Objectives:

The objectives of this course are to:

1. Provide hands on skills on creating a database.
2. Demonstrate different operations on database using SQL DML/DDL commands.
3. Identify and illustrate various clauses for different queries.
4. Generate reports as per user requirements.
5. Develop industry standard database applications for various domains.

2. Lab Outcomes:

On successful completion of this course; student shall be able to:

1. Design and implement a database schema.
2. Use appropriate SQL commands for designing queries.
3. Design and build a GUI application using a front end tool.
4. Design and develop applications like banking, reservation system, etc

3. Lab Requirements:

Following are the required hardware and software for this lab, which is available in the laboratory.

- ❑ **Hardware:** Desktop system or Virtual machine in a cloud with OS installed. Presently in the Lab, Pentium IV Processor having 1 GB RAM and 250 GB Hard Disk is available. Desktop systems are dual boot having Windows as well as Linux OS installed on them.
- ❑ **Software:** The DBMS packages that fall in this category are as follows:
 - Oracle (follows 7 rules)
 - DB2 (follows 9 rules)
 - Ingress (follows 10 rules)
 - Sybase (follows 9 rules)

Log Into Oracle

Microsoft Windows

Under Windows environment, the Oracle client is called SQL*Plus. The following are Steps for logging into the SQL.

- Steps:
1. Click **Start**, and then click **Run**.
 2. Type **sqlplus**, and fill in the username, password, and database name
 3. After you log in to SQL*Plus, you see the following message:

Connected to: Oracle10g Enterprise Edition Release 9.1.7.0.0 - Production

JServer Release 9.1.7.0.0 – Production and you should receive the prompt:

Creating user: Create user <yourName> identified by <Password>;

Where <yourName> is again your login name, and <Password> is the password you would like to use in the future. This command, like all other SQL commands, should be terminated with a semicolon.

Changing Your Password : In response to the SQL> prompt, type

Alter user <username> identified by <Password>;

where <username> is again your login name, and <Password> is the password you would like to use in the future. This command, like all other SQL commands, should be terminated with a semicolon.

4. Guidelines to Students

- Equipment in the lab for the use of student community. Students need to maintain a proper decorum in the computer lab. Students must use the equipment with care. Any damage is caused is punishable.
- Students are required to carry their observation / programs book with completed exercises while entering the lab.
- Students are supposed to occupy the machines allotted to them and are not supposed to talk or make noise in the lab. The allocation is put up on the lab notice board.
- Lab can be used in free time / lunch hours by the students who need to use the systems should take prior permission from the lab in-charge.
- Lab records need to be submitted on or before date of submission.
- Students are not supposed to use flash drives.
- In C3 exam one Data base application will be asked and the set of some queries will be given in the final exam and evaluated for 50 marks and scale down to 25 marks.

5. Introduction to Database, Oracle and SQL

Database

A group of tables with related data in them are called database.

Database Management System

DBMS consists of a collection of interrelated data and a set of programs to manage these data.

Data Model

Structure of database is defined by data model.

Different data models are as follows:

- Object Oriented model
- Relational model
- Network model
- Hierarchical model

Relational model

- Relational model uses a collection of tables to represent both data and relationship among those tables.
- Most database management systems are based on the relational model. ○ RDBMS follows codd's rules.
- There are 12 rules specified by E.F. Codd that must be satisfied by a database package for being an RDBMS.

SQL * Plus

SQL *Plus enables you to manipulate SQL commands and PL/SQL blocks, and to perform many additional tasks as well. Through SQL *Plus, you can

- Enter, edit, store, retrieve, and SQL commands and PL/SQL blocks.
- Format, perform calculations on, store, and print query results in the form of reports. ○ List column definitions for any table.
- Access and copy data between SQL databases.
- Send messages to and accept responses from an end user.

Oracle Overview

Oracle is one the most popular *Relational Database Management System* (RDBMS). Some other famous RDBMS includes Microsoft SQL Server, Sybase, MySQL, PostgreSQL, etc. Essentially, all the aforementioned RDBMS employs *Structural Query Language* (SQL) as their query interface. Users usually issue their queries by SQL through a "client". Different RDBMS offer different forms of clients. For example, MS SQL Server offers a GUI interface for user to type in their SQL language, and their queries would be executed after pressing the "Execute" button on the client. Oracle provides both GUI client and command-line client. In this lesson, we will study the command-line client, *SQL*Plus*. In addition, Oracle extends the standard SQL (e.g. select * from table) with its application-specific commands (e.g. checking how many table you have been created in your Oracle account) into a Oracle specific language called *PL/SQL*. In this tutorial, you will interact with Oracle database, thru SQL*Plus, by issuing a number of PL/SQL queries.

SQL Basics

Structured Query Language (SQL), which is an ANSI standard language for interacting with relational databases, is the main tool for extracting the information.

A **database** is a representation of a real-world thing called an **Entity**. Examples of entities are vehicles, Employees, customers, fish, buildings, and even things such as baseball teams. The database stores facts about the entity in an organized framework, model, or schema. These facts are called **attributes**.

An **Instance** is one occurrence of an entity.

Each entity must have an identifier, which is one or more attributes that make each entity instance unique from any other instance. The identifier should contain a value that does not change.

Examples of identifiers are student IDs, payroll numbers, or social security numbers.

Primary key - If the entity does not have an attribute that can be used as an identifier, an artificial identifier can be created. The identifier on an entity is often called a **primary key**.

Foreign key - A foreign key is a set of attributes of the considered table that exists as a primary key attributes in another table. Database records are matched (joined) through the use of primary and foreign keys.

Normalization - Normalization is a process consisting of series of steps, which is used to group the database attributes. The purpose of this design is to ensure that the tables within the database are space efficient and performance efficient.

- ☐ **Zero Normal Form** - Each of the relations (tables) has a unique identifier (primary key).
- ☐ **First Normal Form** - Separate the repeating groups of attributes or multi valued attributes into a relation of their own. Be sure to form composite keys.
- ☐ **Second Normal Form** - Establish full functional dependency by separating out attributes that are not fully dependent on the full primary keys.
- ☐ **Third Normal Form** - Remove transitive dependencies by separating attributes that are dependent on a non key attribute.

How SQL works

The purpose of SQL is to interface to a relational database such as Oracle, and all SQL statements are **instructions to the databases**.

SQL provides commands for a variety of tasks including:

- ☐ Querying data
- ☐ Inserting, updating, and deleting rows in a table
- ☐ Creating, replacing, altering, and dropping objects
- ☐ Controlling access to the database and its objects
- ☐ Guaranteeing database consistency and integrity

Data Types

Each literal or column value manipulated by Oracle has a data type. A value's data type associates a fixed set of properties with the value. These properties cause Oracle to treat values of one data types differently values of another.

Character Data types - Character data types are used to manipulate words and freeform text. These data types are used to store character. These data types are used for character data:

- ☐ **CHAR** - The **CHAR** data type specifies a fixed length character is 1 character and maximum allowed is 2000 character.
- ☐ **NCHAR** - The **NCHAR** data types specifies a fixed-length national character set character string. The maximum column size allowed is 2000 bytes.
- ☐ **NVARCHAR2** - The **NVARCHAR2** data type specifies variable-length national character string. The maximum column size allowed is 4000 bytes.
- ☐ **VARCHAR2** - The **VARCHAR2** data type specifies a variable length character string. The maximum length of VARCHAR2 data is 4000 bytes.

Number Data type - The **NUMBER** data type is used to store zero, positive and negative fixed and floating point numbers with magnitudes

Floating Point Numbers - A floating point value either can have a decimal point anywhere from the first to the last digit or can omit the decimal point altogether.

Long Data type - LONG columns store variable length variable length character strings containing up to 2 gigabytes, or $2^{31} - 1$ bytes. LONG data type is subject to some restrictions which are:

- A table cannot contain more than one LONG column.
- LONG columns cannot appear in integrity constraints.
- LONG columns cannot be indexed.

Also, LONG columns cannot appear in certain parts of SQL statements:

- ☐ WHERE, GROUP BY, or CONNECT BY clause or with the DISTINCT operator in SELECT statements.
- ☐ UNIQUE clause of a SELECT statement.
- ☐ Select list of queries containing GROUP BY clauses.
- ☐ Select list of sub queries or queries combined by set operators.

DATE Data type - The DATE data types is used to store date and time information.

Operators - All the normal Arithmetic, Relational, Logical operators are used in SQL.

SQL Commands - In order to define schemas, store data, retrieve data and to make amendments in schema and data stored in the database different types of commands are used which are:

- ☐ Data Definition Language Commands (DDL)
- ☐ Data Manipulation Language Commands (DML)
- ☐ Transaction Control Commands (TCL)
- ☐ Session Control Commands (SCL)
- ☐ System Control Commands (SCC)

Data Definition Language (DDL) commands allow you to perform these tasks:

- ☐ Create, Alter, and Drop schema objects(CAD)
- ☐ Grant and Revoke privileges and roles
- ☐ Analyses information on a table, index, or cluster
- ☐ Establish auditing options
- ☐ Add comments to the data dictionary

Create Table Command

It defines each column of the table uniquely.

Each column has minimum of three attributes, a name , data type and size.

Syntax: Create table <table name> (<col1> <datatype>(<size>),<col2> <datatype>(<size>)) ;

Ex: Create table emp(empno number(4) primary key, ename char(10)) ;

Modifying the structure of tables

a) Add new columns

Syntax : Alter table <tablename> **add**(<new col><datatype>(size),<new col>datatype(size));

Ex: Alter table emp **add**(sal number(7,2)) ;

b) Dropping a column from a table

Syntax: Alter table <tablename> **drop** column <col> ;

Ex: Alter table emp **drop** column sal ;

c) Modifying existing columns

Syntax: Alter table <tablename> **modify** (<col><newdatatype>(<newsize>))

; **Ex:** Alter table emp modify(ename varchar2(15)) ;

d) Renaming the tables

Syntax: Rename <oldtable> to <new table> ;

Ex: rename emp to emp1 ;

Truncating the tables

Syntax: Trunc table <tablename> ;

Ex: trunc table emp1 ;

Destroying tables

Syntax: Drop table <tablename> ;

Ex: drop table emp ;

Data Manipulation Language (DML) commands query and manipulate data in existing schema objects. These commands do not implicitly commit the current transaction.

Following are the commands:

1. Select
2. Insert
3. Delete
4. Update
5. Lock table
6. Explain Plan

Inserting Data into Tables - once a table is created the most natural thing to do is load this table with data to be manipulated later.

