



**SAVEETHA SCHOOL OF ENGINEERING
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CHENNAI – 602105**



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CSA05 Database Management Systems

LAB MANUAL

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Ex.No. 1

Date:

DDL Commands – CREATE, ALTER, DROP

Aim:

To Create, Alter and Drop the table using Data Definition Language.

Description:

Data Definition Language (DDL) statements are used to define the database structure or schema.

DDL Commands: Create, Alter, Drop, Rename, Truncate

- CREATE - to create objects in the database
- ALTER - alters the structure of the database
- DROP - delete objects from the database
- TRUNCATE - remove all records from a table, including all spaces allocated for the records are removed
- RENAME - rename an object

SYNTAX:

CREATE TABLE

```
CREATE TABLE table_name  
(  
column_name1 data_type,  
column_name2 data_type,  
column_name3 data_type,  
....  
);
```

ALTER A TABLE

To add a column in a table

```
ALTER TABLE table_name  
ADD column_namdatatype;
```

To delete a column in a table

```
ALTER TABLE table_name  
DROP COLUMN column_name;
```

DROP TABLE

```
DROP TABLE table_name;
```

TRUNCATE TABLE

```
TRUNCATE TABLE table_name;
```

Questions:

1) Create a table name STUDENT with following structure.

	Column #Name	Description	Data Type
1	RegNo	Registration Number	NUMBER(3)
2	Name	Student Name	VARCHAR(15)
3	Gender	Gender of the student	CHAR(1)
4	DOB	Date of Birth	DATE
5	MobileNo	Mobile Number	NUMBER(10)
6	City	Location of stay	VARCHAR(15)

OUTPUTS:

1)

```
mysql> create table student(Regno int(3),Name char(15),gender char(1),Dob int(10),mobilen no int(10),city char(10));
Query OK, 0 rows affected (0.14 sec)

mysql> desc student;
+-----+-----+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Regno | int(3) | YES  |     | NULL    |       |
| Name  | char(15) | YES  |     | NULL    |       |
| gender | char(1) | YES  |     | NULL    |       |
| Dob   | int(10) | YES  |     | NULL    |       |
| mobilen o | int(10) | YES  |     | NULL    |       |
| city  | char(10) | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)
```

2)

```
mysql> create table faculty(Facno int(3),FacName char(15),gender char(1),Dob int(10),mobilen no int(10),DOJ int(10));
Query OK, 0 rows affected (0.06 sec)

mysql> desc faculty;
+-----+-----+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Facno | int(3) | YES  |     | NULL    |       |
| FacName | char(15) | YES  |     | NULL    |       |
| gender | char(1) | YES  |     | NULL    |       |
| Dob   | int(10) | YES  |     | NULL    |       |
| mobilen no | int(10) | YES  |     | NULL    |       |
| DOJ   | int(10) | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)
```

3)

```
mysql> create table department(deptno int(10),deptname char(10),depthead char(10));
Query OK, 0 rows affected (0.11 sec)

mysql> desc department;
+-----+-----+-----+-----+-----+-----+
| Field      | Type      | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| deptno     | int(10)   | YES  |     | NULL    |       |
| deptname   | char(10)  | YES  |     | NULL    |       |
| depthead   | char(10)  | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
3 rows in set (0.00 sec)
```

4)

```
mysql> create table course(courseno int(3),coursedesc char(15),coursetype char(1),semno int(10),hallno int(10),facno int(10));
Query OK, 0 rows affected (0.09 sec)

mysql> desc course;
+-----+-----+-----+-----+-----+-----+
| Field      | Type      | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| courseno   | int(3)    | YES  |     | NULL    |       |
| coursedesc | char(15)  | YES  |     | NULL    |       |
| coursetype | char(1)   | YES  |     | NULL    |       |
| semno      | int(10)   | YES  |     | NULL    |       |
| hallno     | int(10)   | YES  |     | NULL    |       |
| facno      | int(10)   | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)
```

5) Modify the table FACULTY by adding a column name DeptNo of datatype VARCHAR(4)

```
mysql> alter table faculty add dept char(10);
Query OK, 2 rows affected (0.09 sec)
Records: 2  Duplicates: 0  Warnings: 0

mysql> desc faculty;
+-----+-----+-----+-----+-----+-----+
| Field      | Type      | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Facno      | int(3)    | NO   | PRI | NULL    |       |
| FacName    | char(15)  | YES  |     | NULL    |       |
| gender     | char(1)   | YES  |     | NULL    |       |
| Dob        | int(10)   | YES  |     | NULL    |       |
| mobileno   | int(10)   | YES  |     | NULL    |       |
| DOJ        | int(10)   | YES  |     | NULL    |       |
| dept       | char(10)  | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
7 rows in set (0.00 sec)
```

RESULT:

Tables are created, altered and modified using DDL commands.

Ex.No. 2

Date:

DDL Commands with Constraints – PRIMARY, FOREIGN KEY, UNIQUE, CHECK

AIM:

To add the constraints like primary key, foreign key, unique key and check using DDL commands.

Description:

PRIMARY KEY:

The PRIMARY KEY constraint uniquely identifies each record in a database table.

Primary keys must contain UNIQUE values, and cannot contain NULL values.

A table can have only one primary key, which may consist of single or multiple fields.

FOREIGN KEY:

A FOREIGN KEY is a key used to link two tables together.

A FOREIGN KEY is a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table.

The table containing the foreign key is called the child table, and the table containing the candidate key is called the referenced or parent table.

UNIQUE Constraint:

The UNIQUE constraint ensures that all values in a column are different.

Both the UNIQUE and PRIMARY KEY constraints provide a guarantee for uniqueness for a column or set of columns.

A PRIMARY KEY constraint automatically has a UNIQUE constraint.

However, you can have many UNIQUE constraints per table, but only one PRIMARY KEY constraint per table.

CHECK Constraint:

The CHECK constraint is used to limit the value range that can be placed in a column

If you define a CHECK constraint on a single column it allows only certain values for this column.

If you define a CHECK constraint on a table it can limit the values in certain columns based on values in other columns in the row.

PRIMARY:

```
ALTER TABLE table_name  
ADD PRIMARY KEY(primary_key_column);
```

FOREIGN KEY:

```
ALTER TABLE table_name  
ADD CONSTRAINT constraint_name  
FOREIGN KEY foreign_key_name (columns)  
REFERENCES parent_table(columns)  
ON DELETE action  
ON UPDATE action
```

UNIQUE:

```
CREATE TABLE table_1(  
...  
column_name_1 data_type,  
...  
UNIQUE(column_name_1)  
);
```

CHECK

```
CREATE TABLE IF NOT EXISTS parts (  
part_no VARCHAR(18) PRIMARY KEY,  
description VARCHAR(40),  
cost DECIMAL(10 , 2 ) NOT NULL CHECK(cost > 0), price DECIMAL (10,2) NOT  
NULL  
);
```

Questions:

1) Alter the table STUDENT with following structure.

	Column #Name	Constraints
	1RegNo	PRIMARY KEY
	2MobileNo	NOT NULL

2) Alter the table name FACULTY with following structure. The DeptNo in this table refers the DeptNo in the DEPARTMENT table.

#	Column Name	Constraints
	FacNo	PRIMARY

1		KEY
2	Gender	CHECK 'M' or 'F'

3)After the FACULTY table is successfully created, test if you can add a constraint FOREIGN KEY to the DeptNo of this table.

4)Alter the table name DEPARTMENT with following structure.

#	Column Name	Constraint
1	DeptNo	PRIMARY KEY

5) Alter the table name COURSE with following structure.

#	Column Name	Constraint
1	CourseNo	PRIMARY KEY
2	SemNo	1 to 6

OUTPUTS:

1)

```
mysql> alter table student add primary key(city);
Query OK, 0 rows affected (0.14 sec)
mysql> desc student;
```

Field	Type	Null	Key	Default	Extra
Regno	int(3)	YES		NULL	
Name	char(15)	YES		NULL	
gender	char(1)	YES		NULL	
Dob	int(10)	YES		NULL	
mobilen0	int(10)	YES		NULL	
city	char(10)	NO	PRI	NULL	

```
6 rows in set (0.00 sec)
```



```
mysql> alter table faculty add primary key(facno);
Query OK, 0 rows affected (0.07 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> alter table faculty add check(gender='M'or'F');
Query OK, 0 rows affected (0.06 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> desc faculty;
+-----+-----+-----+-----+-----+-----+
| Field      | Type      | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Facno      | int(3)    | NO   | PRI | NULL    |       |
| FacName    | char(15)  | YES  |     | NULL    |       |
| gender     | char(1)   | YES  |     | NULL    |       |
| Dob        | int(10)   | YES  |     | NULL    |       |
| mobileno   | int(10)   | YES  |     | NULL    |       |
| DOJ        | int(10)   | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)
```

4)Alter the table name DEPARTMENT with following structure.

