DATABASE MANAGEMENT SYSTEM LAB
CODE: 214456

CLASS: SECOND YEAR-SEM-II

LAB MANUAL-2019 COURSE

DEPARTMENT OF INFORMATION TECHNOLOGY,

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

Course Objectives:

1. Understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.

2. To provide a strong formal foundation in database concepts, recent technologies and best industry practices.

3. To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.

4. To learn the SQL database system.

5. To learn and understand various Database Architectures and its use for application development.

6. To programme PL/SQL including stored procedures, stored functions, cursors and packages.

Course Outcomes:

After completion of this course student will be able to

CO1 : To install and configure database systems.

CO2: To analyze database models & entity relationship models.

CO3: To design and implement a database schema for a given problem-domain

CO4: To understand the relational database systems.

CO5: To populate and query a database using SQL DDL/DML/DCL commands.

CO6: To design a backend database of any one organization: CASE STUDY

214456: DATABASE MANAGEMENT SYSTEM LAB

Teaching Scheme: Practical: 4 Hours/Week **Credits: 02**

Examination Scheme: Term Work: 25 Marks
Practical: 25 Marks

9	**Group C: PL/SQL** Write and execute PL/SQL stored procedure and function to perform a suitable task on the database. Demonstrate its use.	
10	**Group C: PL/SQL** Write and execute suitable database triggers .Consider row level and statement level triggers.	
11	**Group C: PL/SQL** Write a PL/SQL block to implement all types of cursor.	
12	**Group D: Relational Database Design** Design and case study of any organization (back end only), Project Proposal and High Level SRS To prepare for your project, do the following: 1. Form teams of around 3 to 4 people 2. Create a requirements document with the following information; 1. Give a one or two paragraph description of your goals for the topic(s). 2. List all what all types of users will be accessing your application (e.g., for moodle, the types are teachers, students, teaching assistants, and a few more types). 3. List the various functionalities that your application will support. Explain each in about a paragraph worth of detail. 4. List the hardware and software requirements at the backend and at the front end. 5. Give an estimate of the number of users of each type, the expected load (transactions per day), and the expected database size.	

Reference Books:

1.Dr. P. S. Deshpande, SQL and PL/SQL for Oracle 10g Black Book, DreamTech.

2.Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB Publication.

3.Reese G., Yarger R., King T., Williums H, Managing and Using MySQL, Shroff Publishers and Distributors Pvt. Ltd., ISBN: 81 - 7366 - 465 – X, 2nd Edition.

4.Eric Redmond, Jim Wilson, Seven databases in seven weeks, SPD, ISBN: 978-93-5023-918-6.Jay Kreibich, Using SQLite, SPD, ISBN: 978-93-5110-934-1, 1st edition.

Web Resources:

1.Udemy 2. Coursera 3. SQL TutorialsPoint

IT/DBMSL: D-05	**Group A: Study of Databases:** Study of MySQL Open source software.	**Pages**	6-11
Experiment No: 1	**Semester – II**	**Rev.: 00**	**Date: 18/12/2017**

ASSIGNMENT STATEMENT:
Group A: Study of Databases
Study of MySQL Open source software. Discuss the characteristics like efficiency, scalability, performance and transactional properties

THEORY:

Database:
A database is a collection of information or data which are organized in such a way that it can be easily accessed, managed and retrieved.

Elements of Database:
A database table consists of rows and columns which contain data. For example, you have a table that stores profiles of individuals that is, ID, name, address and contact details.

EMPLOYEE TABLE:

EMP_ID	EMP_NAME	EMP_AGE	EMP_CITY	DEPT_ID	DEPT_NAME
22	Denim	28	Mumbai	827	Sales
33	Alina	25	Delhi	438	Marketing
46	Stephan	30	Bangalore	869	Finance
52	Katherine	36	Mumbai	575	Production
60	Jack	40	Noida	678	Testing

MySQL Database Features:
- MySQL is a fast, easy-to-use RDBMS being used for many small and big businesses. MySQL is becoming so popular because of many good reasons −
- MySQL is released under an open-source license.
- MySQL is a very powerful program in its own right. It handles a large subset of the functionality of the most expensive and powerful database packages.
- MySQL uses a standard form of the well-known SQL data language.
- MySQL works on many operating systems and languages including PHP, PERL, C, C++, JAVA, etc.
- MySQL works very quickly and works well even with large data sets.
- MySQL is very friendly to PHP, the most appreciated language for web development.
- MySQL supports large databases, up to 50 million rows or more in a table.
- MySQL is customizable. The open-source GPL license allows programmers to modify the MySQL software to fit their own specific environments.

1) **MySQL Create Database**
MySQL create database is used to create database.
Example:

create database db1;

2) MySQL Select/Use Database
MySQL use database is used to select database.
Example:
use db1;

3**) MySQL Create Query**
MySQL create query is used to create a table, view, procedure and function.
Example:
CREATE TABLE customers
(id int(10), name varchar(50), city varchar(50),PRIMARY KEY (id));

4) MySQL Alter Query
MySQL alter query is used to add, modify, delete or drop columns of a table.
Let's see a query to add column in customers table:
Example:
ALTER TABLE customers ADD age varchar(50);

5) MySQL Insert Query
MySQL insert query is used to insert records into table.
Example:
insert into customers values(101,'rahul','delhi');

6) MySQL Update Query
MySQL update query is used to update records of a table.
Example:
update customers set name='bob', city='london' where id=101;

7) MySQL Delete Query
MySQL update query is used to delete records of a table from database.
Example:
delete from customers where id=101;

8) MySQL Select Query
Oracle select query is used to fetch records from database.
Example:
SELECT * from customers;

9) MySQL Truncate Table Query
MySQL update query is used to truncate or remove records of a table. Example:
truncate table customers;

10) MySQL Drop Query
MySQL drop query is used to drop a table, view or database. It removes structure and data of a table if you drop table.
Example:
drop table customers;

IT/DBMSL: D-05	Group A: Study of Databases Study of SQLite:	Pages	6-11
Experiment No: 3	Semester – II	Rev.: 00	Date: 18/12/2017

ASSIGNMENT STATEMENT:
Group A: Study of Databases
Study of SQLite: What is SQLite? Uses of SQLite. Building and installing SQLite.

THEORY:

SQLite Database

- SQLite is a self-contained, high-reliability, embedded, full-featured, public domain, SQL database engine. SQLite is the most used database engine in the world
- SQLite databases are very lightweight. Unlike other database systems, there is no configuration, installation required to start working on SQLite database.
- What you need is the SQLite library which is less than 500KB size.