Syntax: insert into <tablename> (<col1>,<col2>) **values** (<exp>,<exp>) ;

Delete operations

- a) remove all rows

Syntax: delete from <tablename> ;

- b) removal of a specified row/s

Syntax: delete from <tablename> **where** <condition> ;

Updating the contents of a table

- a) updating all rows

Syntax: Update <tablename> **set** <col> = <exp> , <col> = <exp> ;

- b) updating selected records.

Syntax:

Update<tablename>**set** <col> = <exp> , <col> = <exp> where <condition>;

Types of data constraints	Syntax
not null constraint at column level	<col> <datatype> (size) not null ;
unique constraint at column level	<col> <datatype> (size) unique ;
unique constraint at table level	Create table tablename (col = format, col = format, unique (<col1>, <col2>);
primary key constraint at column level	<col> <datatype> (size) primary key ;
primary key constraint at table level	Create table tablename (col = format, col = format primary key (col1>, <col2>) ;
foreign key constraint at column level	<col> <datatype>(size)>references<tablename> [<col>];
foreign key constraint at table level	foreign key (<col>[,<col>]) references <tablename> [(<col>,<col>) ;
Check constraint constraint at column level	<col> <datatype> (size) check (<logical expression>) ;
Check constraint constraint at table level	check (<logical expression>) ;

Transaction Control Commands manages change made by Data Manipulation Language commands. Following are the commands:

1. **Commit**
2. **Rollback**
3. **Save point**
4. **Set Transaction**

Oracle provides extensive feature in order to safeguard information stored in its tables from unauthorized viewing and damage. The rights that allow the user of some or all oracle resources on the server are called privileges.

Grant privileges using the GRANT statement

The grant statement provides various types of access to database objects such as tables, views and sequences and so on.

Syntax: GRANT <object privileges> ON <objectname> TO <username>[WITH GRANT OPTION];

REVOKE statement:

The REVOKE statement is used to deny the Grant given on an object.

Syntax: REVOKE <object privilege> ON FROM <user name> ;

Aggregate Functions

Aggregate functions return a single value based upon a set of other values. If used among many other expressions in the item list of a *SELECT* statement, the *SELECT* must have a *GROUP BY* clause. No *GROUP BY* clause is required if the aggregate function is the only value retrieved by the *SELECT* statement. The supported aggregate functions and their syntax are shown in following table.

Usage of Aggregate Functions	Function Name
Computes the average value of a column by the expression	Avg()
Counts the rows defined by the expression	Count()
Counts all rows in the specified table or view	Count all()
Finds the minimum value in a column by the expression	Min()
Finds the maximum value in a column by the expression	Max()
Computes the sum of column values by the expression	Sum()

Syntax: Aggregate function name ([ALL | DISTINCT] expression)

The aggregate function name may be AVG, COUNT, MAX, MIN, or SUM. The ALL clause, which is the default behavior and does not actually need to be specified, evaluates all rows when aggregating the value of the function. The DISTINCT clause uses only distinct values when evaluating the function.

AVG and SUM

The AVG function computes the average of values in a column or an expression. SUM computes the sum. Both functions work with numeric values and ignore NULL values. They also can be used to compute the average or sum of all distinct values of a column or expression.

AVG and SUM are supported by Microsoft SQL Server, MySQL, Oracle, and PostgreSQL.

Explanation:- The following query computes average year-to-date sales for each type of book:

```
SQL> SELECT type, AVG( ytd_sales ) AS "average_ytd_sales"
      FROM titles GROUP BY type;
```

This query returns the sum of year-to-date sales for each type of book:

```
SQL> SELECT type, SUM ( ytd_sales )
      FROM titles GROUP BY type;
```

COUNT

The COUNT function has three variations. COUNT (*) counts all the rows in the target table whether they include nulls or not. COUNT (expression) computes the number of rows with non-NULL values in a specific column or expression. COUNT (DISTINCT expression) computes the number of distinct non-NULL values in a column or expression.

Explanation :- This query counts all rows in a table:

```
SQL>SELECT COUNT (*) FROM publishers;
```

The following query finds the number of different countries where publishers are located:

```
SQL>SELECT COUNT (DISTINCT country) "Count of Countries" FROM publishers
```

MIN and MAX

MIN (expression) and MAX (expression) find the minimum and maximum value (string, date time, or numeric) in a set of rows. DISTINCT or ALL may be used with these functions, but they do not affect the result.

Explanation : The following query finds the best and worst sales for any title on record:

```
SELECT 'MIN' = MIN (ytd_sales), 'MAX' = MAX(ytd_sales) FROM titles;
```

Aggregate functions are used often in **the having clause** of queries with *GROUP BY*. The following query selects all categories (types) of books that have an average price for all books in the category higher than \$15.00:


```
SQL> SELECT type 'Category', AVG( price ) 'Average Price'
      FROM titles
      GROUP BY type
      HAVING AVG(price) > 15
```

CONCATENATE

SQL99 defines a concatenation operator (||), which joins two distinct strings into one string value. The CONCATENATE function appends two or more strings together, producing a single output string. Oracle support the double-pipe concatenation operator. Microsoft SQL Server uses the plus sign (+) concatenation operator.

```
SQL> CONCATENATE ('string1' || 'string2')
```

Practicing SQL Commands with examples

Creating Tables

In SQL*Plus we can execute any SQL command. One simple type of command creates a table (relation). The form is

```
CREATE TABLE <table Name> ( <list of attributes and their types> );
```

You may enter text on one line or on several lines. If your command runs over several lines, you will be prompted with line numbers until you type the semicolon that ends any command. (**Warning:** An empty line terminates the command but does not execute it; see [editing commands in the buffer](#).) An example table-creation command is:

```
CREATE TABLE test ( i int, s char(10) );
```

Note that SQL is *case insensitive*, so CREATE TABLE TEST and create table test are the same. This command creates a table named test with two attributes. The first attribute, named i, is an integer, and the second, named s, is a character string of length (up to) 10.

Exercise 1 : Create a relation Student that suitable for the following instance:

SID	NAME	JOB	SALARY	STREAM	START_AT
1	Ben Kao	Associate Professor	7000	E	01-Sep-1995
2	Eric Lo	Teaching Assistant	1000	E	01-Oct-2003
3	Hammer	Lecturer	7000	E	11-Feb-2000
4	Angela Castro	Program Manager	6000	I	12-Dec-1999
5	Steven Chu	Project Assistant	7000	I	13-Dec-2002

Note: No need to insert the data yet!

Inserting Tuples

Having created a table, we can insert tuples into it. The simplest way to insert is with the INSERT command:

INSERT INTO <tableName> **VALUES** (<list of values for attributes, in order>) ;

For instance, we can insert the tuple (10, 'hi world') into relation test by

Ex: INSERT INTO test **VALUES** (10, 'hi world');

Exercise 2: Insert the records as stated into Exercise 1 into the student table.

Trick: Try to insert a record into test with the following SQL:

INSERT INTO test **VALUES** (11, 'ha 'world');

Updating Tuples

Tuples can be updated by the UPDATE command:

UPDATE <table Name> **SET** <Attribute> = <Expression / Value> **WHERE** <Predicate>;

For example, we can update the tuple (10, 'hi world') in relation test by

Ex: UPDATE test **SET** s='bye world' **WHERE** i=10;

Exercise 3: Update the record of 'Eric Lo' in relation Student such that his salary change to 1234

UPDATE student **set** salary = 1234 where sname = 'Eric Lo' ;

Deleting Tuples

Having insert / update a tuple, we can delete it as well. The simplest way to delete is with the DELETE command:

DELETE FROM <table Name> [**WHERE** <condition>];

<condition> is an optional statement and is used to identify a single record when necessary.

For example, you can delete the record with i=10 in table test with the the following SQL:

Ex: DELETE FROM test WHERE i=10;

Exercise 4: Delete the record of 'Eric Lo' in relation Student.

Trick: Does that record really deleted successfully? Let's check it out by using SELECT command (we will cover it in next section).

Retrieving Tuples

We can see the tuples in a relation with the command:

SELECT <attributes-separated-by-comma> **FROM** <tableName>;

For instance, after the above CREATE, INSERT DELETE and UPDATE statements, the command

SELECT * FROM test;

produces the result

I S
11 ha 'world

Exercise 5: Select ALL records from relation Student.

Question: Do data values also case insensitive? i.e., can a student with name "Hammer" be retrieved by the following SQL or not?

Select name from Student where name ='hammer';

Commit and Rollback

An automatic commit occurs under the following circumstance:

- ☐ DDL statement is issued
- ☐ Normal exit from SQL*Plus, without explicitly issuing COMMIT or ROLLBACK

An automatic rollback occurs under an abnormal termination of SQL*Plus or a system failure.

It provides a good back-door for you to revert the changes you have done on the data. Therefore, unless you have issued COMMIT, the changed data would not be visible to any other session except your own. Conversely, you can rollback all the changes by issuing the ROLLBACK command.

Exercise 6: Issue the COMMIT command in the SQL*Plus that you have done insert/delete/update before, and see if the effect is now visible by the new SQL*Plus?

Dropping Tables

To remove a table from your database, execute

DROP TABLE <table Name>;

We suggest you execute

DROP TABLE test;

Caution: Table dropping is a DML statement, which is an action that you cannot rollback. Since dropping a table will also delete all data in that table, issue the DROP TABLE command with cares.

Getting Information about Your Database

The system keeps information about your own database in certain system tables. The most important for now is USER_TABLES. You can recall the names of your tables by issuing the query:

SELECT TABLE_NAME **FROM** USER_TABLES;

More information about your tables is available from USER_TABLES. To see all the attributes of USER_TABLES, try:

SELECT * **FROM** USER_TABLES;

It is also possible to recall the attributes of a table once you know its name. Issue the command:

DESC <tableName>; to view the schema of <tableName>;

Data Types

Here is part of the data types that are supported by Oracle.

Data Type	Description
VARCHAR2 (<i>size</i>)	Variable-length character data (a maximum <i>size</i> must be specified: Minimum <i>size</i> is 1; maximum <i>size</i> is 4000)
CHAR [(<i>size</i>)]	Fixed-length character data of length <i>size</i> bytes (default and minimum <i>size</i> is 1; maximum <i>size</i> is 2000)
NUMBER [(<i>p</i> , <i>s</i>)]	Number having precision <i>p</i> and scale <i>s</i> (The precision is the total number of decimal digits, and the scale is the number of digits to the right of the decimal point; the precision can range from 1 to 38 and the scale can range from -84 to 127)
DATE	Date and time values to the nearest second between January 1, 4712 B.C., and December 31, 9999 A.D.