#	Column Name	Constraint
1	DeptNo	PRIMARY KEY

```
mysql> alter table department add primary key(deptno);
Query OK, 0 rows affected (0.11 sec)

mysql> desc department;
+-----+-----+-----+-----+-----+-----+
| Field      | Type      | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| deptno     | int(10)   | NO   | PRI | NULL    |       |
| deptname   | char(10)  | YES  |     | NULL    |       |
| depthead   | char(10)  | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
3 rows in set (0.00 sec)
```

5)After the FACULTY table is successfully created, test if you can add a constraint FOREIGN KEY to the DeptNo of this table.

```
mysql> alter table course add primary key(courseno);
Query OK, 0 rows affected (0.07 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> alter table course add check(semno>=1&&semno<=6);
Query OK, 0 rows affected (0.11 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> desc course;
```

Field	Type	Null	Key	Default	Extra
courseno	int(3)	NO	PRI	NULL	
coursedesc	char(15)	YES		NULL	
coursetype	char(1)	YES		NULL	
semno	int(10)	YES		NULL	
hallno	int(10)	YES		NULL	
Facno	int(10)	YES		NULL	

```
6 rows in set (0.00 sec)
```

```
mysql> Alter table student2 ADD UNIQUE KEY(S1Name);
Query OK, 0 rows affected (0.07 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> desc student2;
```

Field	Type	Null	Key	Default	Extra
RegNo	int	NO	PRI	NULL	
S1Name	varchar(15)	YES	UNI	NULL	
Age	char(2)	YES		NULL	
MobileNo	int	YES		NULL	
address	varchar(15)	YES		NULL	

```
5 rows in set (0.00 sec)
```

```
mysql> Alter table student2 ADD PRIMARY KEY(RegNo);
Query OK, 0 rows affected (0.05 sec)
Records: 0 Duplicates: 0 Warnings: 0
```

```
mysql> desc student2;
```

Field	Type	Null	Key	Default	Extra
RegNo	int	NO	PRI	NULL	
S1Name	varchar(15)	YES		NULL	
Age	char(2)	YES		NULL	
MobileNo	int	YES		NULL	
address	varchar(15)	YES		NULL	

5 rows in set (0.01 sec)

```
mysql> desc student2;
```

Field	Type	Null	Key	Default	Extra
RegNo	int	NO	PRI	NULL	
S1Name	varchar(15)	YES	UNI	NULL	
Age	char(2)	YES		NULL	
MobileNo	int	YES		NULL	
address	varchar(15)	YES		NULL	

5 rows in set (0.00 sec)

```
mysql> create table student3(RegNo int(3),Name varchar(15));
Query OK, 0 rows affected, 1 warning (0.03 sec)
```

```
mysql> Alter table student3 ADD PRIMARY KEY(RegNo);
Query OK, 0 rows affected (0.05 sec)
Records: 0 Duplicates: 0 Warnings: 0
```

```
mysql> desc student3;
```

Field	Type	Null	Key	Default	Extra
RegNo	int	NO	PRI	NULL	
Name	varchar(15)	YES		NULL	

2 rows in set (0.00 sec)

```
mysql> Alter table student2 ADD FOREIGN KEY (RegNo) REFERENCES Student3(RegNo);
Query OK, 0 rows affected (0.08 sec)
Records: 0 Duplicates: 0 Warnings: 0
```

```
mysql> ALTER TABLE student1 modify address int not null;
Query OK, 0 rows affected (0.07 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> desc student1;
```

Field	Type	Null	Key	Default	Extra
RegNo	int	NO	PRI	NULL	
S1Name	varchar(15)	YES		NULL	
Age	char(2)	YES	UNI	NULL	
DOB	int	YES		NULL	
address	int	NO		NULL	

```
5 rows in set (0.00 sec)
```

Result:

DDL Commands with Primary, Foreign, Unique, Check constraints are updated and verified.

Ex.No. : 3

Date:

DML Commands – INSERT, SELECT, UPDATE, DELETE

Aim:

To perform Data Manipulation Language (DML) Commands such as INSERT, SELECT, UPDATE, DELETE in the table.

Description:

Data Manipulation Language (DML) statements are used for managing data within schema objects. DML Commands: Insert , Update, Delete, Select

- ☐ INSERT - insert data into a table ☐
- ☐ UPDATE - updates existing data within a table ☐
- ☐ ☐ DELETE - deletes all records from a table, the space for the records remain ☐
- ☐ SELECT - retrieve data from the a database ☐

INSERT:

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

UPDATE:

```
UPDATE table_name
SET column1=value, column2=value2,...
WHERE some_column=some_value;
```

DELETE:

```
DELETE FROM table_name
WHERE some_column=some_value;
```

SELECT:

```
SELECT column_name(s)
FROM table_name;
```

Questions:

1. Populate all the five tables with your own data.
2. Update the value of student name whose register number is '191711342'
3. Delete the record in the table FACULTY, who resigned her job.
4. Modify the date of birth for the faculty whose name is 'RAM' with a value '1983-05-01'.
5. Remove all faculty who are having over 65 years
6. View all the records from the five tables.

OUTPUTS:

1)

```
mysql> SELECT * FROM college;
+-----+-----+-----+-----+-----+-----+-----+
| sno | name | regno | dept | age | DOB | facno |
+-----+-----+-----+-----+-----+-----+-----+
| 1 | YUGA | 191811316 | cse | 19 | 2000 | 200 |
| 2 | SRI | 191811382 | cse | 19 | 2000 | 201 |
| 3 | ABDUL | 191811362 | cse | 20 | 1999 | 202 |
| 4 | SUPRIYA | 191811322 | cse | 20 | 1999 | 203 |
+-----+-----+-----+-----+-----+-----+-----+
4 rows in set (0.00 sec)

mysql> SELECT * FROM fac1;
+-----+-----+-----+-----+-----+-----+-----+
| FacNo | FacName | Gender | DOB | MobileNo | DOJ |
+-----+-----+-----+-----+-----+-----+-----+
| 1 | YUGA | M | 2000 | 123456789 | 2001 |
+-----+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)

mysql> SELECT * FROM department;
+-----+-----+-----+
| deptno | deptname | depthead |
+-----+-----+-----+
| 1 | cse | hari |
+-----+-----+-----+
1 row in set (0.00 sec)

mysql> insert into course values(1,'prgm','u',2000,201,2001);
Query OK, 1 row affected (0.00 sec)

mysql> select * from course;
+-----+-----+-----+-----+-----+-----+
| courseno | coursedesc | coursetype | semno | hallno | Facno |
+-----+-----+-----+-----+-----+-----+
| 1 | prgm | u | 2000 | 201 | 2001 |
+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

2)

```
mysql> update student set regno=324 where name='mukesh';
Query OK, 0 rows affected (0.03 sec)
```

3)

```
mysql> delete from faculty where FacName='Ramu';  
Query OK, 1 row affected (0.00 sec)
```

4)

```
mysql> select * from faculty;  
+-----+-----+-----+-----+-----+-----+  
| Facno | FacName | gender | Dob   | mobileno | DOJ   |  
+-----+-----+-----+-----+-----+-----+  
|      1 | ramu    | M      | 2000 | 90515252 | 2001 |  
+-----+-----+-----+-----+-----+-----+  
1 row in set (0.00 sec)
```

5)

```
mysql> delete from faculty where Facno='2';  
Query OK, 1 row affected (0.06 sec)
```

```
mysql> select * from faculty;  
+-----+-----+-----+-----+-----+-----+  
| Facno | FacName | gender | Dob   | mobileno | DOJ   |  
+-----+-----+-----+-----+-----+-----+  
|      1 | ramu    | M      | 2000 | 90515252 | 2001 |  
+-----+-----+-----+-----+-----+-----+  
1 row in set (0.00 sec)
```

6)

```
mysql> select * from student;  
+-----+-----+-----+  
| sno | column_name | constraints |  
+-----+-----+-----+  
|    1 | RegNo       |             |  
|    1 | RegNo       | xyz         |  
+-----+-----+-----+  
2 rows in set (0.03 sec)
```

```
mysql> select * from faculty;  
+-----+-----+-----+-----+-----+-----+  
| Facno | FacName | gender | Dob   | mobileno | DOJ   |  
+-----+-----+-----+-----+-----+-----+  
|      1 | ramu    | M      | 2000 | 90515252 | 2001 |  
+-----+-----+-----+-----+-----+-----+  
1 row in set (0.00 sec)
```

```
mysql> select * from course;  
+-----+-----+-----+-----+-----+-----+  
| courseno | coursedesc | coursetype | semno | hallno | Facno |  
+-----+-----+-----+-----+-----+-----+  
|          1 | prgm       | u          | 2000 | 201    | 2001 |  
+-----+-----+-----+-----+-----+-----+  
1 row in set (0.00 sec)
```