SQLITE CREATE TABLE

To create a table, you should use the **"CREATE TABLE"** command as following:

```
C:\SQLITE>CREATE TABLE guru99 ( Id Int, Name Varchar);
```

DROP TABLE

To drop a table, use the **"DROP TABLE"** command followed by the table name as following:

```
C:\SQLITE>DROP TABLE guru99;
```

ALTER TABLE

You can use **"ALTER TABLE"** command to rename a table as following:

```
C:\SQLITE>ALTER TABLE guru99 RENAME TO guru100;
```

SQLITE ADD COLUMNS- USING ALTER TABLE **COMMAND**

You can also use the **"ALTER TABLE"** command to add columns:

```
C:\SQLITE>ALTER TABLE guru100 ADD COLUMN Age INT;
```

SQLITE INSERT VALUE INTO A TABLE

```
C:\SQLITE>INSERT INTO guru100 VALUES(1, 'Mike', 25);
```

SQLITE DISPLAY ALL VALUES

```
C:\SQLITE>SELECT * FROM Students;
```

INSTALL SQLITE ON WINDOWS

- **Step 1** − Go to SQLite for Windows
- **Step 2** − Download sqlite-shell-win32-*.zip and sqlite-dll-win32-*.zip zipped files.
- **Step 3** − Create a folder C:\>sqlite and unzip above two zipped files in this folder, which will give you sqlite3.def, sqlite3.dll and sqlite3.exe files.
- **Step 4** − Add C:\>sqlite in your PATH environment variable and finally go to command prompt and issue sqlite3 command, which should display the following result.

```
C:\>sqlite3
SQLite version 3.7.15.2 2013-01-09 11:53:05
Enter ".help" for instructions
Enter SQL statements terminated with a ";"
sqlite>
```

INSTALL SQLITE ON LINUX

- **Step 1**-Download sqlite-autoconf-*.tar.gz from source code section of SQLite Site
- **Step 2** − Run the following command −

```
$tar xvfz sqlite-autoconf-3071502.tar.gz
$cd sqlite-autoconf-3071502
$./configure --prefix=/usr/local
$make
$make install
```

The above command will end with SQLite installation on your Linux machine.

```
$sqlite3
SQLite version 3.7.15.2 2013-01-09 11:53:05
Enter ".help" for instructions
Enter SQL statements terminated with a ";"
sqlite>
```

IT/DBMSL: D-05	**Group B: MySQL:** Draw suitable ER/ EER diagram for the system.	**Pages**	6-11
Experiment No: 4	**Semester – II**	**Rev.: 00**	**Date: 18/12/2017**

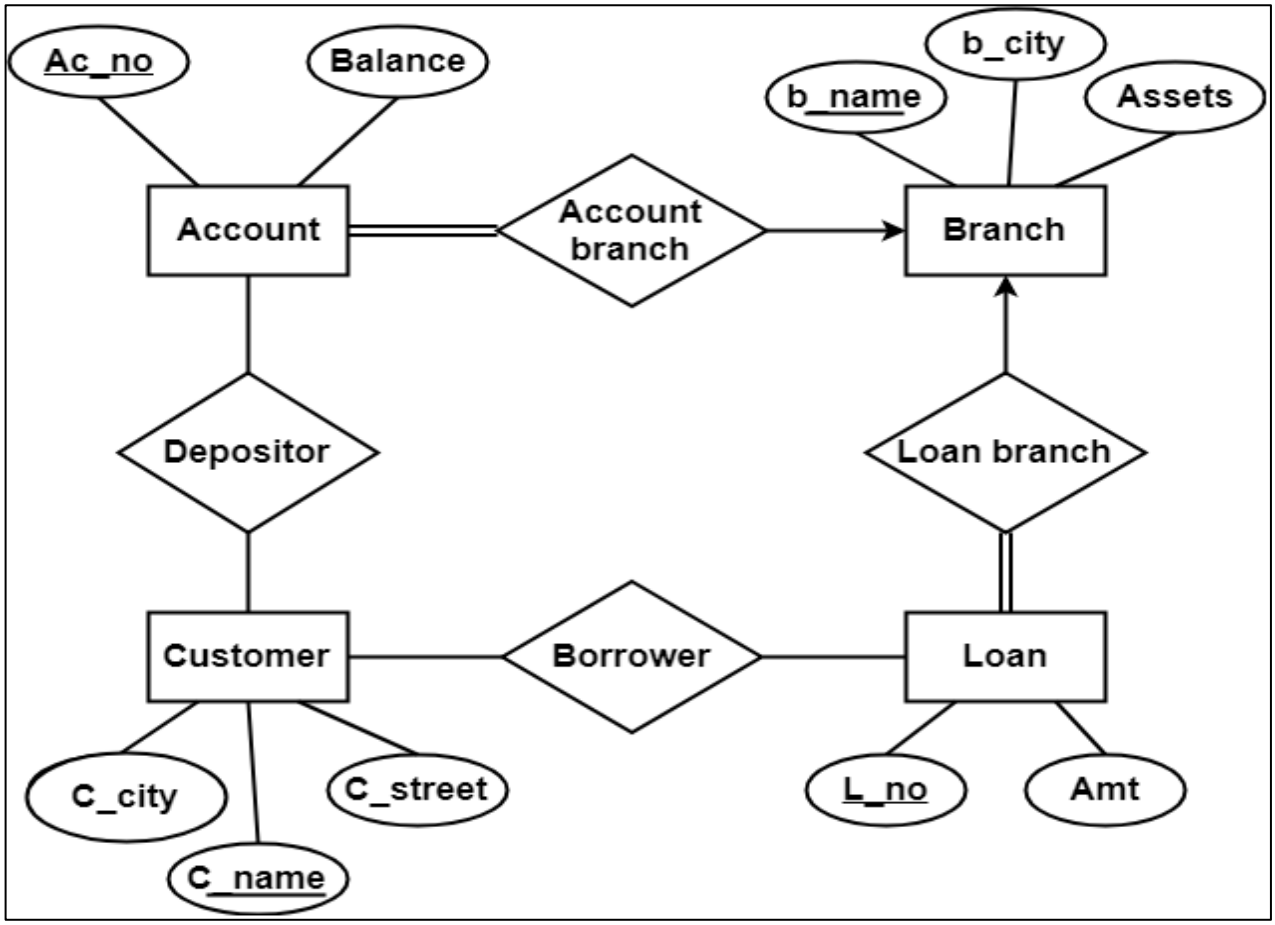
ASSIGNMENT STATEMENT:
Group B: MySQL
Design any database with at least 3 entities and relationships between them. Draw suitable ER/EER diagram for the system.