Creating Tables with Keys

To create a table that declares attribute *a* to be a primary key:

```
CREATE TABLE <tableName> (... , a <type> PRIMARY KEY, b, ...);
```

To create a table that declares the set of attributes (a,b,c) to be a primary key:

```
CREATE TABLE <tableName> (<attrs and their types>, PRIMARY KEY (a,b,c));
```

6. List of Lab Exercises

SL. NO	Name of the Program	PAGE NO.
I	<p>Product - Order System</p> <p>In recent years, most of the grocery items are available online; hence people are doing online transactions for purchase. There are lot of discounts and benefits through the online orders. Since everyone in the life is busy with one or other works, such applications will save their time.</p> <p>These online transaction based applications require many databases to be built for storage and transaction management. Design a product-order database which can store the details of customers, agents and the products. All the details of sold products along with commission from different agents across different cities will get stored in this database and utilized for transactions.</p> <p>Customer (<u>cid</u>, cname, city, discount) Agent (<u>aid</u>, aname, city, commission) Product (<u>pid</u>, pname, city, quantity, price) Orders (<u>ordno</u>, month, cid, aid, pid, qty, amount)</p> <p>Queries</p> <ol style="list-style-type: none"> Retrieve the customer ids of any product which has been ordered by agent "a06". Retrieve cities in which customers or agents located. List product ids which have been ordered by agents from the cities "Dargeling" or "Srinagar". Retrieve customer ids whose discounts are less than the maximum discount. Retrieve product ids ordered by at least two customers. For each (aid, pid) pair get the sum of the orders aid has placed for pid. Retrieve product ids and total quantity ordered for each product when the total exceeds 1000. List the names of the customers and agent who placed an order through that agent. Retrieve order numbers placed by customers in "Dargeling" through agents in "New Delhi". Retrieve names of the customers who have the same discount as that of any (one) of the customers in "Dargeling" or "Bangalore". Retrieve customer ids with smaller discounts than every customer from "Srinagar" Retrieve names of the customers who have placed an order through agent "a05". (using exists) Retrieve names of the customers who do not place orders through agent "a05". (using not exists) Retrieve customer ids whose orders placed through all the agents in "New Delhi". Retrieve agent ids either from "New Delhi" or "Srinagar" who place orders for ALL products priced over one dollar. 	24

	<p>p. Retrieve names and ids of the customers and agents along with total dollar sales for that pair. Order the result from largest to smallest total sales. Also retain only those pairs for which total dollar sales is at least 9000.00.</p> <p>q. Increase the percent commission by 50% for all agents in "New York".</p> <p>r. Retrieve the total quantity that has been placed for each product.</p>	
II	<p style="text-align: center;">Employee Database System</p> <p>The storage of digital data is increasing day by day. Every big / small organization started storing their Employee details like name, salary, address, Department under which they are working in their own database. Design a company database which can store the details of Departments, projects, their Employee and his / her dependent details of a particular organization</p> <p style="padding-left: 40px;">Employee (<u>ssn</u>, name, salary, sex, super_ssn, address, dno) Department (<u>dname</u>, <u>dnumber</u>, mgr_ssn) Dept_Loc (dnumber, dloc) Project (<u>pname</u>, <u>pnumber</u>, plocation, dnum) Works_On (essn, pno, hours) Dependent (<u>essn</u>, <u>depen_name</u>, address, relationship, sex)</p> <p>Queries</p> <ol style="list-style-type: none"> Retrieve the names of the Employees who works on all the projects controlled by dept no 3. Retrieve the names of the Employees who gets second highest salary. Retrieve the names of the Employees who have no dependents in alphabetical order. List the names of all Employees with at least two dependents. Retrieve the number of Employees and their average salary working in each Department. Retrieve the highest salary paid in each Department in descending order. Retrieve the SSN of all Employees who work on atleast one of the project numbers 1, 2, 3. Retrieve the number of dependents for an Employee named RAM. Retrieve the names of the managers working in location named xyz who has no female dependents. Retrieve the names of the Employees who works in the same Department as that of RAM. Retrieve the names of the Employees whose salary is greater than the salary of all the Employees working in Department no 3. Retrieve the names of the Employees who work for dept no 3 and have a daughter as dependent. Retrieve the names of the Employees who paid highest salary from each Department. Retrieve the names of the Employees who are paid the same salary as that of Anil. Retrieve the total the number of Employees in the 'Research' Department. For each project, retrieve the project number, the project name, and the number of Employees who work on that project. 	37

III Car rental agency database systems**52**

The application that can be used for booking a vehicle online from his / her place is very much needed in mobile devices. The main aim of this system is to illustrate a database application for booking vehicles online. Design a car rental agency database which can store customer details, vehicle details like vehicle id, size, transmission and reservation details like who had booked from one date to other.

Customers(cid, firstname, lastname, address)
Vehicle(vid, mileage, location, vsize, transmission)
Reservations(cid,vid, start_date, end_date)

Note :

->Vehicle.transmission can have two values 'manual' and 'automatic'. -

>Vehicle.vsize can have following values. 'compact', 'mid-size', 'full-size', 'premium' and 'luxury'. The default size is compact.

Queries

- Display both the first name and last name in uppercase as "Name of the customer " as column name.
- Display vehicles size which is having maximum mileage.
- Find location and total mileage of all vehicles specific to each respective location.
- Find average mileage of vehicles for each location, which has at least five vehicles.
- Display the customer names whose reservation start date is before Feb 18th 2016.
- Display the vehicles which has been reserved between the dates Nov 5th 2015 and Jan 16th 2016.
- Display the names of the customers whose lastname starts with 'D' and who has reserved more vehicles than the customer with cid as '101'.
- Retrieve the customers who have reserved vehicles from all the locations.
- Retrieve the locations that have at least one vehicle with manual transmission that has lower mileage than any luxury vehicle at that location.
- Delete all the reservations for customer whose last name starts with 'S'.

Lab Exercise 1: Product - Order database

1.1	Problem Statement																				
Design a product-order database which can store the details of customers, agents and the products. All the details of sold products along with commission from different agents across different cities will get stored in this database and utilized for transactions.																					
1.2	Student Learning Outcomes																				
<p>After successful execution of this exercise, the student shall able to</p> <ul style="list-style-type: none"><input type="checkbox"/> Design the database for all the real world applications.<input type="checkbox"/> Implement aggregate functions.<input type="checkbox"/> Apply set operations in database querying.																					
1.3	Queries with Solutions																				
<p>Customer (<u>cid</u>, cname, city, discount) Agent (<u>aid</u>, aname, city, commission) Product (<u>pid</u>, pname, city, quantity, price) Orders (<u>ordno</u>, month, cid, aid, pid, qty, amount)</p> <p>Aim: Create the tables with the appropriate integrity constraints and Insert around 10 records in each of the tables</p> <p>SQL> Create table Customer (cid char(4) ,cname varchar(13) not null,city varchar(20), discount real check(discount >= 0.0 and discount <= 15.0), primary key (cid));</p> <p>Table created.</p> <p>Explanation: The above command will create a new table Customer in database system with 4 columns, namely cid, cname, city and discount using not null constraint for cname and primary key constraint for cid, discount checking with constraint as discount range+ greater than zero and less than 15 percent.</p> <p>SQL> desc customer;</p> <table><tr><td>OUTPUT:</td><td><u>Name</u></td><td><u>Null?</u></td><td><u>Type</u></td></tr><tr><td></td><td>CID</td><td>NOT NULL</td><td>CHAR(4)</td></tr><tr><td></td><td>CNAME</td><td>NOT NULL</td><td>VARCHAR2(13)</td></tr><tr><td></td><td>CITY</td><td></td><td>VARCHAR2(20)</td></tr><tr><td></td><td>DISCOUNT</td><td></td><td>FLOAT(63)</td></tr></table>		OUTPUT:	<u>Name</u>	<u>Null?</u>	<u>Type</u>		CID	NOT NULL	CHAR(4)		CNAME	NOT NULL	VARCHAR2(13)		CITY		VARCHAR2(20)		DISCOUNT		FLOAT(63)
OUTPUT:	<u>Name</u>	<u>Null?</u>	<u>Type</u>																		
	CID	NOT NULL	CHAR(4)																		
	CNAME	NOT NULL	VARCHAR2(13)																		
	CITY		VARCHAR2(20)																		
	DISCOUNT		FLOAT(63)																		

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```
SQL> Create table agent (aid char(3) ,
                        aname varchar(13) not null,
                        city varchar(20),
                        percent number(6) check (percent >= 0 and percent <=
                        100), primary key (aid));
```

Table created.

Explanation: The above command will create a new table **agent** in database system with 4 columns, namely aid, aname, city and percent using not null constraint for aname and primary key constraint for aid, percent checking with constraint as percent range greater than or equal to zero and less than equal to 100 percent.

```
SQL> desc agent;
```

OUTPUT:	<u>Name</u>	<u>Null?</u>	<u>Type</u>
	AID	NOT NULL	CHAR(3)
	ANAME	NOT NULL	VARCHAR2(13)
	CITY		VARCHAR2(20)
	PERCENT		NUMBER(6)

```
SQL>Create table product ( pid char(3),pname varchar(13) unique not null,city varchar(20),
> quantity number(10) check(quantity > 0),price real check(price
>
> 0.0),primary key (pid));
```

Table created.

Explanation: The above command will create a new table **Product** in database system with 5 columns, namely pid, pname, city , Quantity and price using not null constraint for pname and primary key constraint for pid , price checking with constraint as range greater than zero.

```
SQL> desc product;
```

OUTPUT:	<u>Name</u>	<u>Null?</u>	<u>Type</u>
	PID	NOT NULL	CHAR(3)
	PNAME	NOT NULL	VARCHAR2(13)
	CITY		VARCHAR2(20)
	QUANTITY		NUMBER(10)
	PRICE		FLOAT(63)

```
create table order (
    *
```

ERROR at line 1:

ORA-00903: invalid table name

As order is a reserved word in oracle we cant create a table with name “order” so used orders

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```
SQL> Create table orders ( ordno number(6),
                           month char(3),
                           cid char(4) not null,
                           aid char(3) not null,
                           pid char(3) not null,
                           qty number(6) not null check(qty > 0),
                           ordamount float default 0.0 check(ordamount >= 0.0),
                           primary key (ordno),
                           foreign key (cid) references customer,
                           foreign key (aid) references agent,
                           foreign key (pid) references product);
```

Table created.