```
mysql> select * from department;  
+-----+-----+-----+  
| deptno | deptname | depthead |  
+-----+-----+-----+  
|        1 | cse      | vasu     |  
+-----+-----+-----+  
1 row in set (0.00 sec)
```

RESULT:

Data Manipulation Language (DML) Commands such as INSERT, SELECT, UPDATE, DELETE are performed in the five tables.

Ex. No.: 4

Date:

SELECT with various clause – WHERE, pattern matching

AIM:

To view the records from the tables using SELECT commands with WHERE Clause and Pattern matching.

DESCRIPTION:

The SELECT statement allows you to get the data from tables. A table consists of rows and columns like a spreadsheet. Often, you want to see a subset rows, a subset of columns, or a combination of two. The result of the SELECT statement is called a result set that is a list of rows, each consisting of the same number of columns.

SELECT:

```
SELECT
column_1, column_2, ...
FROM
table_1
[INNER | LEFT | RIGHT] JOIN table_2 ON conditions
WHERE
conditions
GROUP BY column_1
HAVING group_conditions
ORDER BY column_1
LIMIT offset, length;
```

The SELECT statement consists of several clauses as explained in the following list:

- SELECT followed by a list of comma-separated columns or an asterisk (*) to indicate that you want to return all columns.
- FROM specifies the table or view where you want to query the data.
- JOIN gets related data from other tables based on specific join conditions.
- WHERE clause filters row in the result set.
- GROUP BY clause groups a set of rows into groups and applies aggregate functions on each group.
- HAVING clause filters group based on groups defined by GROUP BY clause.
- ORDER BY clause specifies a list of columns for sorting.
- LIMIT constrains the number of returned rows.

Questions:

WHERE:

1. The student counsellor wanted to display the registration number, student name and date of birth for all the students.
2. The controller of examinations wanted to list all the female students
3. Who are the boy students registered for course with the course number “C001“
4. Display all faculty details joined before “November 2014”

5. Display all the courses not allotted to halls

LIKE:

6. List the students whose name ends with the substring “ma”
7. Display all students whose name contains the substring “ma”
8. Find all the students who are located in cities having “Sal” as substring
9. Display the students whose names do not contain six letters.
10. Find all the students whose names contains “th”

OUTPUTS:

1)

```
mysql> SELECT * FROM student;
```

sno	name	dept	age	DOB	Facno	gender
1	DHONI	cse	19	2000	7	M
2	virat	cse	19	2000	71	M
3	sindhu	cse	18	2001	71	F
4	VIJAY_DEVARAKONDA	cse	21	1998	3	M

4 rows in set (0.00 sec)

2)

```
mysql> select name from student where gender='f';
```

name
nani
ram

3)

```
mysql> select * from course;
```

courseno	coursedesc	coursetype	semno	hallno	Facno
1	prgm	u	2000	201	2001

1 row in set (0.00 sec)

4)

```
mysql> select * from course;
```

courseno	coursedesc	coursetype	semno	hallno	Facno
1	prgm	u	2000	201	2001

1 row in set (0.00 sec)

5)

```
mysql> select * from course;
```

courseno	coursedesc	coursetype	semno	hallno	Facno
1	prgm	u	2000	201	2001

1 row in set (0.00 sec)

6)

```
mysql> select * from student where name like '%sh';
```

7)

```
mysql> select * from student where name like 'ma%';
```

LIKE:

The LIKE operator is commonly used to select data based on patterns. Using the LIKE operator in the right way is essential to increase the query performance.

The LIKE operator allows you to select data from a table based on a specified pattern. Therefore, the LIKE operator is often used in the WHERE clause of the SELECT statement.

MySQL provides two wildcard characters for using with the LIKE operator, the percentage % and underscore _ .

The percentage (%) wildcard allows you to match any string of zero or more characters.

The underscore (_) wildcard allows you to match any single character.

8)

```
mysql> SELECT * FROM student;
```

sno	name	dept	age	DOB	Facno	gender
1	DHONI	cse	19	2000	7	M
2	virat	cse	19	2000	71	M
3	sindhu	cse	18	2001	71	F
4	VIJAY_DEVARAKONDA	cse	21	1998	3	M

4 rows in set (0.00 sec)

9)

```
mysql> SELECT * FROM student;
```

sno	name	dept	age	DOB	Facno	gender
1	DHONI	cse	19	2000	7	M
2	virat	cse	19	2000	71	M
3	sindhu	cse	18	2001	71	F
4	VIJAY_DEVARAKONDA	cse	21	1998	3	M

4 rows in set (0.00 sec)

10)

```
mysql> select * from student where 'name' like '%h';
Empty set (0.00 sec)
```

RESULT:

The records from the tables are displayed using SELECT commands with WHERE Clause and Pattern matching.

Ex. No. : 5

Date:

SELECT with various clause – BETWEEN, IN, Aggregate function

AIM:

To view the records from the tables using SELECT commands with BETWEEN, IN, Aggregate functions.

DESCRIPTION:

The BETWEEN operator allows you to specify a range to test. We often use the BETWEEN operator in the WHERE clause of the SELECT, INSERT, UPDATE, and DELETE statements.

The IN operator allows you to determine if a specified value matches any one of a list or a sub query.

MySQL provides many aggregate functions that include AVG, COUNT, SUM, MIN, MAX, etc. An aggregate function ignores NULL values when it performs calculation except for the COUNT function.

BETWEEN operator:

```
SELECT column1, column2, ...  
FROM table_name  
WHERE expr [NOT] BETWEEN begin_expr AND end_expr;
```

The *expr* is the expression to test in the range that is defined by *begin_expr* and *end_expr*.

IN operator:

```
SELECT  
column1, column2, ...  
FROM  
table_name  
WHERE (expr|column_1) IN ('value1', 'value2', ...);
```

Questions:

IN & BETWEEN

1. List the type of the courses “Statistics” and “Programming”
2. The instructor wants to know the CourseNos whose scores are in the range 50 to 80

AGGREGATE

1. Find the average mark of “C002”.
2. List the maximum, minimum mark for “C021”
3. List the maximum, minimum, average mark for each subject in 5th semester
4. List the name of the courses and average mark of each courses.
5. Calculate the sum of all the scores.
6. How many students are registered for each course? Display the course description and the number of students registered in each course.
7. How many courses did each student register for? Use Assessment table.

OUTPUTS:

1)

```
mysql> select course from course;
ERROR 1054 (42S22): Unknown column 'course' in 'field list'
mysql> select * from course;
+-----+-----+-----+-----+
| courseno | regno      | coursedesc | scores |
+-----+-----+-----+-----+
| C001     | 191811306  | mathematics | 93     |
| C001     | 191811307  | mathematics | 80     |
| C002     | 191811306  | OOAD       | 75     |
| C002     | 191811307  | OOAD       | 85     |
| C003     | 191811306  | DBMS       | 91     |
| C003     | 191811307  | DBMS       | 93     |
+-----+-----+-----+-----+
6 rows in set (0.00 sec)
```

2)

```
mysql> select courseno from course where scores between 50 and 80;
+-----+
| courseno |
+-----+
| C001     |
| C002     |
+-----+
2 rows in set (0.00 sec)
```

1)

```
mysql> select avg(scores) from course;
+-----+
| avg(scores) |
+-----+
| 86.1667     |
+-----+
1 row in set (0.00 sec)
```

2)

```
mysql> select max(scores),min(scores) from course;
+-----+-----+
| max(scores) | min(scores) |
+-----+-----+
| 93          | 75          |
+-----+-----+
1 row in set (0.00 sec)
```

3)

```
mysql> select max(scores),min(scores),avg(scores) from course;
+-----+-----+-----+
| max(scores) | min(scores) | avg(scores) |
+-----+-----+-----+
| 93          | 75          | 86.1667     |
+-----+-----+-----+
1 row in set (0.00 sec)
```

4)

```
mysql> select avg(scores) from course where courseno like 'C00%';
+-----+
| avg(scores) |
+-----+
|      68.2000 |
+-----+
```

5)

```
mysql> select sum(scores) from course;
+-----+
| sum(scores) |
+-----+
|          517 |
+-----+
1 row in set (0.00 sec)
```

6)

```
mysql> select coursedesc,count(coursetype) from course;
+-----+-----+
| coursedesc | count(coursetype) |
+-----+-----+
| mathematics |          5 |
+-----+-----+
1 row in set (0.00 sec)
```

7)