THEORY:

Entity Relationship(ER) Diagrams:

ER Diagram stands for Entity Relationship Diagram, also known as ERD. It displays the relationship of entity sets stored in a database. ER Diagrams contain different symbols that use rectangles to represent entities, ovals to define attributes and diamond shapes to represent relationships.

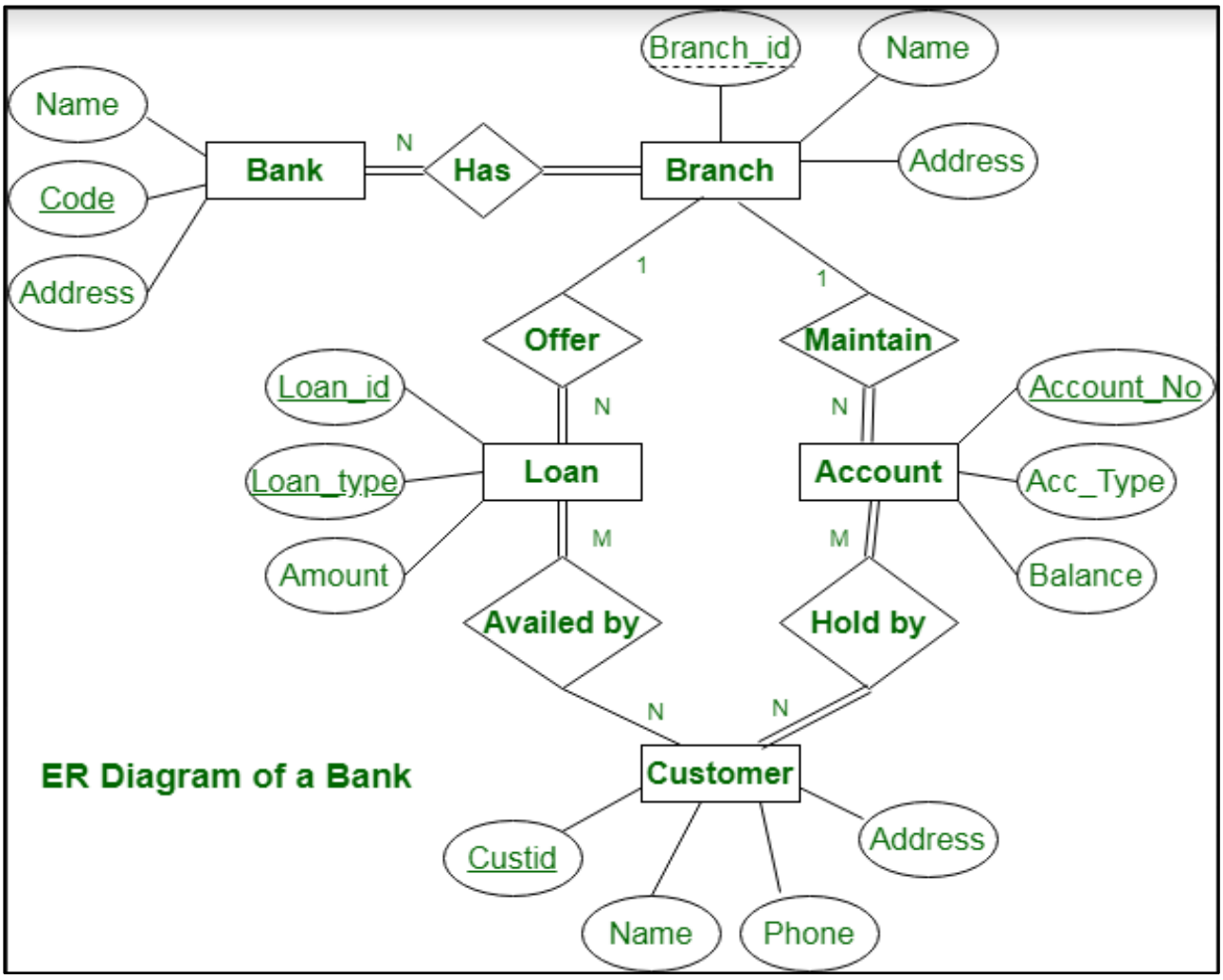
EXAMPLE-1: ER DIAGRAM OF BANK MANAGEMENT SYSTEM



EXAMPLE-2: MORE DETAILED ER DIAGRAM OF BANK MANAGEMENT SYSTEM

ER diagram of Bank has the following description:

- Bank have Customer.
- Banks are identified by a name, code, address of main office.
- Banks have branches.
- Branches are identified by a branch_no., branch_name, address.
- Customers are identified by name, cust-id, phone number, address.
- Customer can have one or more accounts.
- Accounts are identified by acc_no., acc_type, balance.
- Customer can avail loans.
- Loans are identified by loan_id, loan_type and amount.
- Account and loans are related to bank's branch.



Entities and their **Attributes** are :

- **Bank Entity :** Attributes of Bank Entity are Bank Name, Code and Address. Code is Primary Key for Bank Entity.

- **Customer Entity :** Attributes of Customer Entity are Customer_id, Name, Phone Number and Address.
  Customer_id is Primary Key for Customer Entity.
- **Branch Entity :** Attributes of Branch Entity are Branch_id, Name and Address.
  Branch_id is Primary Key for Branch Entity.
- **Account Entity :** Attributes of Account Entity are Account_number, Account_Type and Balance.
  Account_number is Primary Key for Account Entity.
- **Loan Entity :** Attributes of Loan Entity are Loan_id, Loan_Type and Amount.
  Loan_id is Primary Key for Loan Entity.

Relationships are :

- **Bank has Branches => 1 : N**
  One Bank can have many Branches but one Branch can not belong to many Banks, so the relationship between Bank and Branch is one to many relationship.

- **Branch maintain Accounts => 1 : N**
  One Branch can have many Accounts but one Account can not belong to many Branches, so the relationship between Branch and Account is one to many relationship.