Explanation: The above command will create a new table **orders** in database system with 7 columns, namely ordno, month, cid ,aid, pid, Qty and ordamount and with foreign key constraint of cid referring to customer and aid referring agent, pid referring product, ordno as primary key and quantity with check constraint with range greater than zero .

```
SQL> desc order;
```

OUTPUT:	<u>Name</u>	<u>Null?</u>	<u>Type</u>
	ORDNO	NOT NULL	NUMBER(6)
	MONTH		CHAR(3)
	CID	NOT NULL	CHAR(4)
	AID	NOT NULL	CHAR(3)
	PID	NOT NULL	CHAR(3)
	QTY	NOT NULL	NUMBER(6)
	DOLLARS		FLOAT(126)

Insert the data into the table customer, agent , product, orders

```
SQL> insert into customer values
      ('c001','Sobhit','Darjeling',10.00); 1 row created.
SQL>insert into customer values
      ('c002','Bhanu','Srinagar',12.00); 1 row created.
SQL>insert into customer values ('c003','Amar','
      Srinagar',8.00); 1 row created.
SQL>insert into customer values ('c004','Anand','Darjeling',8.00);
      1 row created.
SQL>insert into customer values
      ('c005','Anand','Mumbai',0.00); 1 row created.
```

NOTE: If an attempt is made to insert the same cid , as it is having primary constraint it shows an error.

```
SQL> insert into customer values ('c001','Sachin','Darjeling',10.00);

      1 row created.
SQL>insert into customer values ('c001','Sachin','Darjeling',10.00)*
```

ERROR at line 1:

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ORA-00001: unique constraint (DBMS.SYS_C005054) violated

SQL> select * from customer;

OUTPUT:

CID	CNAME	CITY	DISCOUNT
c001	Sobhit	Darjeling	10
c002	Bhanu	Srinagar	12
c003	Amar	Srinagar	8
c004	Anand	Darjeling	8
c005	Anand	Mumbai	0

SQL>insert into agent
values('a01','Sonu','NewDelhi',6.00); 1 row created.

SQL>insert into agent
values('a02','John','Agra',6.00); 1 row created.

SQL>insert into agent
values('a03','Bhargav','Jaipur',7.00); 1 row created.

SQL>insert into agent
values('a04','Gaurav','NewDelhi',6.00); 1 row created.

SQL>insert into agent
values('a05','Omkar','Srinagar',5.00); 1 row created.

SQL>insert into agent
values('a06','Sonu','Darjeling',5.00); 1 row created.

SQL> select * from agent;

OUTPUT:

AID	ANAME	CITY	PERCENT
a01	Sonu	NewDelhi	6
a02	John	Agra	6
a03	Bhargav	Jaipur	7
a04	Gaurav	NewDelhi	6
a05	Omkar	Srinagar	5
a06	Sonu	Darjeling	5

6 rows selected.

SQL>insert into product values('&PID','&PNAME','&CITY','&QUANTITY','&PRICE');

OUTPUT:

PID	PNAME	CITY	QUANTITY	PRICE
p01	comb	Darjeling	100000	10
p02	brush	Agra	200000	20
p03	eraser	Srinagar	150000	2
p04	pen	Srinagar	100000	15
p05	pencil	Darjeling	170000	3
p06	folder	Darjeling	180000	15
p07	Highlighter	Agra	180000	20

SQL> insert into orders values ('&ordno','&month','&cid','&aid','&pid','&qty','&ordamount');

Enter value for ordno: 1011

Enter value for month: jan

Enter value for cid: c001

Enter value for aid: a01

Enter value for pid: p01

Enter value for qty: 1000

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Enter value for ordamount: 9400

old 1: insert into orders values ('&ordno','&month','&cid','&aid','&pid','&qty','&ordamount')

new 1: insert into orders values ('1011','jan','c001','a01','p01',1000,9400)

1 row created.

SQL> /

Enter value for ordno: 1012

Enter value for month: jan

Enter value for cid: c001

Enter value for aid: a01

Enter value for pid: p01

Enter value for qty: 1000

Enter value for ordamount: 9400

SQL> select * from orders;

OUTPUT:	<u>ORDNO</u>	<u>MON</u>	<u>CID</u>	<u>AID</u>	<u>PID</u>	<u>QTY</u>	<u>ORDAMOUNT</u>
	1011	jan	c001	a01	p01	1000	9400
	1012	jan	c001	a01	p01	1000	9400
	1013	jan	c002	a03	p03	1000	1860
	1014	jan	c003	a03	p05	1200	3348
	1015	jan	c003	a03	p05	1200	3348
	1016	jan	c005	a01	p01	1000	9400
	1017	feb	c001	a02	p02	400	7520
	1018	feb	c001	a03	p04	600	2232
	1019	feb	c001	a02	p02	400	7520
	1020	feb	c005	a03	p07	600	11160
	1021	feb	c004	a06	p01	1000	9500
	1022	mar	c001	a05	p06	400	5700
	1023	mar	c001	a04	p05	500	1410
	1024	mar	c005	a06	p01	800	7600
	1025	Apr	c001	a05	p07	800	15200

15 rows selected.

a. Retrieve the customer ids of any product which has been ordered by agent "a06".

SQL> select distinct p.cid from orders o, orders p where p.pid=o.pid and o.aid='a06'

Explanation: Distinct keyword gives the different values of attribute cid from table Orders and product with the join ,pid attribute from product table and pid attribute from order table, whose agent id is a06.

OUTPUT: CID
 c001
 c004

c005

b. Retrieve cities in which customers or agents located.

SQL> select city from customer
 union
 select city from agent;

Explanation: This query retrieves the city names as the union operator helps to combine both the tables customer and agent containing column name city and it won't allow duplicate values.

OUTPUT: CITY
 Agra
 Darjeling
 Jaipur
 Mumbai
 NewDelhi
 Srinagar

6 rows selected

c. List product ids which have been ordered by agents from the cities "Darjeling" or "Srinagar".

SQL> select distinct(o.pid) from orders o ,agent a where o.aid=a.aid and
 a.city in('Darjeling','Srinagar');

Explanation: Distinct helps to select the distinct values of pid attribute from order table and agent table, and the columns aid from tables order and agents with city 'Darjeeling' and Srinagar using in operator.

Or

SQL> select distinct(pid) from orders where aid in (select aid from agent where
 city in('Darjeling','Srinagar'));

Explanation: Distinct selects the distinct values of pid from orders table and using in operator to select the aid attribute from agent table with city names darjeling and Srinagar.

OUTPUT: PID
 p01
 p06
 p07

d. Retrieve customer ids whose discounts are less than the maximum discount.

SQL> select cid from customer
 where discount < (select max(discount) from customer);

Explanation: This query gives the customer ids from customer table with condition whose discount is less than max discount as max(discount) gives the maximum discount from

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customer table.

OUTPUT: CID
 c001
 c003
 c004
 c005

e. Retrieve product ids ordered by at least two customers.

SQL> select p.pid from product p
 where 2 <= (select count(distinct cid) from orders
 where pid = p.pid);

Explanation: This Query gives the pids from product table, with condition $2 \leq \text{count}(\text{distinct cid})$ as count gives the no. of distinct cids from orders table and pid column from product table.

OUTPUT: PID
 p01
 p05
 p07

f. For each (aid,pid) pair get the sum of the orders aid has placed for pid.

SQL> select pid, aid, sum(qty) TOTAL
 from orders
 group by pid, aid;

Explanation: To retrieve pid and aid attribute and the sum operator is used to return the total sum of the qty column from orders table using group by function is used to get the result in a set of pid and aid attributes.

OUTPUT:

PID	AID	TOTAL
p01	a01	3000
p01	a06	1800
p02	a02	800
p03	a03	1000
p04	a03	600
p05	a03	2400
p05	a04	500
p06	a05	400
p07	a03	600
p07	a05	800

10 rows selected.

g. Retrieve product ids and total quantity ordered for each product when the total exceeds 1000.

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```
SQL> select pid, aid, sum(qty) TOTAL
      from orders
      group by pid, aid
      having sum(qty) > 1000;
```

Explanation: To retrieve pid and aid attributes and the sum operator is used to return the total sum of the qty from orders table using group by function is used to get the result in a set of pid and aid attributes and having clause is used instead of where as condition whose sum(qty) is greater than 1000.

OUTPUT:

<u>PID</u>	<u>AID</u>	<u>TOTAL</u>
p01	a01	3000
p01	a06	1800
p05	a03	2400

h. List the names of the customers and agent who placed an order through that agent.

```
SQL> select distinct cname, aname
      from customer, orders, agent
      where customer.cid = orders.cid and
            orders.aid = agent.aid;
```

Explanation: This query gives distinct values from attributes v=cname,aname from customer, orders and agent tables with condition cid from customer table and orders and also from aid attribute from orders and agent table.

OUTPUT:

<u>CNAME</u>	<u>ANAME</u>
Amar	Bhargav
Anand	Bhargav
Anand	Sonu
Bhanu	Bhargav
Sobhit	Bhargav
Sobhit	Gaurav
Sobhit	John
Sobhit	Omkar
Sobhit	Sonu

6 rows selected.

i. Retrieve the order numbers placed by customers in "Dargeling" through agents in "NewDelhi".