```
mysql> select courseno,coursedesc,count(regno) from course where regno like '191811%';
+-----+-----+-----+
| courseno | coursedesc | count(regno) |
+-----+-----+-----+
| C001     | mathematics |          6 |
+-----+-----+-----+
1 row in set (0.00 sec)
```

RESULT:

The records from the tables are displayed using SELECT commands with WHERE Clause and Pattern matching.

Ex. No.: 6

Date:

SELECT with various clause – GROUP BY, HAVING, ORDER BY

AIM:

To view the records from the tables using SELECT commands with Group By, Having, Order By

DESCRIPTION:

GROUP BY – HAVING:

The GROUP BY clause groups a set of rows into a set of summary rows by values of columns or expressions. The GROUP BY clause returns one row for each group. In other words, it reduces the number of rows in the result set.

The GROUP BY clause is used with aggregate functions such as SUM, AVG, MAX, MIN, and COUNT. The aggregate function that appears in the SELECT clause provides the information about each group.

The GROUP BY clause is an optional clause of the SELECT statement.

To filter the groups returned by GROUP BY clause, you use a HAVING clause.

ORDER BY:

When you use the SELECT statement to query data from a table, the result set is not sorted in any orders. To sort the result set, you use the ORDER BY clause. The ORDER BY clause allows you to:

- ☐ Sort a result set by a single column or multiple columns. ☐
- ☐ Sort a result set by different columns in ascending or descending order. ☐

SYNTAX:

GROUP BY – HAVING:

SELECT c1, c2,...,cn, aggregate_function(ci)

FROM table

WHERE where_conditions

GROUP BY c1 , c2,...,cn

HAVING conditionS

Questions:

GROUP BY - HAVING

1. How many students are registered for each course? Display the course description and the number of students registered in each course.
2. How many courses did each student register for? Use Assessment table.

ORDER BY

1. Retrieve Name, Gender, MobileNo of all the students in ascending order of RegNo.
2. List the faculty members in the order of older faculty first.

OUTPUTS:

1)

```
mysql> select courseno,count(courseno) from course group by courseno;
+-----+-----+
| courseno | count(courseno) |
+-----+-----+
|          1 |                1 |
+-----+-----+
1 row in set (0.06 sec)
```

2)

```
mysql> select courseno,count(score) from course group by courseno;
+-----+-----+
| courseno | count(score) |
+-----+-----+
|          1 |                1 |
+-----+-----+
1 row in set (0.00 sec)
```

3)

```
mysql> select name,DOB from student order by regno;
```

sno	name	regno	DOB
1	mukesh	191811309	2001
2	nani	191811319	2001
3	ram	191811320	2000
4	ntr	191811321	2000

4)

```
mysql> select * from faculty order by Dob;
```

Facno	FacName	gender	Dob	mobileno	DOJ
2	somu	m	1999	465415456	1987
1	ramu	M	2000	90515252	2001

2 rows in set (0.06 sec)

ORDER BY:

```
SELECT column1, column2,...  
FROM tbl  
ORDER BY column1 [ASC|DESC], column2 [ASC|DESC],...
```

ASC stands for ascending and the DESC stands for descending. By default, the ORDER BY clause sorts the result set in ascending order if you don't specify ASC or DESC explicitly.

RESULT:

The records from the tables are displayed using SELECT commands with GROUP BY, HAVING and ORDER BY.

Ex. No.: 7

Date:

SubQuery & Correlated Query

AIM:

To perform subquery and correlated query on the given relation.

DESCRIPTION:

SUBQUERY

A MySQL subquery is a query nested within another query such as SELECT, INSERT, UPDATE or DELETE. In addition, a MySQL subquery can be nested inside another subquery.

A MySQL subquery is called an inner query while the query that contains the subquery is called an outer query. A subquery can be used anywhere that expression is used and must be closed in parentheses.

CORRELATED QUERY:

A correlated subquery is a subquery that uses the data from the outer query. In other words, a correlated subquery depends on the outer query. A correlated subquery is evaluated once for each row in the outer query.

SYNTAX:

SUBQUERY:

```
SELECT c1, c2,...,cn  
FROM table  
WHERE c1 IN (SELECT c1, c2,...,cn  
            FROM table  
            WHERE where_conditions);
```

CORRELATED QUERY:

```
SELECT *  
FROM table_name  
WHERE EXISTS(subquery );
```

Questions:

Sub-Query and Correlated Sub-Query:

1. Which of the student's score is greater than the average score?
2. Which of the students' have written more than one assessment test?
3. Which faculty has joined recently and when?
4. List the course and score of assessments that have the value more than the average score each Course

OUTPUTS:

1) Which of the student's score is greater than the avg score?

```
mysql> select * from stud2 where marks>(select avg(marks) from stud2);
+-----+-----+-----+-----+-----+-----+
| regno | name | courseno | marks | facultydoj | assements |
+-----+-----+-----+-----+-----+-----+
| 1234 | nani | coo1 | 50 | 2001 | 5 |
| 1254 | ramu | coo1 | 50 | 2002 | 4 |
+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

2) Which of the students' have written more than one assessment test?

```
mysql> select name from stud2 where assements>1;
+-----+
| name |
+-----+
| nani |
| ramu |
| ravi |
+-----+
3 rows in set (0.00 sec)
```

3) Which faculty has joined recently and when?

```
mysql> select * from faculty order by doj limit 1;
+-----+-----+-----+-----+-----+-----+-----+
| FacNo | FacultyName | gender | Dob | Doj | Mobileno | DeptNo |
+-----+-----+-----+-----+-----+-----+-----+
| fo1 | chaithu | m | 0000-00-00 | 0000-00-00 | 2147483647 | cse |
+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

4) List the course and score of assessments that have the value more than the average score each Course

```
mysql> select courseno,marks from stud2 where marks>(select avg(marks) from stud2) order by courseno;
+-----+-----+
| courseno | marks |
+-----+-----+
| coo1 | 50 |
| coo1 | 50 |
+-----+-----+
2 rows in set (0.00 sec)
```

RESULT:

The records from the tables are displayed using Sub-Query and Correlated Sub-Query.

Ex. No.: 8

Date:

Joins – EquiJoin, InnerJoin, OuterJoin

AIM: To perform JOIN using EquiJoin, InnerJoin, OuterJoin on the given relation.

DESCRIPTION:

JOIN

A MySQL join is a method of linking data from one or more table based on values of the common column between tables.

MySQL supports the following types of joins:

1. Cross join
2. Inner join
3. Left join
4. Right join

CROSS JOIN

The CROSS JOIN makes a Cartesian product of rows from multiple tables. Suppose, you join t1 and t2 tables using the CROSS JOIN, the result set will include the combinations of rows from the t1 table with the rows in the t2 table.

INNER JOIN

To join two tables, the INNER JOIN compares each row in the first table with each row in the second table to find pairs of rows that satisfy the join-predicate. Whenever the join-predicate is satisfied by matching non-NULL values, column values for each matched pair of rows of the two tables are included in the result set.

LEFT JOIN

Unlike an INNER JOIN, a LEFT JOIN returns all rows in the left table including rows that satisfy join-predicate and rows do not. For the rows that do not match the join-predicate, NULLs appear in the columns of the right table in the result set.

RIGHT JOIN

A RIGHT JOIN is similar to the LEFT JOIN except that the treatment of tables is reversed. With a RIGHT JOIN, every row from the right table (t2) will appear in the result set. For the rows in the right table that do not have the matching rows in the left table (t1), NULLs appear for columns in the left table (t1).

SYNTAX:

CROSS JOIN:

```
SELECT t1.id, t2.id
FROM t1 CROSS JOIN t2;
```

INNER JOIN:

```
SELECT t1.id, t2.id
FROM t1 INNER JOIN t2 ON t1.pattern = t2.pattern;
```

LEFT JOIN:

```
SELECT t1.id, t2.id
FROM t1 LEFT JOIN t2 ON t1.pattern = t2.pattern
ORDER BY t1.id;
```

RIGHT JOIN:

```
SELECT t1.id, t2.id
FROM t1 RIGHT JOIN t2 ON t1.pattern = t2.pattern
ORDER BY t2.id;
```

Questions:

1. List the departments where the faculty members are working.
2. Find the student who has no score in any of the courses. List student name and course number.
3. The office clerk needs the names of the courses taken by the faculty belonging to 'ECE department' whose name is 'Kamal'

OUTPUTS:

- 1) List the departments where the faculty members are working.