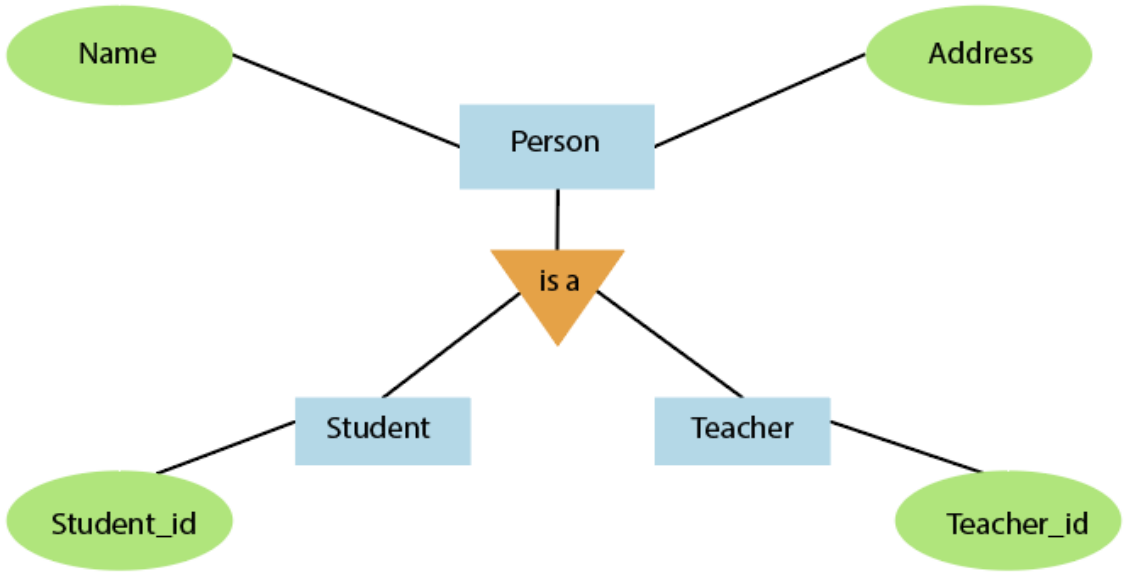
- **Branch offer Loans => 1 : N**
  One Branch can have many Loans but one Loan can not belong to many Branches, so the relationship between Branch and Loan is one to many relationship.

- **Account held by Customers => M : N**
  One Customer can have more than one Accounts and also One Account can be held by one or more Customers, so the relationship between Account and Customers is many to many relationship.

- **Loan availed by Customer => M : N**
  (Assume loan can be jointly held by many Customers).
  One Customer can have more than one Loans and also One Loan can be availed by one or more Customers, so the relationship between Loan and Customers is many to many relationship.

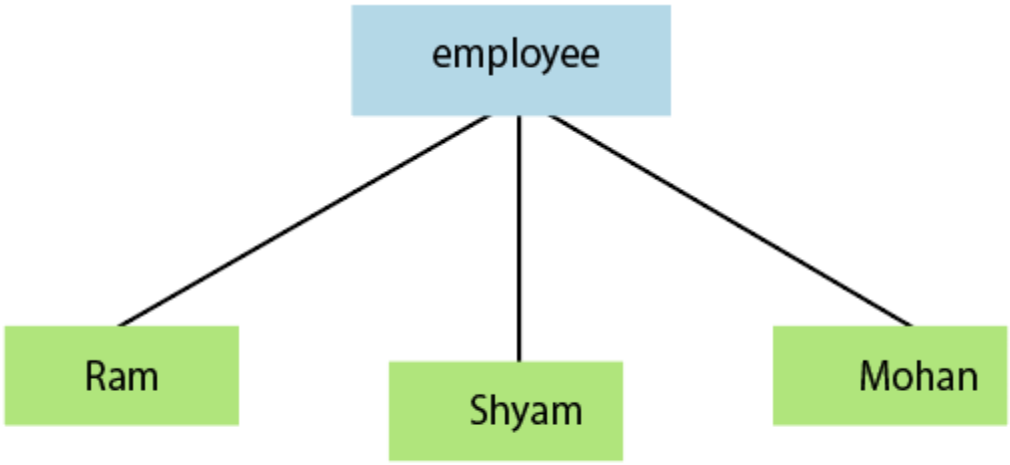
EER Diagram

Generalization is a bottom-up approach in which the common attributes of two or more lower-level entities combines to form a new higher-level entity.
According to the below diagram, there are two entities, namely **teacher** and **student**. The teacher entity contains attributes such as **teacher_id, name, and address** and student entity include **student_id, name, and address**. A lower-level entity is called a subclass, and the higher-level entity is called a superclass. So, the **person** entity is the superclass of two subclasses **teacher** and **student**.



Generalisation

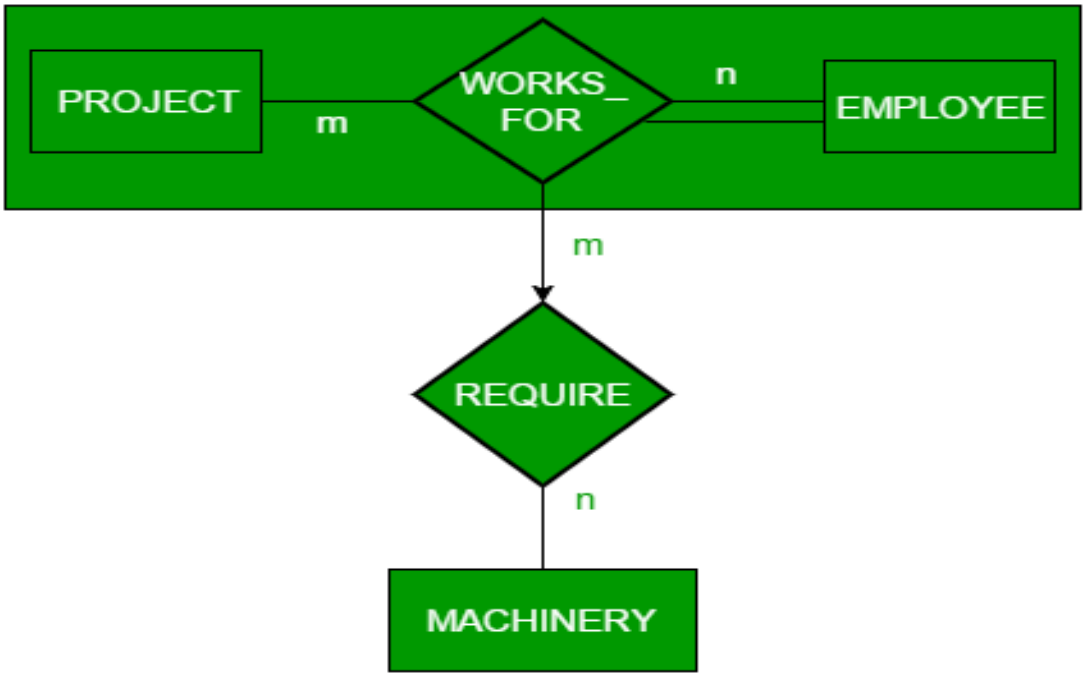
Specialization: It is opposite or inverse of generalization. A specialization is a top-down approach in which an entity of higher-level entity is broken down into two or more entities of lower level. In the below example, it can be seen that the **employee** is a high-level entity which is divided into three sub-entities (Ram, Shyam, and Mohan). The sub-entities are the names of the employees (relating to the high-level entity). Therefore, splitting a high-level entity into a low-level entity is called **specialization**.