```
SQL>select ordno from orders where cid in (select cid from customer where city =
      'Darjeling') and aid in (select aid from agent where city = 'NewDelhi');
```

Explanation: To get ordno from orders table with condition using in operator for attribute cid from customer table whose city is darjeling and aid from agent table whose city is newdelhi.

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OUTPUT: ORDNO

1011

1012

1023

j. Retrieve names of the customers who have the same discount as that of any (one) of the customers in "Dargeling" or "Bangalore".

SQL> select cname from customer
 where discount =any (select discount from customer
 where city = 'Darjeling' or city = 'Bangalore');

Explanation: To get the cname from customer table with condition where any value of discount from customer table whose city is Darjeeling or Bangalore.

OUTPUT: CNAME

Sobhit

Anand

Amar

k. Retrieve customer ids with smaller discounts than every customer from " Srinagar"

SQL> select cid from customer
 where discount < all (select discount from customer
 where city = 'Srinagar');

Explanation: To get cid from customer table, with condition whose all discount values is less than the discount of every customer whose city is Srinagar.

OUTPUT: CID
c005

l. Retrieve names of the customers who have placed an order through agent "a05" (using exists)

SQL> select c.cname from customer c
 where exists (select * from orders o
 where c.cid = o.cid and o.aid = 'a05');

Explanation: To get the cname from customer table as exist helps to check the existence of query and selects the complete table from orders with condition cid attribute from customer table and order table whose aid column from order table is a05.

or

SQL> select cname from customer where cid in (select cid from orders where aid='a05');

OUTPUT: CNAME
Sobhit

m. Retrieve names of the customers who do not place orders through agent "a05". (using not exists)

SQL> select cname from customer
 where cid not in (select cid from orders where orders.aid = 'a05');

Explanation: To retrieve cname from customer table with condition cid from orders table is not in cid of order table where aid from order table is a05

or

SQL> select cname from customer
 where cid <>any (select cid from orders where orders.aid = 'a05');

OUTPUT: CNAME
 Bhanu
 Amar
 Anand
 Anand

**n. Retrieve customer ids whose orders placed through all the agents in "New Delhi".
Get cid values of customers such that (the set of agents from " NewDelhi " through whom the customer has NOT placed an order) is EMPTY.**

SQL> select c.cid from customer c
 where not exists (select * from agent a where a.city = 'NewDelhi'
 and
 not exists (select * from orders o where o.cid=c.cid and
o.aid=a.aid));

Explanation: To retrieve cid from customer table ,with condition not exists,as this helps to get the values which are not existed in the agent table whose city is new delhi and also from orders table that do not exist with condition cid column from order table equal to cid column from customer table and also aid columns from order and agent tables.

OUTPUT: CID
 c00

o. Retrieve agent ids either from "NewDelhi" or "Srinagar" who place orders for ALL products priced over fifteen rupee. Get aid values of agents from "New York" or "Duluth" such that (the set of products priced over one dollar that the agent has NOT ordered) is EMPTY.

```
SQL> select a.aid from agent a
      where (a.city in ('NewDelhi','Srinagar')) and
      not exists (select p.pid from product p where p.price >
                  15.00 and
                  not exists (select * from orders o
                              where o.pid = p.pid and o.aid = a.aid));
```

Explanation: To retrieve aid from agent table whose cities are new delhi and srinagar and using not exist to select the pid from product whose price is greater than 15, and also again using not exist from orders table where pid from order and product table also aid from both tables are equal.

OUTPUT:

no rows selected

So

insert into orders values('1026','apr','c005','a05','p02',900,17100);

OUTPUT: AID
 a05

p. Retrieve names and ids of the customers and agents along with total sales for that pair. Order the result from largest to smallest total sales. Also retain only those pairs for which total rupee sales is at least 9000.00.

```
SQL> select c.cname, c.cid, a.aname, a.aid, sum(o.ordamount)
      from customer c, orders o, agent a
      where c.cid = o.cid and o.aid = a.aid
      group by c.cname, c.cid, a.aname, a.aid
      having sum(o.ordamount) >= 9000.00
      order by 5 desc;
```

Explanation: To retrieve cname, cid, from customer table and aname and aid from agent table, with sum function for order amount from order table, customer and agent table with condition cid from customer and order tables and aid from order and agent tables are equal and to get the result in one set group by is used for cname, cid of customer table and aid, aname from agent table with sum of ordamount of order table is >= 9000 in descending order as result.

OUTPUT:

CNAME	CID	ANAME	AID	SUM(O.ORDAMOUNT)
Sobhit	c001	Omkar	a05	20900
Sobhit	c001	Sonu	a01	18800

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Sobhit	c001	John	a02	15040
Anand	c005	Bhargav	a03	11160
Anand	c004	Sonu	a06	9500
Anand	c005	Sonu	a01	9400

6 rows selected.

q. Increase the percent commission by 50% for all agents in "NewDelhi".

SQL> update agent
 set percent = 1.5 * percent
 where city = 'NewDelhi;

Explanation: To update agent table, percentage value is set to 1.5*percent to get 50% whose city is NewDelhi.

r. Retrieve the total quantity that has been placed for each product

SQL> select pid, sum(qty) TOTAL from orders group by pid;

Explanation: To get pid with total sum of qty from orders table using group by to get the result in one set.

OUTPUT:

PID	TOTAL
p01	4800
p02	800
p03	1000
p04	600
p05	2900
p06	400
p07	1400

7 rows selected.

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DNUMBER	NOT NULL	NUMBER(38)																					
SQL> Insert into Department values ('Research',1); 1 row created.																							
SQL> Insert into Department values ('HR',2); 1 row created.																							
SQL> Insert into Department values ('Development',3); 1 row created.																							
SQL> Insert into Department values ('Testing',4); 1 row created.																							
SQL> select * from Department;																							
OUTPUT:	<table><tr><th>DNAME</th><th>DNUMBER</th></tr><tr><td>Research</td><td>1</td></tr><tr><td>HR</td><td>2</td></tr><tr><td>Development</td><td>3</td></tr><tr><td>Testing</td><td>4</td></tr></table>	DNAME	DNUMBER	Research	1	HR	2	Development	3	Testing	4												
DNAME	DNUMBER																						
Research	1																						
HR	2																						
Development	3																						
Testing	4																						
SQL> Create table Employee (ssn char(9), name varchar(15) not null , salary decimal(10,2), sex char, address varchar(30), dno int not null , primary key (ssn), foreign key (dno) references Department(dnumber));																							
Table Created.																							
SQL> desc Employee;																							
OUTPUT :	<table><tr><th>Name</th><th>Null?</th><th>Type</th></tr><tr><td>SSN</td><td>NOT NULL</td><td>CHAR(9)</td></tr><tr><td>NAME</td><td>NOT NULL</td><td>VARCHAR2(15)</td></tr><tr><td>SALARY</td><td></td><td>NUMBER(10,2)</td></tr><tr><td>SEX</td><td></td><td>CHAR(1)</td></tr><tr><td>ADDRESS</td><td></td><td>VARCHAR2(30)</td></tr><tr><td>DNO</td><td>NOT NULL</td><td>NUMBER(38)</td></tr></table>	Name	Null?	Type	SSN	NOT NULL	CHAR(9)	NAME	NOT NULL	VARCHAR2(15)	SALARY		NUMBER(10,2)	SEX		CHAR(1)	ADDRESS		VARCHAR2(30)	DNO	NOT NULL	NUMBER(38)	
Name	Null?	Type																					
SSN	NOT NULL	CHAR(9)																					
NAME	NOT NULL	VARCHAR2(15)																					
SALARY		NUMBER(10,2)																					
SEX		CHAR(1)																					
ADDRESS		VARCHAR2(30)																					
DNO	NOT NULL	NUMBER(38)																					
SQL> Insert into Employee values('emp001','Ram',30000,'M','RT Nagar, Blore',3);																							
SQL> Insert into Employee values('emp002','Sudha',75000,'F','Hebbal, Blore',2);																							
SQL> Insert into Employee values('emp003','Ravi',20000,'M','Hebbal, Blore',4);																							
SQL> Insert into Employee values('emp004','Rohan',80000,'M','RT Nagar, Mysore',1);																							
SQL> Insert into Employee values('emp005','Amar',35000,'M','MG Road, Mysore',3);																							
SQL> Insert into Employee values('emp006','Anil',45000,'M','MG Road, Noida',3);																							
SQL> Insert into Employee values('emp007','Tanya',35000,'F','Yelahanka, Blore',3);																							
SQL> Insert into Employee values('emp008','Kavita',50000,'F','Baglur, Blore',1);																							
SQL> Insert into Employee values('emp009','John',45000,'M','RT Nagar, Blore',4);																							
SQL> select * from Employee;																							

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OUTPUT:

SSN	NAME	SALARY	SEX	ADDRESS	DNO
emp001	Ram	30000	M	RT Nagar, Blore	3
emp002	Sudha	75000	F	Hebbal, Blore	2
emp003	Ravi	20000	M	Hebbal, Blore	4
emp004	Rohan	80000	M	RT Nagar, Mysore	1
emp005	Amar	35000	M	MG Road, Mysore	3
emp006	Anil	45000	M	MG Road, Noida	3
emp007	Tanya	35000	F	Yelahanka, Blore	3
emp008	Kavita	50000	F	Baglur, Blore	1
emp009	John	45000	M	RT Nagar, Blore	4

SQL> alter table Employee add super_ssn char(9) references Employee(ssn);
Table altered.

SQL>update Employee set super_ssn='emp006' where ssn='emp001';
SQL>update Employee set super_ssn='emp008' where ssn='emp003';
SQL>update Employee set super_ssn='emp002' where ssn='emp005';
SQL>update Employee set super_ssn='emp008' where ssn='emp006';
SQL>update Employee set super_ssn='emp008' where ssn='emp007';
SQL>update Employee set super_ssn='emp004' where ssn='emp008';
SQL>update Employee set super_ssn='emp008' where ssn='emp009';

SQL> select * from Employee;

OUTPUT:

SSN	NAME	SALARY	S	ADDRESS	DNO	
SUPER_SSN						
emp001	Ram	30000	M	RT Nagar, Blore	3	emp006
emp002	Sudha	75000	F	Hebbal, Blore	2	
emp003	Ravi	20000	M	Hebbal, Blore	4	emp008
emp004	Rohan	80000	M	RT Nagar, Mysore	1	
emp005	Amar	35000	M	MG Road, Mysore	3	emp002
emp006	Anil	45000	M	MG Road, Noida	3	emp008
emp007	Tanya	35000	F	Yelahanka, Blore	3	emp008
emp008	Kavita	50000	F	Baglur, Blore	1	emp004
emp009	John	45000	M	RT Nagar, Blore	4	emp008

SQL> alter table Department add mgr_ssn char(9) references Employee(ssn);

SQL> desc Department;

OUTPUT:

Name	Null?	Type
DNAME	NOT NULL	VARCHAR2(15)
DNUMBER	NOT NULL	NUMBER(38)
MGR_SSN		CHAR(9)

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```
SQL> select * from Department;
```

OUTPUT:	<u>DNAME</u>	<u>DNUMBER</u>	<u>MGR_SSN</u>
	Research	1	
	HR	2	
	Development	3	
	Testing	4	

```
SQL>update Department set mgr_ssn='emp004' where dnumber=1;
```

```
SQL>update Department set mgr_ssn='emp002' where dnumber=2;
```

```
SQL>update Department set mgr_ssn='emp006' where dnumber=3;
```

```
SQL>update Department set mgr_ssn='emp009' where dnumber=4;
```

```
SQL> select * from Department;
```

OUTPUT:	DNAME	DNUMBER	MGR_SSN
	Research	1	emp004
	HR	2	emp002
	Development	3	emp006
	Testing	4	emp009

```
SQL>Create table Dept_Location ( dnumber int not null,
                                dlocation varchar(15) not null,
                                primary key(dnumber, dlocation),
                                foreign key(dnumber) references
Department(dnumber) );
```

Department(dnumber));

Table Created.

```
SQL> desc Dept_Location;
```

OUTPUT:	<u>Name</u>	<u>Null?</u>	<u>Type</u>
	DNUMBER	NOT NULL	NUMBER(38)
	DLOCATION	NOT NULL	VARCHAR2(15)

```
SQL> Create table Project ( pname varchar(15) not null,
                             pnumber varchar(5) not null,
                             plocation varchar(15),
                             dnum int not null,
                             primary key (pnumber),
                             unique(pname),
                             foreign key (dnum) references Department(dnumber));
```

Table Created.

```
SQL> desc Project;
```


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OUTPUT:	<u>Name</u>	<u>Null?</u>	<u>Type</u>
	PNAME	NOT NULL	VARCHAR2(15)
	PNUMBER	NOT NULL	VARCHAR2(5)
	PLOCATION		VARCHAR2(15)
	DNUM	NOT NULL	NUMBER(38)

SQL>Create table Workson (essn char(9) **not null,**
pno varchar(5) **not null,**
hours decimal(3,1) **not null ,**
primary key(essn, pno),
foreign key (essn) **references** Employee(ssn),
foreign key (pno) **references** project(pnumber));

Table Created.