```
mysql> select faculty.facno,faculty.facname,department.deptno,department.deptname from faculty cross join department;
+-----+-----+-----+-----+
| facno | facname | deptno | deptname |
+-----+-----+-----+-----+
| 802   | Ratnam  | 11     | Sales    |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

- 2) Find the student who has no score in any of the courses. List student name and course number.

```
mysql> select student.name,student.marks,course.courseno from student inner join course on student.course=course.courseno;
+-----+-----+-----+
| name  | marks | courseno |
+-----+-----+-----+
| Ranu  | 0     | C00      |
| Geetha | 0     | C00      |
| Pooja  | 0     | C00      |
+-----+-----+-----+
3 rows in set (0.00 sec)
```

3) The office clerk needs the names of the courses taken by the faculty belonging to 'Sales' whose name is 'Ratnam'

```
mysql> select faculty.facno,faculty.facname,department.deptno,department.deptname from faculty cross join department;
+-----+-----+-----+-----+
| facno | facname | deptno | deptname |
+-----+-----+-----+-----+
| 802   | Ratnam  | 11     | Sales    |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

RESULT: The records from the tables are displayed using JOIN using EquiJoinInnerJoin, OuterJoin.

Ex. No.: 9

Date:

VIEW, INDEX, SEQUENCE

AIM:

To create view, index and sequence on the given relation.

DESCRIPTION:

VIEW

MySQL has supported database views since version 5+. In MySQL, almost features of views conform to the SQL: 2003 standard. MySQL processes query against the views in two ways:

1. In a first way, MySQL creates a temporary table based on the view definition
2. statement and executes the incoming query on this temporary table.
3. In a second way, MySQL combines the incoming query with the query defined the view into one query and executes the combined query.

INDEX:

A database index, or just index, helps **speed up the retrieval of data from tables**. When you query data from a table, first MySQL **checks if the indexes exist**, then MySQL uses the indexes to select exact physical corresponding rows of the table instead of scanning the whole table..

SEQUENCE:

In MySQL, a sequence is a **list of integers generated in the ascending order i.e., 1,2,3...** Many applications need sequences to generate unique numbers mainly for identification e.g., customer ID in CRM, employee numbers in HR, equipment numbers in services management system, etc.

To create a sequence in MySQL automatically, you set the AUTO_INCREMENT attribute to a column, which typically is a primary key column.

SYNTAX:

VIEW:

CREATE[ALGORITHM = {MERGE | TEMPTABLE | UNDEFINED}]

VIEW[database_name].[view_name]

AS[SELECT statement]

INDEX:

CREATE [UNIQUE|FULLTEXT|SPATIAL] **INDEX**index_name

USING [BTREE | HASH | RTREE]

ON table_name (column_name [(length)] [ASC | DESC],...)

SEQUENCE:

CREATE TABLEtable_name(

col_name1 **AUTO_INCREMENT PRIMARY**

KEY, col_name2,col_name3,);

Questions:

1. Create a view with name 'v1' using employees1 table which holds the value of employee_id and salary of employee.
2. Do the insert and delete records from v1 table.

```
mysql> select * from employees1;
```

employee_id	first_name	last_name	device_serial	salary
1	John	Smith	ABC123	60000
2	Jane	Doe	DEF456	65000
3	Bob	Johnson	GHI789	70000
4	Sally	Fields	JKL012	75000
5	Michael	Smith	MNO345	80000
6	Emily	Jones	PQR678	85000
7	David	Williams	STU901	90000
8	Sarah	Johnson	VWX234	95000
9	James	Brown	YZA567	100000
10	Emma	Miller	BCD890	105000
11	William	Davis	EFG123	110000
12	Olivia	Garcia	HIJ456	115000
13	Christopher	Rodriguez	KLM789	120000
14	Isabella	Wilson	NOP012	125000
15	Matthew	Martinez	QRS345	130000
16	Sophia	Anderson	TUV678	135000
17	Daniel	Smith	WXY901	140000
18	Mia	Thomas	ZAB234	145000
19	Joseph	Hernandez	CDE567	150000
20	Abigail	Smith	FGH890	155000

```
20 rows in set (0.00 sec)
```

```
mysql> desc employees1;
```

Field	Type	Null	Key	Default	Extra
employee_id	int	YES	MUL	NULL	
first_name	varchar(50)	YES		NULL	
last_name	varchar(50)	YES		NULL	
device_serial	varchar(15)	YES		NULL	
salary	int	YES		NULL	

```
5 rows in set (0.00 sec)
```

```
mysql> create view v1 as select employee_id,salary from employees1;
Query OK, 0 rows affected (0.02 sec)
```

```
mysql> desc v1;
```

Field	Type	Null	Key	Default	Extra
employee_id	int	YES		NULL	
salary	int	YES		NULL	

2 rows in set (0.01 sec)

```
mysql> insert into v1 values(101,100001);
Query OK, 1 row affected (0.01 sec)
```

```
mysql> select * from v1;
```

employee_id	salary
1	60000
2	65000
3	70000
4	75000
5	80000
6	85000
7	90000
8	95000
9	100000
10	105000
11	110000
12	115000
13	120000
14	125000
15	130000
16	135000
17	140000
18	145000
19	150000
20	155000
101	100001

21 rows in set (0.00 sec)

```
mysql> select * from employees1;
```

employee_id	first_name	last_name	device_serial	salary
1	John	Smith	ABC123	60000
2	Jane	Doe	DEF456	65000
3	Bob	Johnson	GHI789	70000
4	Sally	Fields	JKL012	75000
5	Michael	Smith	MNO345	80000
6	Emily	Jones	PQR678	85000
7	David	Williams	STU901	90000
8	Sarah	Johnson	VWX234	95000
9	James	Brown	YZA567	100000
10	Emma	Miller	BCD890	105000
11	William	Davis	EFG123	110000
12	Olivia	Garcia	HIJ456	115000
13	Christopher	Rodriguez	KLM789	120000
14	Isabella	Wilson	NOP012	125000
15	Matthew	Martinez	QRS345	130000
16	Sophia	Anderson	TUV678	135000
17	Daniel	Smith	WXY901	140000
18	Mia	Thomas	ZAB234	145000
19	Joseph	Hernandez	CDE567	150000
20	Abigail	Smith	FGH890	155000
101	NULL	NULL	NULL	100001

```
21 rows in set (0.00 sec)
```

```
mysql> delete from v1 where employee_id=10;  
Query OK, 1 row affected (0.01 sec)
```

```
mysql> select * from v1;
```

+-----+-----+	
employee_id salary	
+-----+-----+	
1	60000
2	65000
3	70000
4	75000
5	80000
6	85000
7	90000
8	95000
9	100000
11	110000
12	115000
13	120000
14	125000
15	130000
16	135000
17	140000
18	145000
19	150000
20	155000
101	100001

```
+-----+-----+  
20 rows in set (0.00 sec)
```

```
mysql> select * from employees1;
```

employee_id	first_name	last_name	device_serial	salary
1	John	Smith	ABC123	60000
2	Jane	Doe	DEF456	65000
3	Bob	Johnson	GHI789	70000
4	Sally	Fields	JKL012	75000
5	Michael	Smith	MNO345	80000
6	Emily	Jones	PQR678	85000
7	David	Williams	STU901	90000
8	Sarah	Johnson	VWX234	95000
9	James	Brown	YZA567	100000
11	William	Davis	EFG123	110000
12	Olivia	Garcia	HIJ456	115000
13	Christopher	Rodriguez	KLM789	120000
14	Isabella	Wilson	NOP012	125000
15	Matthew	Martinez	QRS345	130000
16	Sophia	Anderson	TUV678	135000
17	Daniel	Smith	WXY901	140000
18	Mia	Thomas	ZAB234	145000
19	Joseph	Hernandez	CDE567	150000
20	Abigail	Smith	FGH890	155000
101	NULL	NULL	NULL	100001

```
20 rows in set (0.00 sec)
```

INDEX:

1. Create index1 for 'salary' attribute from employees1 relation and list the first name of the employees whose salary is above 145000 and explain the working principle of indexing and then drop the index1.
2. Create index1 for 'employee_id' attribute and display the first name of an employee whose employee id is 10 and explain the working principle of index1.