Specialisation

DBMS Aggregation

Through the Entity-Relationship model, we cannot express a relationship set with another relationship set. Thus we use the concept of aggregation to express it. Aggregation is an abstraction in which the relationship between two entities is treated as a higher-level entity. It allows you to indicate that a relationship set participates in another relationship set.



Aggregation

IT/DBMSL: D-05	**Group B: MySQL:** Perform Relational, Boolean, Arithmetic, Set operators, Group Functions, Date, time, complex queries SQL queries	**Pages**	6-11
Experiment No: 7	**Semester – II**	**Rev.: 00**	**Date: 18/12/2017**

ASSIGNMENT STATEMENT:
Group B: MySQL
Perform following SQL queries on the database:

- Implementation of relational operators in SQL
- Boolean operators and pattern matching
- Arithmetic operations and built in functions
- Group functions
- Processing Date and Time functions
- Complex queries and set operators

THEORY:

I)SQL ARITHMETIC OPERATORS:
+ (Addition), - (Subtraction), * (Multiplication), / (Division), % (Modulus)

II)SQL COMPARISON OPERATORS:
=, !=, <>, >, <, >=, <=, !<, !>

III)SQL LOGICAL OPERATORS:
ALL, ANY, BETWEEN, EXISTS, IN, NOT, IS NULL, UNIQUE

iv)SQL: RELATIONAL OPERATORS: AND, OR
Consider the CUSTOMERS table having the following records −

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

The AND Operator

```
SQL> SELECT ID, NAME, SALARY
FROM CUSTOMERS
WHERE SALARY > 2000 AND age < 25;
```

This would produce the following result −

```
+----+-------+----------+
| ID | NAME  | SALARY   |
+----+-------+----------+
|  6 | Komal |  4500.00 |
|  7 | Muffy | 10000.00 |
+----+-------+----------+
```

The OR Operator

```
SQL> SELECT ID, NAME, SALARY
FROM CUSTOMERS
WHERE SALARY > 2000 OR age < 25;
```

This would produce the following result –

```
+----+----------+----------+
| ID | NAME     | SALARY   |
+----+----------+----------+
|  3 | kaushik  |  2000.00 |
|  4 | Chaitali |  6500.00 |
|  5 | Hardik   |  8500.00 |
|  6 | Komal    |  4500.00 |
|  7 | Muffy    | 10000.00 |
+----+----------+----------+
```

The ARITHMETIC Operators

```
SQL> SELECT * FROM CUSTOMERS
WHERE SALARY = SALARY + 1000;
```

Consider the CUSTOMERS table having the following records −

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  3000.00 |
|  2 | Khilan   |  25 | Delhi     |  2500.00 |
|  3 | kaushik  |  23 | Kota      |  3000.00 |
|  4 | Chaitali |  25 | Mumbai    |  7500.00 |
|  5 | Hardik   |  27 | Bhopal    |  9500.00 |
|  6 | Komal    |  22 | MP        |  5500.00 |
|  7 | Muffy    |  24 | Indore    | 11000.00 |
+----+----------+-----+-----------+----------+
```

V)SQL - GROUP BY

Employees

employee_number	last_name	first_name	salary	dept_id
1001	Smith	John	62000	500
1002	Anderson	Jane	57500	500
1003	Everest	Brad	71000	501
1004	Horvath	Jack	42000	501

```
SELECT dept_id, SUM(salary) AS total_salaries
FROM employees
GROUP BY dept_id;
```

There will be 2 records selected. These are the results that you should see:

dept_id	total_salaries
500	119500
501	113000

VI)SQL - LIKE CLAUSE FOR PATTERN MATCHING

Let us take a real example, consider the CUSTOMERS table

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Display all from the CUSTOMERS table, where the SALARY starts with 200.

```
SQL> SELECT * FROM CUSTOMERS
WHERE SALARY LIKE '200%';
```

This would produce the following result –

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
+----+----------+-----+-----------+----------+
```

Examples:

The following table has a few examples showing the WHERE part having different LIKE clause with '%' and '_' operators

Sr.No.	Statement & Description
1	**WHERE SALARY LIKE '200%'** Finds any values that start with 200.
2	**WHERE SALARY LIKE '%200%'** Finds any values that have 200 in any position.
3	**WHERE SALARY LIKE '_00%'** Finds any values that have 00 in the second and third positions.
4	**WHERE SALARY LIKE '2_%_%'** Finds any values that start with 2 and are at least 3 characters in length.
5	**WHERE SALARY LIKE '%2'** Finds any values that end with 2.
6	**WHERE SALARY LIKE '_2%3'** Finds any values that have a 2 in the second position and end with a 3.
7	**WHERE SALARY LIKE '2___3'** Finds any values in a five-digit number that start with 2 and end with 3.

VII)SQL SET OPERATIONS

SQL - UNIONS CLAUSE

```
SQL>select * from hostel1
    UNION
Select * from hostel2'
```

SQL INTERSECT Operation

```
SQL>select * from hostel1
     INTERSECT
Select * from hostel2'
```

SQL MiNUS Operation

```
SQL>select * from hostel1
      MINUS
Select * from hostel2'
```

VIII)SQL NESTED QUERIES OR COMPLEX QUERIES

Consider the CUSTOMERS table having the following records –

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  35 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Now, let us check the following subquery with a SELECT statement.

```
SQL> SELECT *
   FROM CUSTOMERS
   WHERE ID IN (SELECT ID FROM CUSTOMERS WHERE SALARY > 4500) ;
```

This would produce the following result.

```
+----+----------+-----+---------+----------+
| ID | NAME     | AGE | ADDRESS | SALARY   |
+----+----------+-----+---------+----------+
|  4 | Chaitali |  25 | Mumbai  |  6500.00 |
|  5 | Hardik   |  27 | Bhopal  |  8500.00 |
|  7 | Muffy    |  24 | Indore  | 10000.00 |
+----+----------+-----+---------+----------+
```