SQL> desc Workson;

OUTPUT:	<u>Name</u>	<u>Null?</u>	<u>Type</u>
	ESSN	NOT NULL	CHAR(9)
	PNO	NOT NULL	VARCHAR2(5)
	HOURS	NOT NULL	NUMBER(3,1)

SQL> Create table Dependent (essn char(9) **not null,**
dependent_name varchar(15) **not null,**
sex char,
relationship varchar(8),
primary key (essn,dependent_name),
foreign key (essn) **references** Employee(ssn));

Table Created.

SQL> desc Dependent;

OUTPUT:	<u>Name</u>	<u>Null?</u>	<u>Type</u>
	ESSN	NOT NULL	CHAR(9)
	DEPENDENT_NAME	NOT NULL	VARCHAR2(15)
	SEX		CHAR(1)
	RELATIONSHIP		VARCHAR2(8)

SQL> select * from Dept_Location;

OUTPUT:	<u>DNUMBER</u>	<u>DLOCATION</u>
	1	Blore
	2	Blore
	3	Blore
	3	Mysore
	4	Noida
	4	Blore

SQL> select * from Project;

OUTPUT:	<u>PNAME</u>	<u>PNUMBER</u>	<u>PLOCATION</u>	<u>DNUM</u>
	Banking	p01	Blore	3

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Android App	p02	Mysore	3
WSN	p03	Blore	4
Robotics	p04	Noida	4
Smart Vehicle	p05	Blore	3

SQL> select * from Workson;

OUTPUT:

ESSN	PNO	HOURS
emp001	p01	14
emp003	p01	10
emp001	p02	7
emp005	p03	18
emp003	p02	14
emp004	p05	12
emp007	p04	14
emp001	p05	12

SQL> select * from Dependent;

OUTPUT:

ESSN	DEPENDENTNAME	SEX	RELATION
emp001	Raghu	M	son
emp004	Reshma	F	wife
emp007	Bindu	F	daughter
emp009	Shaan	M	son
emp009	Shamir	M	son

a. Retrieve the names of the Employees who works on all the projects controlled by dept no 3

SQL> select name from Employee
 where not exists ((select pnumber from project where dnum = 3)
 MINUS
 (select pno from workson where essn = ssn)
);

Explanation : This Query gives the name of the Employee using not exists with result of minus operator whose pnumber from project table with condition dnum as 3 and pno from workson table where essn=ssn.

OUTPUT:

NAME
Ram

b. Retrieve the names of the Employees who gets second highest salary.

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```
SQL> select name from Employee
      where salary in ( select max(salary) from Employee
                      where salary not in (select max(salary) from
Employee));
or
```

```
SQL> select name from Employee
      where salary in ( select max(salary) from Employee
                      where salary < (select max(salary) from Employee));
```

Explanation: This Query gives the name of the Employee using max function for salary column from Employee table, whose sal is not in max(salary) or by using < operator .

OUTPUT: NAME
 Sudha

c. Retrieve the names of the Employees who have no dependents in alphabetical order.

```
SQL> select name from Employee e
      where not exists (select * from dependent where essn=e.ssn) order by
name;
or
```

```
SQL> select name from Employee
      where ssn not in (select essn from dependent) order by name;
```

Explanation: This query gives the name of Employee using not exists in dependent with condition essn=e.ssn using order by name. or

By using not in and ssn column from dependent table using order by .

OUTPUT: NAME
 Anil
 Sudha
 Ravi
 Amar
 Kavita

d. List the names of all Employees who have at least two dependents

```
SQL> select name from Employee
      where ( select count (*) from Dependent where ssn =Essn )>=2;
```

Explanation: This query gives the names of the Employees, using count function as it gives the count value of the selected table with condition ssn=Essn and >=2.

OUTPUT : NAME
 John

e. Retrieve the number of Employees and their average salary working in each department.

SQL> select dno, count (*),avg(salary) from Employee group by dno;

Explanation: This Query gives dno,count and avg sal from Employee table using group by dno .

OUTPUT :	<u>DNO</u>	<u>COUNT(*)</u>	<u>AVG(SALARY)</u>
	1	2	65000
	2	1	75000
	3	4	36250
	4	2	32500

f. Retrieve the highest salary paid in each department in descending order.

SQL> select dno,max(salary) from Employee group by dno order by max(salary) desc;

Explanation: This Query gives the dno and Max (salary) Using Group by and Oder by functions

with conditions group by dno and order by max(salary) as desc.

OUTPUT :	<u>DNO</u>	<u>MAX(SALARY)</u>
	1	80000
	2	75000
	3	45000
	4	45000

g. Retrieve the SSN of all Employees who work on atleast one of the project numbers 1, 2, 3

SQL> select distinct(essn) from workson where pno in ('p01','p02','p03');
or

SQL> select distinct(essn) from workson where pno='p01' or pno='p02' or pno='p03';

Explanation : This Query gives the Essn of Employee from workson table using distinct with

condition pno in (p01,p02,p03) or pno=p01 or p02,p03

OUTPUT :	<u>ESSN</u>
	emp001
	emp003
	emp005

h. Retrieve the number of dependents for an Employee named RAM.

SQL> select count(*) from Dependent
 where essn = (select ssn from Employee where
 name='Ram');

select

SQL> select count(*) from Employee e, dependent d
 where d.essn=e.ssn and e.name='Ram';

Explanation : This Query gives the no .of dependents using count function for dependent table with condition whose essn is equal to ssn of Employee table whose ename is ram .

Or

Explanation: By using count for Employee table and dependent with condition essn of dependent table = ssn of Employee table and whose name from Employee table is ram.

OUTPUT : **COUNT(*)**
 1

i. Retrieve the names of the managers working in location named xyz who has no female dependents.

SQL> select name from Employee
 where ssn in (select essn from
 dependent where sex!='F'
 and essn in(
 (select mgr_ssn from
 department where dnumber in
 (select dnumber from dept_location
 dlocation='Blore')))) where
 ; distinct(name) from Employee e , Department d, Dept_location l,
Or Dependent
 where e.ssn= de.essn and de.sex!='F' and
SQL> de.essn=d.mgr_ssn and
de d.dnumber=l.dnumber and
 l.dlocation='Blore';

Explanation: This query gives the name of manger from Employee table by using IN operator,
whose ssn from dependent table sex is not 'F' and mgr_ssn from department,whose dnumber from dep_location is Blore.

Or

Explanation: By using distinct for name from Employee table ,department ,dependent and location tables whose ssn from Employee =essn from dependent table and sex is not 'F' in dependent and essn from dependent =mgr from department mgr_ssn and dnumber from d=dhumber from l;and dlocation from l='Blore'.

```

OUTPUT :      NAME
                  John

```

j. Retrieve the names of the Employees who works in the same department as that of RAM

```
SQL> select name from Employee
      where dno = (select dno from Employee where name='Ram') and name!='Ram';
```

Explanation: This gives the name from Employee using condition get dno whose name is ram
from emp table and name whose name is not ram.

```

OUTPUT :           NAME
                     Amar
                     Anil
                     Tanya

```

k. Retrieve the name of the Employees whose salary is greater than the salary of all the Employees working in department 3.

```
SQL> select name, salary from Employee
      where salary> all ( select salary from Employee where dno=3 );
```

Explanation: To get the name, salary of Employee from emp table using condition whose salary is > All Employees and whose dno=3.

OUTPUT :	<u>NAME</u>	<u>SALARY</u>
	Sudha	75000
	Rohan	80000
	Kavita	50000

1. Retrieve the names of the Employees who work for dept no 3 and have a daughter as dependent.

```
SQL> select name from Employee e , dependent d
      where e.ssn=d.essn and  d.relationship='daughter' and e.dno=3;
```

Explanation: This Query gives the name using conditions ssn from emp=essn from dependent and relationship from depend=daughter and dno from emp=3.

OUTPUT : NAME
 Tanya

m. Retrieve the Employee name who paid highest salary from each department.