```
mysql> select * from employees1;
```

employee_id	first_name	last_name	device_serial	salary
1	John	Smith	ABC123	60000
2	Jane	Doe	DEF456	65000
3	Bob	Johnson	GHI789	70000
4	Sally	Fields	JKL012	75000
5	Michael	Smith	MNO345	80000
6	Emily	Jones	PQR678	85000
7	David	Williams	STU901	90000
8	Sarah	Johnson	VWX234	95000
9	James	Brown	YZA567	100000
10	Emma	Miller	BCD890	105000
11	William	Davis	EFG123	110000
12	Olivia	Garcia	HIJ456	115000
13	Christopher	Rodriguez	KLM789	120000
14	Isabella	Wilson	NOP012	125000
15	Matthew	Martinez	QRS345	130000
16	Sophia	Anderson	TUV678	135000
17	Daniel	Smith	WXY901	140000
18	Mia	Thomas	ZAB234	145000
19	Joseph	Hernandez	CDE567	150000
20	Abigail	Smith	FGH890	155000

```
20 rows in set (0.00 sec)
```

```
mysql> select first_name from employees1 where salary>145000;
```

first_name
Joseph
Abigail

```
2 rows in set (0.00 sec)
```

```
mysql> explain select first_name from employees1 where salary>145000;
```

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	employees1	NULL	ALL	NULL	NULL	NULL	NULL	20	33.33	Using where

```
1 row in set, 1 warning (0.00 sec)
```

```
mysql> create index index1 on employees1(salary);
Query OK, 0 rows affected (0.04 sec)
Records: 0 Duplicates: 0 Warnings: 0
```

```
mysql> explain select first_name from employees1 where salary>145000;
```

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	employees1	NULL	range	index1	index1	5	NULL	2	100.00	Using index condition

```
1 row in set, 1 warning (0.00 sec)
```

```
mysql> drop index index1 on employees1;
Query OK, 0 rows affected (0.01 sec)
Records: 0 Duplicates: 0 Warnings: 0
```

```
mysql> select first_name from employees1 where employee_id=10;
+-----+
| first_name |
+-----+
| Emma      |
+-----+
1 row in set (0.00 sec)
```

```
mysql> explain select first_name from employees1 where employee_id=10;
+-----+
| id | select_type | table      | partitions | type | possible_keys | key | key_len | ref | rows | filtered | Extra |
+-----+
| 1  | SIMPLE      | employees1 | NULL       | ALL  | NULL          | NULL | NULL    | NULL | 20 | 10.00 | Using where |
+-----+
1 row in set, 1 warning (0.00 sec)
```

```
mysql> create index index1 on employees1(employee_id);
Query OK, 0 rows affected (0.03 sec)
Records: 0 Duplicates: 0 Warnings: 0
```

```
mysql> explain select first_name from employees1 where employee_id=10;
+-----+
| id | select_type | table      | partitions | type | possible_keys | key | key_len | ref | rows | filtered | Extra |
+-----+
| 1  | SIMPLE      | employees1 | NULL       | ref  | index1        | index1 | 5       | const | 1 | 100.00 | NULL |
+-----+
1 row in set, 1 warning (0.00 sec)
```

```
mysql> show index from employees1;
```

Table	Non unique	Key_name	Seq_in_index	Column_name	Collation	Cardinality	Sub_part	Packed	Null	Index_type	Comment	Index_comment	Visible	Expression
employees1	1	index1	1	employee_id	A	20		NULL	NULL	YES	BTREE		YES	NULL

1 row in set (0.09 sec)

SEQUENCE:

1. **Populateregister number using auto increment in DBMS_Stud table.**
2. **Manually populate register number**
3. **Drop the auto increment.**

```
mysql> CREATE TABLE DBMS_Stud(
-> Reg_No INT UNSIGNED NOT NULL AUTO_INCREMENT,
-> PRIMARY KEY (Reg_No),
-> Name VARCHAR(30) NOT NULL,
-> Department VARCHAR(30) NOT NULL,
-> Mark INT(30) NOT NULL
-> );
```

```
Query OK, 0 rows affected, 1 warning (0.04 sec)
```

```
mysql> desc DBMS_Stud;
```

Field	Type	Null	Key	Default	Extra
Reg_No	int unsigned	NO	PRI	NULL	auto_increment
Name	varchar(30)	NO		NULL	
Department	varchar(30)	NO		NULL	
Mark	int	NO		NULL	

```
4 rows in set (0.01 sec)
```

```
mysql> INSERT INTO DBMS_Stud(Name, Department, Mark) VALUES
->      ('Raj','CSE', 89),
->      ('Rajesh','CSE', 88),
->      ('Ramesh','ECE', 90),
->      ('Rajan','ECE', 85);
```

Query OK, 4 rows affected (0.03 sec)

Records: 4 Duplicates: 0 Warnings: 0

```
mysql> select * from DBMS_Stud;
```

Reg_No	Name	Department	Mark
1	Raj	CSE	89
2	Rajesh	CSE	88
3	Ramesh	ECE	90
4	Rajan	ECE	85

4 rows in set (0.00 sec)

```
mysql> INSERT INTO DBMS_Stud(Reg_No,Name, Department, Mark) VALUES
->      (10,'Aarthi','CSE', 89),
->      (12,'Anu','CSE', 88),
->      (11,'Anbu','ECE', 90);
```

Query OK, 3 rows affected (0.01 sec)

Records: 3 Duplicates: 0 Warnings: 0

```
mysql> select * from DBMS_Stud;
```

Reg_No	Name	Department	Mark
1	Raj	CSE	89
2	Rajesh	CSE	88
3	Ramesh	ECE	90
4	Rajan	ECE	85
10	Aarthi	CSE	89
11	Anbu	ECE	90
12	Anu	CSE	88

7 rows in set (0.00 sec)


```
mysql> INSERT INTO DBMS_Stud(Name, Department, Mark) VALUES
->      ('abc','CSE', 89),
->      ('xyz','CSE', 88);
Query OK, 2 rows affected (0.00 sec)
Records: 2  Duplicates: 0  Warnings: 0
```

```
mysql> select * from DBMS_Stud;
+-----+-----+-----+-----+
| Reg_No | Name   | Department | Mark |
+-----+-----+-----+-----+
| 1      | Raj    | CSE        | 89   |
| 2      | Rajesh | CSE        | 88   |
| 3      | Ramesh | ECE        | 90   |
| 4      | Rajan  | ECE        | 85   |
| 10     | Aarthi | CSE        | 89   |
| 11     | Anbu   | ECE        | 90   |
| 12     | Anu    | CSE        | 88   |
| 13     | abc    | CSE        | 89   |
| 14     | xyz    | CSE        | 88   |
+-----+-----+-----+-----+
9 rows in set (0.00 sec)
```

```
mysql> INSERT INTO DBMS_Stud(Name, Department, Mark) VALUES
->      ('AAAAA','CSE', 89),
->      ('BBBBB','ECE', 88),
->      ('CCCCC','ECE', 88);
Query OK, 3 rows affected (0.00 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

```
mysql> select * from DBMS_Stud;
+-----+-----+-----+-----+
| Reg_No | Name   | Department | Mark |
+-----+-----+-----+-----+
| 1      | Raj    | CSE        | 89   |
| 2      | Rajesh | CSE        | 88   |
| 3      | Ramesh | ECE        | 90   |
| 4      | Rajan  | ECE        | 85   |
| 10     | Aarthi | CSE        | 89   |
| 11     | Anbu   | ECE        | 90   |
| 12     | Anu    | CSE        | 88   |
| 13     | abc    | CSE        | 89   |
| 14     | xyz    | CSE        | 88   |
| 15     | AAAAA  | CSE        | 89   |
| 16     | BBBBB  | ECE        | 88   |
| 17     | CCCCC  | ECE        | 88   |
+-----+-----+-----+-----+
12 rows in set (0.00 sec)
```

```
mysql> ALTER TABLE DBMS_Stud AUTO_INCREMENT =50;
Query OK, 0 rows affected (0.02 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> INSERT INTO DBMS_Stud(Name, Department, Mark) VALUES
->      ('DD','CSE', 89),
->      ('EE','ECE', 88),
->      ('FF','ECE', 88);
Query OK, 3 rows affected (0.00 sec)
Records: 3 Duplicates: 0 Warnings: 0

mysql> select * from DBMS_Stud;
```

Reg_No	Name	Department	Mark
1	Raj	CSE	89
2	Rajesh	CSE	88
3	Ramesh	ECE	90
4	Rajan	ECE	85
10	Aarthi	CSE	89
11	Anbu	ECE	90
12	Anu	CSE	88
13	abc	CSE	89
14	xyz	CSE	88
15	AAAAA	CSE	89
16	BBBBB	ECE	88
17	CCCCC	ECE	88
50	DD	CSE	89
51	EE	ECE	88
52	FF	ECE	88

```
15 rows in set (0.00 sec)
```

```
mysql> ALTER TABLE DBMS_Stud DROP Reg_No;
Query OK, 15 rows affected (0.07 sec)
Records: 15  Duplicates: 0  Warnings: 0

mysql> INSERT INTO DBMS_Stud(Name, Department, Mark) VALUES
->      ('gggg','CSE', 89),
->      ('hhhh','ECE', 88);
Query OK, 2 rows affected (0.00 sec)
Records: 2  Duplicates: 0  Warnings: 0

mysql> select * from DBMS_Stud;
+-----+-----+
| Name   | Department | Mark |
+-----+-----+
| Raj    | CSE        | 89   |
| Rajesh | CSE        | 88   |
| Ramesh | ECE        | 90   |
| Rajan  | ECE        | 85   |
| Aarthi | CSE        | 89   |
| Anbu   | ECE        | 90   |
| Anu    | CSE        | 88   |
| abc    | CSE        | 89   |
| xyz    | CSE        | 88   |
| AAAAAA | CSE        | 89   |
| BBBBBB | ECE        | 88   |
| CCCCCC | ECE        | 88   |
| DD     | CSE        | 89   |
| EE     | ECE        | 88   |
| FF     | ECE        | 88   |
| gggg   | CSE        | 89   |
| hhhh   | ECE        | 88   |
+-----+-----+
17 rows in set (0.00 sec)
```

```
mysql> INSERT INTO DBMS_Stud(Reg_No, Name, Department, Mark) VALUES
->      (111,'yy','CSE', 89),
->      (222,'zz','ECE', 88);
ERROR 1054 (42S22): Unknown column 'Reg_No' in 'field list'
mysql> desc DBMS_Stud;
+-----+-----+-----+-----+-----+-----+
| Field      | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Name       | varchar(30)   | NO   |     | NULL    |       |
| Department | varchar(30)   | NO   |     | NULL    |       |
| Mark       | int           | NO   |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
3 rows in set (0.02 sec)
```

RESULT:

The records from the tables are displayed using view, index and sequence on the given relation.