IX)SQL DATE AND TIME

- DATE - format YYYY-MM-DD
- DATETIME - format: YYYY-MM-DD HH:MI:SS
- TIMESTAMP - format: YYYY-MM-DD HH:MI:SS
- YEAR - format YYYY or YY

EXAMPLE :
SELECT DATE("2017-06-15 09:34:21");

Result:
2017-06-15

SELECT * FROM Orders WHERE OrderDate='2008-11-11'

IT/DBMSL: D-05	**Group B: MySQL:** Create Table with primary key and foreign key constraints. a. Alter table with add n modify b. Drop table	**Pages**	6-11
Experiment No: 6	**Semester – II**	**Rev.: 00**	**Date: 18/12/2017**

ASSIGNMENT STATEMENT:
Group B: MySQL
Create Table with primary key and foreign key constraints.
a. Alter table with add n modify b. Drop table

THEORY:
The queries are shown with example database:

CREATE TABLE WITH PRIMARY KEY:

```
SQL> CREATE TABLE CUSTOMERS(
  ID   INT NOT NULL,NAME VARCHAR (20) NOT NULL,
  AGE INT  NOT NULL, ADDRESS  CHAR (25) ,
  SALARY   DECIMAL (18, 2), PRIMARY KEY (ID));
```

ID is Primary Key

You can verify if your table has been created successfully by using the **DESC** command as follows –

```
SQL> DESC CUSTOMERS;
+---------+---------------+------+-----+---------+-------+
| Field   | Type          | Null | Key | Default | Extra |
+---------+---------------+------+-----+---------+-------+
| ID      | int(11)       | NO   | PRI |         |       |
| NAME    | varchar(20)   | NO   |     |         |       |
| AGE     | int(11)       | NO   |     |         |       |
| ADDRESS | char(25)      | YES  |     | NULL    |       |
| SALARY  | decimal(18,2) | YES  |     | NULL    |       |
+---------+---------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

SQL INSERT INTO Statement
Example:

The following statements would create six records in the CUSTOMERS table.

```
INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)
VALUES (1, 'Ramesh', 32, 'Ahmedabad', 2000.00 );

INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)
VALUES (2, 'Khilan', 25, 'Delhi', 1500.00 );

INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)
VALUES (3, 'kaushik', 23, 'Kota', 2000.00 );

INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)
VALUES (4, 'Chaitali', 25, 'Mumbai', 6500.00 );

INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)
VALUES (5, 'Hardik', 27, 'Bhopal', 8500.00 );

INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY)
VALUES (6, 'Komal', 22, 'MP', 4500.00 );
```

Above statements give records in the CUSTOMERS table as shown below.

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
+----+----------+-----+-----------+----------+
```

SQL - SELECT Query

```
SQL> SELECT * FROM CUSTOMERS;
```

This would produce the result as shown below.

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
+----+----------+-----+-----------+----------+
```

SQL - ALTER TABLE Command

Consider the CUSTOMERS table having the following records −

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Following is the example to DROP Salary column from the existing table.

```
ALTER TABLE CUSTOMERS DROP SALARY;
```

The complete COLUMN SALARY with it's values will be deleted

```
ALTER TABLE CUSTOMERS ADD RESULT char(10);
```

The column RESULT will be added in the table

SQL - ALTER TABLE Command with ADD

ALTER TABLE Customers
ADD Email varchar(255);

SQL **DROP DATABASE**

```
SQL> DROP DATABASE Employee
```

```
SQL> SHOW DATABASES;
+--------------------+
| Database           |
+--------------------+
| BeginnersBook      |
| AbcTemp            |
| Customers          |
| Student            |
| Faculty            |
| MyTest             |
| Demo               |
+--------------------+
8 rows in set (0.00 sec)
```

SQL FOREIGN KEY on CREATE TABLE

A foreign key is a key used to link two tables together. This is sometimes also called as a referencing key.

A Foreign Key is a column or a combination of columns whose values match a Primary Key in a different table.

The relationship between 2 tables matches the Primary Key in one of the tables with a Foreign Key in the second table.

If a table has a primary key defined on any field(s), then you cannot have two records having the same value of that field(s).

Example:
Consider the structure of the following two tables.

CUSTOMERS table

```
CREATE TABLE CUSTOMERS(
   ID   INT              NOT NULL,
   NAME VARCHAR (20)     NOT NULL,
   AGE  INT              NOT NULL,
   ADDRESS  CHAR (25) ,
   SALARY   DECIMAL (18, 2),
   PRIMARY KEY (ID)
);
```

ORDERS table

```
CREATE TABLE ORDERS (
   ID         INT       NOT NULL,
   DATE       DATETIME,
   CUSTOMER_ID INT references CUSTOMERS(ID),
   AMOUNT     double,
   PRIMARY KEY (ID)
);
```

CUSTOMER_ID of ORDERS table matches with **ID** of CUSTOMERS table. This is set by **references** keyword i.e. **referencing key** i.e. **foreign key.**

IT/DBMSL: D-05	Group B: MySQL:Execute DDL/DML statements which demonstrate the use of views.	Pages	6-11
Experiment No: 8	Semester – II	Rev.: 00	Date:18/12/2017

ASSIGNMENT STATEMENT:
Group B: MySQL
Execute DDL/DML statements which demonstrate the use of views. Try to update the base table using its corresponding view. Also consider restrictions on updatable views and perform view creation from multiple tables.

THEORY:

VIEWS IN DBMS
Views in SQL are kind of virtual tables. A view also has rows and columns as they are in a real table in the database. We can create a view by selecting fields from one or more tables present in the database. A View can either have all the rows of a table or specific rows based on certain condition.

CREATING VIEWS

Database views are created using the **CREATE VIEW** statement. Views can be created from a single table, multiple tables or another view.

To create a view, a user must have the appropriate system privilege according to the specific implementation.

Example

Consider the CUSTOMERS table having the following records –

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Following is an example to create a view from the CUSTOMERS table. This view would be used to have customer name and age from the CUSTOMERS table.

```
SQL > CREATE VIEW CUSTOMERS_VIEW AS
SELECT name, age
FROM  CUSTOMERS;
```

Now, you can query CUSTOMERS_VIEW in a similar way as you query an actual table. Following is an example for the same.

```
SQL > SELECT * FROM CUSTOMERS_VIEW;
```

This would produce the following result.