```
SQL> select name from Employee
      where salary in ( select max(salary) from Employee group by dno );
```

Explanation: To get the name from emp using condition whose sal in emp using max and groupby dno.

OUTPUT :

<u>NAME</u>
Rohan
Sudha
John
Anil

n. Retrieve the names of the Employees who are paid the same salary as that of Anil.

SQL> select name from Employee
 where salary in (select salary from Employee where
 name='Anil') and name!='Anil';
 or

SQL> select name from Employee
 where salary = (select salary from Employee where
 name='Anil') and name!='Anil';

Explanation This gives the name of Employee using In operator and condition sal frm emp
table whose name is Anil and name frm emp whose name is not
anil.

OUTPUT : NAME
 John

To get
the
total
,we
use
count

o. Retrieve the total the number of Employees in the 'Research' department.

SQL> select count (*) from Employee, Department
 where dno =dnumber and dname='Research';

Explanation: research.

COUNT(*)
2

OUTPUT :

p. For each project, retrieve the project number, the project name, and the number of Employees who work on that project.

SQL> select Pnumber, Pname, count (*)
 from Project, Workson
 where Pnumber=Pno
 GROUP BY Pnumber, Pname;

Explanation: This query gives the pnumb ,pname and total number from project and

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workson

tables using condition whose pnumber is pno and group by pnumber and pname.

OUTPUT :	<u>PNUMB</u>	<u>PNAME</u>	<u>COUNT(*)</u>
	p01	Banking	2
	p02	Android App	2
	p03	WSN	1
	p04	Robotics	1
	p05	Smart Vehicle	2

Lab Exercise 3 : Car Rental Agency Database

3.1	Problem Statement
Design a car rental agency database which can store customer details, vehicle details like vehicle id, size, transmission and reservation details like who had booked from one date to other.	
3.2	Student Learning Outcomes
<p>After successful execution of this exercise, the student shall able to</p> <ul style="list-style-type: none">❑ Design the database for all the real world applications.❑ Implement aggregate functions.❑ Apply date operations in database querying.	
3.3	<p>Queries with Solutions</p> <p>Customers(<u>cid</u>, firstname, lastname, address) Vehicle(<u>vid</u>, mileage, location, size, transmission) Reservations(<u>cid</u>,<u>vid</u>, start_date, end_date)</p> <p>Note :</p> <ul style="list-style-type: none">➤ Vehicle.transmission can have two values ‘manual’ and ‘automatic’.➤ Vehicle.size can have following values. ‘compact’, ‘mid-size’, ‘full-size’, ‘premium’ and ‘luxury’. The default size is compact. <p>Aim: Create the tables with the appropriate integrity constraints and Insert around 10 records in each of the tables.</p>
<p>SQL> create table carcustomer (cid varchar(5) , </p>	

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```
SQL> create table vehicle ( vid varchar(5) primary key,
                           mileage number(7,2),
                           location varchar(20),
                           vsize varchar(30) check (vsize in ('compact','mid-size',
                                                           'full-
size','premium','luxury')),
                           transmission varchar(10) check (transmission in
                                                           ('manual','automatic'))
                           );
```

Table Created

```
SQL> desc vehicle;
```

OUTPUT:	Name	Null?	Type
	VID	NOT NULL	VARCHAR2(5)
	MILEAGE		NUMBER(7,2)
	LOCATION		VARCHAR2(20)
	VSIZE		VARCHAR2(30)
	TRANSMISSION		VARCHAR2(10)

```
SQL> create table reservation ( cid varchar(5) references carcustomer(cid),
                                vid varchar(5) references vehicle(vid),
                                start_date date,
                                end_date date,
                                primary key (cid,vid) );
```

Table Created

```
SQL> desc reservation;
```

OUTPUT:	Name	Null?	Type
	VID	NOT NULL	VARCHAR2(5)
	START_DATE		DATE
	END_DATE		DATE

```
SQL> select * from carcustomer;
```

OUTPUT:	CID	FIRST_NAME	LAST_NAME	ADDRESS
	101	Karan	P	Malleswaram,Blore
	102	Bhuvan	M	Vailakavali, Blore
	103	Darshan	D	Devanahalli,Devan
	104	Vishal	D	Hebbal, Blore
	105	Sagar	S	Kalyannagar, Blore

```
SQL> select * from vehicle;
```

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OUTPUT:	<u>VID</u>	<u>MILEAGE</u>	<u>LOCATION</u>	<u>VSIZE</u>	
<u>TRANSMISSION</u>					
	V- 101	70	Blore	compact	
	automatic				
	V-102	50	Surat	compact	
	automatic				
	V-103	10	Blore	mid-size	manual
	V-104	30	Blore	mid-size	
	automatic				
	V-105	15	Vailakavali	full-size	
	automatic				
	V-106	20	Blore	luxury	
	automatic				
	V-107	50	Blore	luxury	manual

SQL> select * from reservation;

OUTPUT:	<u>CID</u>	<u>VID</u>	<u>START_DATE</u>	<u>END_DATE</u>
	101	V-101	15-FEB-09	18-FEB-09
	102	V-102	10-JAN-11	15-JAN-11
	103	V-103	20-FEB-13	24-FEB-13
	105	V-105	12-MAR-16	10-JUN-16

a. Display both the firstname and last name in uppercase as Name of the customer as column name.

SQL> select upper(first_name) || ' '||upper(last_name) as "Name of the customers"
from carcustomer;

Explanation: This query concatenates the first name and last name in uppercase whose first name is "Vishal".

OUTPUT: Name of the customers
KARAN P
BHUVAN M
DARSHAN D
VISHAL D
SAGAR S

b. Display vehicles size which is having maximum mileage.

SQL> select vsize from vehicle where mileage = (select max(mileage) from vehicle);

Explanation: This query displays the vehicle size which has the maximum mileage.

OUTPUT: VSIZE
Compact

c. Find location and total mileage of all vehicles specific to each respective location.

SQL> select location, sum(mileage) from vehicle group by location;

Explanation: This query displays the location and total mileage of all vehicles specific to each respective location using aggregate function Sum () and group by clause.

OUTPUT:

<u>LOCATION</u>	<u>SUM(MILEAGE)</u>
Blore	180
Vailakavali	15
Surat	50

d. Find average mileage of vehicles for each location, which has at least five vehicles.

SQL> select avg(mileage), count(vid), location from vehicle
group by location having count(vid) >= 5;

Explanation: This query displays the average mileage of vehicles for each location in which the location has at least five vehicles using Count and Avg aggregate functions.

OUTPUT:

<u>AVG(MILEAGE)</u>	<u>COUNT(VID)</u>	<u>LOCATION</u>
36	5	Blore

e. Display the customer names whose reservation start date is before 18 Feb 2012.

SQL> select c.first_name, c.last_name from reservation r, carcustomer c
where c.cid=r.cid and r.start_date< '18-FEB-2012';

Explanation: This query display the customer names whose reservation start date is before 18 Feb 2012 by using the inner join between tables Customer and Reservation.

OUTPUT:

<u>FIRST_NAME</u>	<u>LAST_NAME</u>
Karan	P
Bhuvan	M

f. Display the vehicles which has been reserved between the dates Nov 5th 2015 and Jan 16th 2016

SQL> select vid from reservation
where start_date >= '5-JAN-2011' AND end_date <= '1-JAN-2014';

Explanation: This query display the vehicles which has been reserved between the dates Nov 5th 2015 and Jan 16th 2016 using Reservation table and where clause.

OUTPUT:

<u>VID</u>
V-102
V-103

g. Display the names of the customers whose lastname starts with 'D' and who has reserved more vehicles than the customer with CID as 101.

SQL> select c.first_name from carcustomer c

```

where c.last_name like 'D%' and
      c.cid in ( select cid from reservation group by cid having count(*)
                > (select count(*) from reservation where cid ='101'));

```

OUTPUT: No rows selected

cid's 103 & 104 are having lastname as D,
 101 is having one record in reservation
 So either 103 or 104 should have atleast 2 records
 So I can insert minimum 1 record for 103 or 2 records for 104

SQL> insert into reservation values ('103','V-104','15-OCT-2014','24-OCT-2014');

OUTPUT: FIRST NAME
 Darshan

h. Retrieve the customers who have reserved vehicles from all the locations.

```

SQL> select c.cid from carcustomer c
      where not exists ( (select distinct(location) from vehicle)
                        minus
                        (select v.location from vehicle v, reservation r
                          where v.vid=r.vid and c.cid=r.cid)
                        );

```

OUTPUT: No rows selected

NOTE : In reservation table we have 5 records in which
 101, 102, 105 reserved once
 103 reserved twice (V-103, V-104)
 But total number of distinct locations are three.
 I should have atleast one customer who reserves in all these three locations.
 V-103, V-104 reserved by 103 cid belongs to same location Blore
 So we can't consider 103 is reserved from 2 different locations
 So I can insert data here for
 101 for surat and vailakavali or
 102 for Blore and vailakavali or
 103 for Surat and vailakavali so on

SQL> insert into reservation values ('103','V-102','12-MAR-2016','14-MAR-2016');

SQL> insert into reservation values ('103','V-105','15-APR-2016','20-APR-2016');

SQL> select * from reservation;

OUTPUT:	<u>CID</u>	<u>VID</u>	<u>START_DAT</u>	<u>END_DATE</u>
	101	V-101	10-JAN-11	10-FEB-15
	102	V-102	12-MAR-11	10-JUN-16
	103	V-103	15-FEB-09	09-SEP-15
	105	V-105	15-FEB-13	09-SEP-15
	103	V-104	15-OCT-14	24-OCT-14
	103	V-102	12-MAR-16	14-MAR-16
	103	V-105	15-APR-16	20-APR-16

i. Retrieve the locations that have at least one vehicle with manual transmission that has lower mileage than any luxury vehicle at that location.

```
SQL> select * from vehicle v1
      where v1.vsize not in ('luxury') and v1.transmission='manual'
      and v1.mileage < ( select min(mileage) from vehicle v2
                        where v2.vsize='luxury' and
                        v1.location=v2.location);
```

Explanation: This Query displays all the locations that have at least one vehicle with manual transmission that has lower mileage than any luxury vehicle at that location by using subquery.

OUTPUT: VID	MILEAGE	LOCATION	VSIZE	TRANSMISSION
V-103	10	Blore	mid-size	manual

j. Delete all the reservations for customer whose last name starts with 'S' or only S.

```
SQL> delete from reservation where cid in (select cid from carcustomer where last_name like 'S%');
```

Explanation: This Query Delete all the reservations for customer whose last name starts with 'S' or only S and the output is shown for the same, before deletion and after deletion.