Ex:No: 10

Date:

Simple programming exercise using(REPEAT, WHILE)

Aim:

To learn how to use various MySQL loop statements including while, repeat to run a block of code repeatedly based on a condition.

Procedure:

WHILE loop

The syntax of the WHILE statement is as follows:

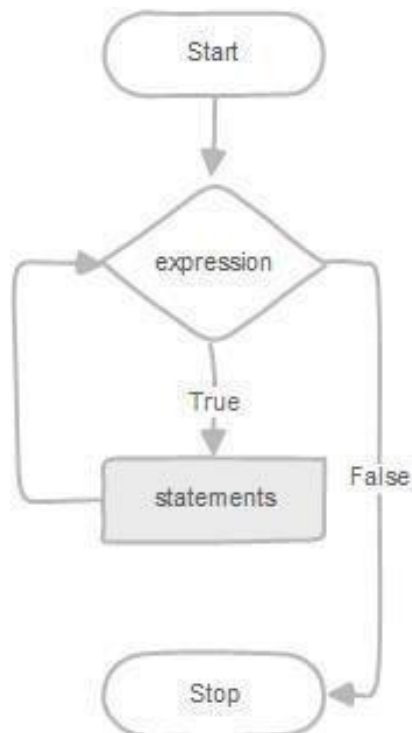
WHILE expression

DO statements

END WHILE

The WHILE loop checks the expression at the beginning of each iteration. If the expression evaluates to TRUE, MySQL will execute statements between WHILE and END WHILE until the expression evaluates to FALSE. The WHILE loop is called pretest loop because it checks the expression before the statements execute.

The following flowchart illustrates the WHILE loop statement:



Program1

Write a function to build a string repeatedly until the value of the variable becomes s greater than 5. Then, we display the final string using a SELECT statement.

Procedure:

REPEAT loop

The syntax of the REPEAT loop statement is as follows:

REPEAT statements;

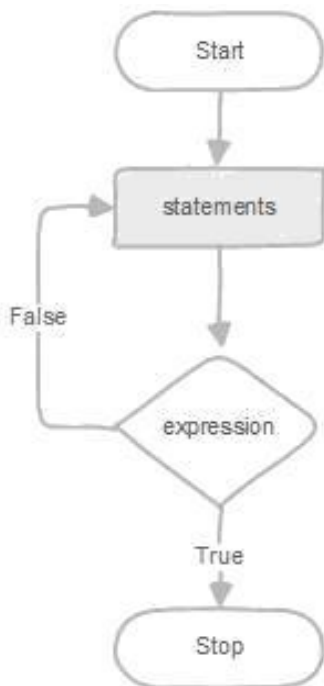
UNTIL expression

END REPEAT

First, MySQL executes the statements, and then it evaluates the expression. If the expression evaluates to FALSE, MySQL executes the statements repeatedly until the expression evaluates to TRUE.

Because the REPEAT loop statement checks the expression after the execution of statements, the REPEAT loop statement is also known as the post-test loop.

The following flowchart illustrates the REPEAT loop statement:



Program1

Write a function to build a string repeatedly until the value of the variable becomes **x greater than 5**. Then, we display the final string using a SELECT statement.

Program :-1

```
mysql> CREATE PROCEDURE test_mysql_while_loop()
-> BEGIN
-> DECLARE x INT;
-> DECLARE str VARCHAR(255);
->
-> SET x = 1;
-> SET str = '';
->
-> WHILE x <= 5 DO
-> SET str = CONCAT(str,x,',');
-> SET x = x + 1;
-> END WHILE;
->
-> SELECT str;
-> END
-> //
```

Query OK, 0 rows affected (0.00 sec)

```
mysql> CALL test_mysql_while_loop() //
```

```
+-----+
| str   |
+-----+
| 1,2,3,4,5, |
+-----+
```

1 row in set (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

Program 2:

Write a function that uses REPEAT statement which would repeat the loop until income is greater than or equal to 4000, at which point the REPEAT loop would be terminated

Program :-2

```
mysql> CREATE PROCEDURE dorepeat(p1 INT) BEGIN SET @x=0; REPEAT SET @x=@x+1; UNTIL @x>p1 END REPEAT; END//
Query OK, 0 rows affected (0.01 sec)

mysql> CALL dorepeat(4001) //
Query OK, 0 rows affected (0.03 sec)

mysql> SELECT @x;
-> //
+-----+
| @x    |
+-----+
| 4002  |
+-----+
1 row in set (0.00 sec)
```

RESULT: Thus the Simple programming exercise using (REPEAT, WHILE) executed successfully.

Ex:No: 11

Date:

Simple programming exercise using(CASE and LOOP)

Aim:

To learn how to use various MySQL loop statements including case and loop to run a block of code repeatedly based on a condition.

Procedure:

In MySQL, the CASE statement has the functionality of an IF-THEN-ELSE statement and has 2 syntaxes that we will explore.

CASE Syntax

CASE case_value

WHEN when_value THEN statement_list

[WHEN when_value THEN statement_list] ...

[ELSE statement_list]

END CASE

Program 1:

Write a function that uses CASE statement where if monthly_value is equal to or less than 4000, then income_level will be set to 'Low Income'. If monthly_value is equal to or less than 5000, then income_level will be set to 'Avg Income'. Otherwise, income_level will be set to 'High Income'.

Procedure:

LOOP Syntax

[begin_label:] LOOP

statement_list

END LOOP [end_label]

LOOP implements a simple loop construct, enabling repeated execution of the statement list, which consists of one or more statements, each terminated by a semicolon

(;) statement delimiter. The statements within the loop are repeated until the loop is terminated. Usually, this is accomplished with a LEAVE statement. Within a stored function, RETURN can also be used, which exits the function entirely.

Program 1:

Write a function that uses CASE statement where if monthly_value is equal to or less than 4000, then income_level will be set to 'Low Income'. If monthly_value is equal to or less than 5000, then income_level will be set to 'Avg Income'. Otherwise, income_level will be set to 'High Income'.

```
mysql> CREATE FUNCTION IncomeLevel ( monthly_value INT )
-> RETURNS varchar(20)
->
-> BEGIN
->
->   DECLARE income_level varchar(20);
->
->   CASE monthly_value
->     WHEN 4000 THEN
->       SET income_level = 'Low Income';
->
->     WHEN 5000 THEN
->       SET income_level = 'Avg Income';
->
->     ELSE
->       SET income_level = 'High Income';
->   END CASE;
->   RETURN income_level;
->
-> END; //
```

Query OK, 0 rows affected (0.01 sec)

```
mysql> SELECT INCOMELEVEL(5300); //
```

```
+-----+
| INCOMELEVEL(5300) |
+-----+
| High Income      |
+-----+
```

1 row in set (0.00 sec)

```
mysql> █
```

Program 2:

Write a function that will use ITERATE statement which would cause the loop to repeat while income is less than 4000. Once income is greater than or equal to 4000, would terminate the LOOP.

```
mysql> CREATE FUNCTION CALCINCOME2 ( starting_value INT )
-> RETURNS INT
->
-> BEGIN
->
->   DECLARE income INT;
->
->   SET income = 0;
->
->   label1: LOOP
->     SET income = income + starting_value;
->     IF income < 4000 THEN
->       ITERATE label1;
->     END IF;
->     LEAVE label1;
->   END LOOP label1;
->
->   RETURN income;
->
-> END; //
```

Query OK, 0 rows affected (0.00 sec)

```
mysql> SELECT CALCINCOME2(2100);
-> //
```

CALCINCOME2(2100)
4200

1 row in set (0.00 sec)

```
mysql>
```

RESULT: Thus the Simple programming exercise using(CASE and LOOP) excuted successfully.