```
+----------+-----+
| name     | age |
+----------+-----+
| Ramesh   |  32 |
| Khilan   |  25 |
| kaushik  |  23 |
| Chaitali |  25 |
| Hardik   |  27 |
| Komal    |  22 |
| Muffy    |  24 |
+----------+-----+
```

Updating a View

A view can be updated under certain conditions which are given below −

- The SELECT clause may not contain the keyword DISTINCT.
- The SELECT clause may not contain summary functions.
- The SELECT clause may not contain set functions.
- The SELECT clause may not contain set operators.
- The SELECT clause may not contain an ORDER BY clause.
- The FROM clause may not contain multiple tables.
- The WHERE clause may not contain subqueries.
- The query may not contain GROUP BY or HAVING.
- Calculated columns may not be updated.
- All NOT NULL columns from the base table must be included in the view in order for the INSERT query to function.

So, if a view satisfies all the above-mentioned rules then you can update that view. The following code block has an example to update the age of Ramesh.

```
SQL > UPDATE CUSTOMERS_VIEW
   SET AGE = 35
   WHERE name = 'Ramesh';
```

This would ultimately update the base table CUSTOMERS and the same would reflect in the view itself. Now, try to query the base table and the SELECT statement would produce the following result.

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  35 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Inserting Rows into a View

Rows of data can be inserted into a view. The same rules that apply to the UPDATE command also apply to the INSERT command. Here, we cannot insert rows in the CUSTOMERS_VIEW because we have not included all the NOT NULL columns in this view, otherwise you can insert rows in a view in a similar way as you insert them in a table.

Deleting Rows into a View

Rows of data can be deleted from a view. The same rules that apply to the UPDATE and INSERT commands apply to the DELETE command.

Following is an example to delete a record having AGE = 22.

```
SQL > DELETE FROM CUSTOMERS_VIEW
  WHERE age = 22;
```

This would ultimately delete a row from the base table CUSTOMERS and the same would reflect in the view itself. Now, try to query the base table and the SELECT statement would produce the following result.

```
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  35 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  7 | Muffy    |  24 | Indore    | 10000.00 |
+----+----------+-----+-----------+----------+
```

Dropping Views

Obviously, where you have a view, you need a way to drop the view if it is no longer needed. The syntax is very simple and is given below –

Following is an example to drop the CUSTOMERS_VIEW from the CUSTOMERS table.

```
DROP VIEW CUSTOMERS_VIEW;
```

IT/DBMSL: D-05	Group C: PL/SQL:PL/SQL stored procedure and function	Pages	6-11
Experiment No: 9	Semester – II	Rev.: 00	Date:18/12/2017

ASSIGNMENT STATEMENT:
Group C: PL/SQL: Write and execute PL/SQL stored procedure and function to perform a suitable task on the database. Demonstrate its use.

THEORY:

PL/SQL – Procedure

Function:
Function, in computer programming language context, a set of instructions which takes some input and performs certain tasks. In PL/SQL, a function returns a value.

Procedure:
Procedure, as well, is a set of instructions which takes input and performs certain task. In SQL, procedure does not return a value.

Example1:

```
DECLARE
   a number;
   b number;
   c number;
PROCEDURE findMin(x IN number, y IN number, z OUT number) IS
BEGIN
   IF x < y THEN
      z:= x;
   ELSE
      z:= y;
   END IF;
END;


BEGIN
   a:= 23;
   b:= 45;
   findMin(a, b, c);
   dbms_output.put_line(' Minimum of (23, 45) : ' || c);
END;
/
```

```
Minimum of (23, 45) : 23
```

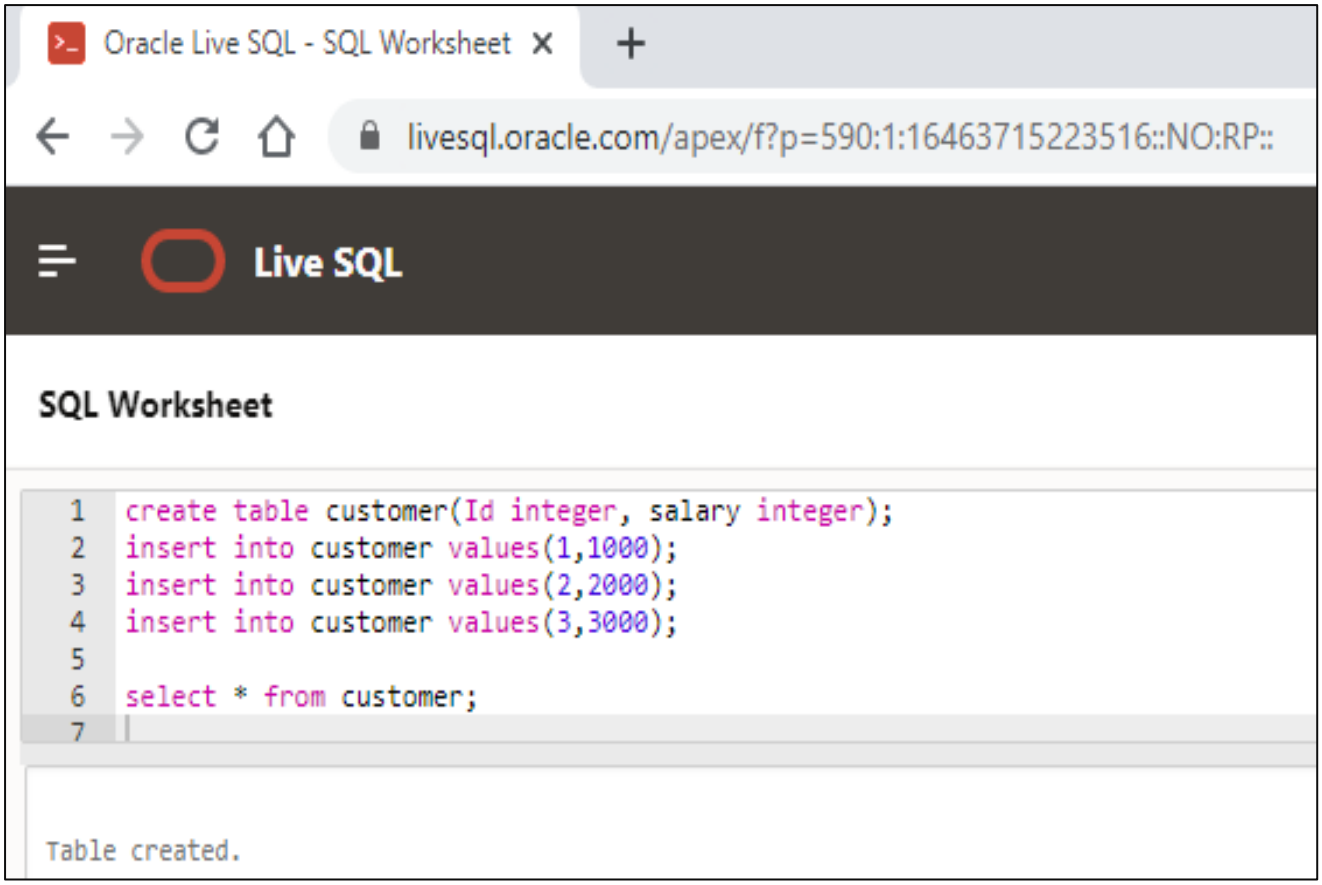
IT/DBMSL: D-05	**Group C: PL/SQL:** Triggers in PL/SQL	**Pages**	6-11
Experiment No: 10	**Semester – II**	**Rev.: 00**	**Date: 18/12/2017**

ASSIGNMENT STATEMENT:
Group C: PL/SQL: Write and execute suitable database triggers .Consider row level and statement level triggers.

THEORY:

Trigger: A trigger is a stored procedure in database which automatically invokes whenever a special event in the database occurs. For example, a trigger can be invoked when a row is inserted into a specified table or when certain table columns are being updated. Trigger is **EVENT-CONDITION-ACTION** Model

Example:
To create-Insert-Select Queries using Live Oracle SQL



Similarly Trigger program is executed using LIVE ORACLE SQL:

Example:

```
Select * from customers;
+----+----------+-----+-----------+----------+
| ID | NAME     | AGE | ADDRESS   | SALARY   |
+----+----------+-----+-----------+----------+
|  1 | Ramesh   |  32 | Ahmedabad |  2000.00 |
|  2 | Khilan   |  25 | Delhi     |  1500.00 |
|  3 | kaushik  |  23 | Kota      |  2000.00 |
|  4 | Chaitali |  25 | Mumbai    |  6500.00 |
|  5 | Hardik   |  27 | Bhopal    |  8500.00 |
|  6 | Komal    |  22 | MP        |  4500.00 |
+----+----------+-----+-----------+----------+
```

```
CREATE OR REPLACE TRIGGER display_salary_changes
BEFORE DELETE OR INSERT OR UPDATE ON customers
FOR EACH ROW
WHEN (NEW.ID > 0)
DECLARE
  sal_diff number;
BEGIN
  sal_diff := :NEW.salary  - :OLD.salary;
  dbms_output.put_line('Old salary: ' || :OLD.salary);
  dbms_output.put_line('New salary: ' || :NEW.salary);
  dbms_output.put_line('Salary difference: ' || sal_diff);
END;
/
```

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

```
Trigger created.
```

```
UPDATE customers
SET salary = salary + 500
WHERE id = 2;
```

When a record is updated in the CUSTOMERS table, the above create trigger, **display_salary_changes** will be fired and it will display the following result –

```
Old salary: 1500
New salary: 2000
Salary difference: 500
```

IT/DBMSL: D-05	Group C: PL/SQL: cursor in PL/SQL	Pages	6-11
Experiment No: 11	Semester – II	Rev.: 00	Date: 18/12/2017

ASSIGNMENT STATEMENT:
Group C: PL/SQL: Write a PL/SQL block to implement all types of cursor.

THEORY:

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**.

There are two types of cursors −

- Implicit cursors
- Explicit cursors

Implicit Cursors

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.

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**.

S.No	Attribute & Description
1	**%FOUND** Returns TRUE if an INSERT, UPDATE, or DELETE statement affected one or more rows or a SELECT INTO statement returned one or more rows. Otherwise, it returns FALSE.
2	**%NOTFOUND** The logical opposite of %FOUND. It returns TRUE if an INSERT, UPDATE, or DELETE statement affected no rows, or a SELECT INTO statement returned no rows. Otherwise, it returns FALSE.
3	**%ISOPEN** Always returns FALSE for implicit cursors, because Oracle closes the SQL cursor automatically after executing its associated SQL statement.
4	**%ROWCOUNT** Returns the number of rows affected by an INSERT, UPDATE, or DELETE statement, or returned by a SELECT INTO statement.

Example:

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 −

Select * from customers;

ID	NAME	AGE	ADDRESS	SALARY
1	Ramesh	32	Ahmedabad	2000.00
2	Khilan	25	Delhi	1500.00
3	kaushik	23	Kota	2000.00
4	Chaitali	25	Mumbai	6500.00
5	Hardik	27	Bhopal	8500.00
6	Komal	22	MP	4500.00

```
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;
/
```

```
6 customers selected

PL/SQL procedure successfully completed.
```

Select * from customers;

ID	NAME	AGE	ADDRESS	SALARY
1	Ramesh	32	Ahmedabad	2500.00
2	Khilan	25	Delhi	2000.00
3	kaushik	23	Kota	2500.00
4	Chaitali	25	Mumbai	7000.00
5	Hardik	27	Bhopal	9000.00
6	Komal	22	MP	5000.00

Explicit Cursors:

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.
The syntax for creating an explicit cursor is –

```
CURSOR cursor_name IS select_statement;
```

Working with an explicit cursor includes the following steps −

- Declaring the cursor for initializing the memory
- Opening the cursor for allocating the memory
- Fetching the cursor for retrieving the data
- Closing the cursor to release the allocated memory
-

Declaring the Cursor

Declaring the cursor defines the cursor with a name and the associated SELECT statement. For example –

```
CURSOR c_customers IS
   SELECT id, name, address FROM customers;
```

Opening the Cursor

Opening the cursor allocates the memory for the cursor and makes it ready for fetching the rows returned by the SQL statement into it. For example, we will open the above defined cursor as follows –

```
OPEN c_customers;
```

Fetching the Cursor

Fetching the cursor involves accessing one row at a time. For example, we will fetch rows from the above-opened cursor as follows –

```
FETCH c_customers INTO c_id, c_name, c_addr;
```

Closing the Cursor

Closing the cursor means releasing the allocated memory. For example, we will close the above-opened cursor as follows −

```
CLOSE c_customers;
```

Example

```
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 –

```
1 Ramesh Ahmedabad
2 Khilan Delhi
3 kaushik Kota
4 Chaitali Mumbai
5 Hardik Bhopal
6 Komal MP
```