OUTPUT:

RESERVATION TABLE BEFORE 'DELETE' OPERATION :=====>

CID	VID	START_DAT	END_DATE
101	V-101	10-JAN-11	10-FEB-15
102	V-102	12-MAR-11	10-JUN-16
103	V-103	15-FEB-09	09-SEP-15
105	V-105	15-FEB-13	09-SEP-15
103	V-104	15-OCT-14	24-OCT-14
103	V-102	12-MAR-16	14-MAR-16
103	V-105	15-APR-16	20-APR-16

RESERVATION TABLE AFTER 'DELETE' OPERATION :=====>

CID	VID	START_DAT	END_DATE
101	V-101	10-JAN-11	10-FEB-15
102	V-102	12-MAR-11	10-JUN-16
103	V-103	15-FEB-09	09-SEP-15
103	V-104	15-OCT-14	24-OCT-14
103	V-102	12-MAR-16	14-MAR-16
103	V-105	15-APR-16	20-APR-16

8. Lab Assignments

SL. No.	Practice & Assignment Queries
1	<p>Assignment Queries for Lab Exercise I</p> <ol style="list-style-type: none"> Retrieve the complete data from Customer table. Retrieve the complete data from Agent table by mentioning attributes. Display only product id and product name. Display Product name and price as a single column and the column name be “Product and their prices” (concatenation operator and alias). Display the city names of the customers by eliminating duplicates. Retrieve the names of the customers lives in “Mumbai”. Display agent ids and names belongs to New Delhi. Retrieve customer ids who ordered both “P01” and “P02”. Get customers whose name begins with letter "A". Retrieve the customers whose name starts with letter “A” and third letter is “a” eg. Amar. Retrieve the customers whose name consists of letter “a” eg. Amar, Anand. Get customer ids whose discount is between 8 and 10. Display the product name whose price is 10 or 20 using IN and OR operators. Get total quantity of product "p01" that has been ordered. Get number of cities in which customers are based. Get total amount of all orders. Get total number of customers. Get average discount value for customers. Get agent ids with the smallest percent commission. Display the customer names who placed an order through the agent who is having aid as “a01”. Retrieve the names of the customers who live in “Mumbai” and order product “P01”. Retrieve customer ids who do not order part “P01”.

2**Assignment Queries for Lab Exercise II**

- a. List female employees from dept no is 2 earning more than Rs.35000
- b. Retrieve the names and address of all employee who work for the 'Research' department.
- c. Retrieve the names and salary of all employees who work in department number 5.
- d. Retrieve the names of the employees and their superSSN name
- e. Display name as "Employee name" and salary for the year as "Annual Income"
- f. Display name, current salary and salary if it is going to be increased by 800 rupees
- g. Display Department name and number as a single column with the name as "Department Details"
- h. Retrieve the names of the managers who have more than two dependents.
- i. Retrieve the names of the managers with atleast one dependent.
- j. List all the Projects on which employee Ram is working
- k. Retrieve the names of the employees who work on any project that Kumar works.
- l. Retrieve the names of the employees who do not have supervisor
- m. Count the number of distinct salary values in the database.
- n. For each project, retrieve the project number, the project name, and the number of employees from department 3 who work on the project.
- o. Retrieve all employees in department 3 whose salary is between Rs.35,000 and Rs.40,000.

9. Solutions for Lab Assignment Exercise I:

a) Retrieve the complete data from customer table

SQL> select * from customer;

OUTPUT:

CID	CNAME	CITY	DISCOUNT
c001	Sobhit	Darjeling	10
c002	Bhanu	Srinagar	12
c003	Amar	Srinagar	8
c004	Anand	Darjeling	8
c005	Anand	Mumbai	0

b) Retrieve the data complete from Agents by mentioning attributes

SQL>select aid, aname, city, percent from agent;

OUTPUT:

AID	ANAME	CITY	PERCENT
a01	Sonu	NewDelhi	6
a02	John	Agra	6
a03	Bhargav	Jaipur	7
a04	Gaurav	NewDelhi	6
a05	Omkar	Srinagar	5
a06	Sonu	Darjeling	5

7 rows selected.

c) Display only product id and product name

SQL> select pid,pname from product;

OUTPUT:

PID	PNAME
p01	comb
p02	brush
p03	eraser
p04	pen
p05	pencil
p06	folder
p07	Highlighter

7 rows selected.

d) Display Product name and price as a single column and the column name be "Product and their prices" (concatenation operator and alias)

SQL> select pname||price "product and their prices" from product;

OUTPUT:

product and their prices	
comb	10
brush	20
eraser	2
pen	15
pencil	3
folder	15

University

Highlighter 20
7 rows selected.

If some space has to be included between 2 column values after concatenating in the output, use number of spaces required within the single quote along with concatenation operator.

SQL> select pname||' ||price "product and their prices" from product;

OUTPUT:

<u>product and their prices</u>	
comb	10
brush	20
eraser	2
pen	15
pencil	3
folder	15
Highlighter	20

SQL> select pname||' cost is '||price "product and their prices" from product;

OUTPUT: product and their prices

comb cost is	10
brush cost is	20
eraser cost is	2
pen cost is	15
pencil cost is	3
folder cost is	15
Highlighter cost is	20

e) Display the city names of the customers by eliminating duplicates

SQL> select distinct city from customer;

OUTPUT: CITY

Srinagar
Darjeling
Mumbai
Srinagar

f) Retrieve the names of the customers lives in “Mumbai”

SQL> select cname from customer where city='Mumbai';

OUTPUT: CNAME

Anand

g) Display agent ids and names belongs to New Delhi

SQL> select aid, aname from agent where city = 'NewDelhi';

OUTPUT:

<u>AID</u>	<u>ANAME</u>
a01	Sonu
a04	Gaurav

h) Retrieve the customer ids who ordered the products “p01” and “p02”

SQL> select cid from orders where pid='p01' intersect select cid from orders where pid='p07';

OUTPUT: CID
 c001
 c005

i) Get customers whose name begins with letter "A".

SQL> select cname from customer where cname like 'A%';

OUTPUT: CNAME
 Amar
 Anand
 Anand

j) Retrieve the customers whose name starts with letter "A" and third letter is "a" eg. Amar

SQL> select cname from customer where cname like 'A_a%';

OUTPUT: CNAME
 Amar
 Anand
 Anand

k) Retrieve the customers whose name consists of letter "a"

SQL> select cname from customer where cname like '%a%';

OUTPUT: CNAME
 Bhanu
 Amar
 Anand
 Anand

l) Get customer ids whose discount is between 8 and 10.

SQL> select cid from customer where discount between 8 and 10;

OUTPUT: CID
 c001
 c003
 c004

m) Display the product name whose price is 10 or 20 using IN and OR operators

SQL> select pname from product where price in (10,20);

or

SQL> select pname from product where price=10 or price=20;

OUTPUT: PNAME

comb
brush
Highlighter

n) Get total quantity of product "p01" that has been ordered.

SQL> select sum(qty) from orders where pid='p01'

OUTPUT: SUM(QTY)
 4800

o) Get number of cities in which customers are based.

SQL> select count (distinct (cname)) from customer;

OUTPUT: COUNT(DISTINCT(CNAME))
 4

p) Get total amount of all orders.

SQL> select sum(ordamount) from orders;

OUTPUT: SUM(ORDAMOUNT)
 104598

q)Get total number of customers.

SQL> select count(cid) from customer;

OUTPUT: COUNT(CID)
 5

r)Get average discount value for customers.

SQL> select avg(discount) from customer;

OUTPUT: AVG(DISCOUNT)
 7.6

s)Get agent ids with the smallest percent commission.

SQL> select aid from agent where percent in (select min(percent) from agent);

Or select aid from agent where percent= (select min(percent) from agent)

OUTPUT: AID
 a05
 a06

t) Display the names of the customers who placed an order through the agent who is having aid as "a01"

SQL> Select distinct(c.cname) from customer c , orders o where c.cid=o.cid and o.aid='a01';

OUTPUT: CNAME
 Sobhit
 Anand

u) Retrieve the names of the customers who live in "Mumbai" and order product "p01"

SQL> select cname from customer c , orders o
 where c.city='Mumbai' and c.cid=o.cid and o.pid='p01';

OUTPUT: CNAME
 Anand
 Anand

SQL> select distinct(cname) from customer c,orders o
 where c.city='Mumbai' and c.cid=o.cid and o.pid='p01';

OUTPUT: CNAME
 Anand

v) Retrieve customer ids who do not order part "p01"

SQL> select cid from customer minus (select cid from orders where pid='p01') ;
 or
 select cid from customer minus (select distinct (cid) from orders where pid='p01');

OUTPUT: CID
 c002
 c003

10. Viva Voce Questions

- 1) What is an RDBMS?
- 2) What is the SQL?
- 3) What are the different kinds of DBMS?
- 4) What are the features of relational database?
- 5) What are data types?
- 6) What is an E-R diagram?
- 7) What is the referential integrity?
- 8) What is a foreign key?
- 9) What is a primary key?
- 10) What is an alternate key in table?
- 11) What is the normalization?
- 12) Explain the First Normal Form?
- 13) Explain the Second Normal Form?
- 14) Explain the Third Normal Form?
- 15) What is an index, and how is it used to improve performance?
- 16) What are the types of indexes, and if separate indexes are created on each column of a table, what are the advantages and disadvantages of this approach?
- 17) What is the SQL Data Manipulation Language (DML)?
- 18) What is the SQL Data Definition Language (DDL)?
- 19) What is the de-normalization?
- 20) What is a transaction?
- 21) What are ACID properties?
- 22) What is the difference between DELETE TABLE and TRUNCATE TABLE commands?
- 23) What are constraints?
- 24) What are the different types of constraints?
- 25) What are cursors? What are the different types of cursors?
- 26) What are the advantages of cursors? How can you avoid cursors?
- 27) What is a join and explain different types of joins.
- 28) What is a self-join? Explain it with an example.
- 29) How do you implement one-to-one, one-to-many, many-to-many relationships while designing tables?
- 30) What is the difference between primary key and a unique key?
- 31) What are defaults?
- 32) What are triggers? How do you invoke a trigger on demand?
- 33) What is a stored procedure? What are the advantages?
- 34) What is the difference between stored procedure and a trigger?
- 35) What are the different types of parameters available in stored procedures?
- 36) How do you get the distinct rows in a table/ resultset?
- 37) How do you get the distinct rows without using the keyword DISTINCT?
- 38) How can you get the duplicated rows from the table using a single query?

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- 39) How can you get the total number of records in a table?
 - 40) How can you insert values in multiple rows using one insert statement?
 - 41) What is the database replication?
 - 42) What will happen when a Rollback statement is executed inside a Trigger?

Recommended Learning Resources:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, 3rd Edition, McGraw-Hill, 2003.
2. Elmasri and Navathe, *Fundamentals of Database Systems*, 5th Edition, Pearson Education, 2007.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan: *Database System Concepts*, 6th Edition, McGraw Hill, 2010.

References:

1. Christopher J Date, *An Introduction to Database Systems*
2. J. D. Ullman, "Principles of Database Systems"
3. Serge Abiteboul, Richard Hull and Victor Vianu, "Foundations of Databases"
4. Bipin C Desai, *An Introduction to Database Systems*
5. Mark L Gillenson, *Fundamentals of Database Management Systems*
6. Thomas Connolly and Carolyn Begg, *Data base Solutions: A step by step Guide to Building Data bases*
7. C J Date, *Database Design and Relational Theory: Normal Forms and All that Jazz*, O'Reilly, April 2012.