Ex:No: 12

Date:

TCL COMMANDS

Aim:

To learn how to use various TCL commands Commit, Rollback and Savepoint SQL commands

Procedure and Syntax:

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

COMMIT command

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

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

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

SYNTAX;

COMMIT;

ROLLBACK command

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

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

Syntax:

```
ROLLBACK TO savepoint_name;
```

SAVEPOINT command

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

Syntax:

```
SAVEPOINT savepoint_name;
```

Problem 1:

Rollback to that state using the ROLLBACK command whenever required.

Create a following table Class and insert values into it in the order and create savepoints in between them. Try to rollback to the save point and check your output by giving select commands.

Let us use some SQL queries on the above table and see the results.

```
INSERT INTO class VALUES(5,'Rahul');
```

```
COMMIT;
```

```
UPDATE class SET name ='Abi' WHERE id ='5';
```

```
SAVEPOINT A;
```

```
INSERT INTO class VALUES(6,'Raj');
```

```
SAVEPOINT B;
```

```
INSERT INTO class VALUES(7,'Mary');
```

```
SAVEPOINT C;
```

The resultant table will look like,

Now let's use the ROLLBACK command to roll back the state of data to the savepoint B.

```
ROLLBACK TO B;
```

```
SELECT * FROM class;
```

Now our class table will look like,

Now let's again use the ROLLBACK command to roll back the state of data to the savepoint A

```
ROLLBACK TO A;
```

```
SELECT * FROM class;
```

Now the table will look like,

Questions:-

```
mysql> create table class(name varchar(10),id int(5));
Query OK, 0 rows affected (0.19 sec)

mysql> insert into class values("dj",5);
Query OK, 1 row affected (0.00 sec)

mysql> commit;
Query OK, 0 rows affected (0.04 sec)

mysql> update class set name="bravo" where id="5";
Query OK, 0 rows affected (0.00 sec)
Rows matched: 0  Changed: 0  Warnings: 0

mysql> savepoint A;
Query OK, 0 rows affected (0.00 sec)

mysql> insert into class values("uppal",6);
Query OK, 1 row affected (0.00 sec)

mysql> savepoint B;
Query OK, 0 rows affected (0.00 sec)

mysql> insert into class values("balu",7);
Query OK, 1 row affected (0.00 sec)

mysql> savepoint C;
Query OK, 0 rows affected (0.00 sec)

mysql> select * from class;
+-----+-----+
| name | id |
+-----+-----+
| dj   | 5 |
| uppal | 6 |
| balu | 7 |
+-----+-----+
3 rows in set (0.00 sec)

mysql> ROLLBACK TO B;
Query OK, 0 rows affected (0.00 sec)

mysql> select * from class;
+-----+-----+
| name | id |
+-----+-----+
| dj   | 5 |
| uppal | 6 |
+-----+-----+
2 rows in set (0.00 sec)

mysql> ROLLBACK TO A;
Query OK, 0 rows affected (0.00 sec)

mysql> select * from class;
+-----+-----+
| name | id |
+-----+-----+
| dj   | 5 |
+-----+-----+
1 row in set (0.00 sec)
```

Result:

So now we know how the commands COMMIT, ROLLBACK and SAVEPOINT works.

Ex:No: 13

Date:

DCL COMMANDS

Aim:

To learn how to use various DCL commands GRANT and REVOKE SQL commands

Procedure and Syntax:

Data Control Language(DCL) is used to control privileges in Database. To perform any operation in the database, such as for creating tables, sequences or views, a user needs privileges. Privileges are of two types,

System: This includes permissions for creating session, table, etc and all types of other system privileges.

Object: This includes permissions for any command or query to perform any operation on the database tables.

In DCL we have two commands,

GRANT: Used to provide any user access privileges or other privileges for the database.

REVOKE: Used to take back permissions from any user. □

Allow a User to create session

When we create a user in SQL, it is not even allowed to login and create a session until and unless proper permissions/privileges are granted to the user.

Following command can be used to grant the session creating privileges.

```
GRANT CREATE SESSION TO username;
```

Allow a User to create table

To allow a user to create tables in the database, we can use the below command,

```
GRANT CREATE TABLE TO username;
```

Provide user with space on tablespace to store table

Allowing a user to create table is not enough to start storing data in that table. We also must provide the user with privileges to use the available tablespace for their table and data.

```
ALTER USER username QUOTA UNLIMITED ON SYSTEM;
```

The above command will alter the user details and will provide it access to unlimited tablespace on system.

NOTE: Generally unlimited quota is provided to Admin users.

Grant all privilege to a User

Sysdba is a set of privileges which has all the permissions in it. So if we want to provide all the privileges to any user, we can simply grant them the **sysdba** permission.

```
GRANT sysdba TO username
```

Grant permission to create any table

Sometimes user is restricted from creating some tables with names which are reserved for system tables. But we can grant privileges to a user to create any table using the below command,

```
GRANT CREATE ANY TABLE TO username
```

Grant permission to drop any table

As the title suggests, if you want to allow user to drop any table from the database, then grant this privilege to the user,

```
GRANT DROP ANY TABLE TO username
```

To take back Permissions

And, if you want to take back the privileges from any user, use the REVOKE command.

```
REVOKE CREATE TABLE FROM username
```

RESULT: Thus the DCL commands GRANT and REVOKE SQL executed successfully.

Ex:No: 14

Date:

HIGH LEVEL PROGRAMMING EXTENSIONS (PROCEDURES)

Aim:

To implement procedures using program in MySQL.

PROCEDURES:

A procedure is a subprogram that performs a specific action.

Creating a procedure

We use the CREATE PROCEDURE statement to create a new stored procedure. We specify the name of stored procedure after the CREATE PROCEDURE statement. The DELIMITER command is used to change the standard delimiter of MySQL commands (i.e. ;). As the statements within the routines (functions, stored procedures or triggers) end with a semi-colon (;), to treat them as a compound statement we use DELIMITER.

Calling stored procedures(Executing a procedure)

In order to call a stored procedure, you use the following SQL command:

```
CALL stored_procedure_name();
```

Program 1:

Create a simple procedure to get all the records from the table 'student_info' which have the following data:

```
mysql> select * from student_info;
```

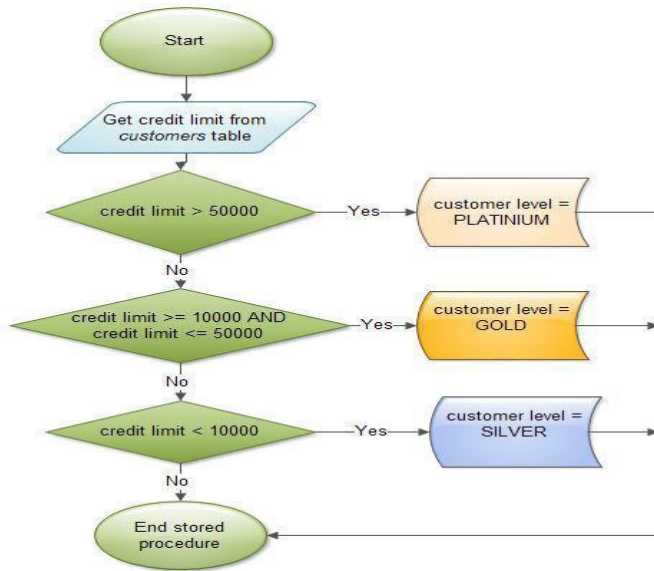
id	Name	Address	Subject
100	Aarav	Delhi	Computers
101	YashPal	Amritsar	History
105	Gaurav	Jaipur	Literature
110	Rahul	Chandigarh	History

Program 2:

Create a stored procedure GetCustomerLevel() that accepts two parameters customer number and customer level.

- First, it gets the credit limit from the customers table.
- Then, based on the credit limit, it determines the customer level: PLATINUM, GOLD, and SILVER.
- The parameter p_customerlevel stores the level of the customer and is used by the calling program.

The following flowchart demonstrates the logic of determining customer level.



The table 'customers' should have the following attributes:

customers(cno , cname, creditlimit)

Program:-1

```
mysql> CREATE PROCEDURE student_info()
-> select * from student_info;
Query OK, 0 rows affected (0.00 sec)

mysql> call student_info();
+-----+-----+-----+-----+
| stuid | name | area   | subject |
+-----+-----+-----+-----+
| 201 | raj | chennai | dbms |
| 202 | rahul | hyderabad | ooad |
| 203 | rahim | munbai | java |
| 204 | vikas | kochi | python |
+-----+-----+-----+-----+
4 rows in set (0.00 sec)

Query OK, 0 rows affected (0.00 sec)
```

Program:-2

```
mysql> DELIMITER $$
mysql>
mysql> CREATE PROCEDURE GetCustomerLevel(
-> in p_customerNumber int(11),
-> out p_customerLevel varchar(10))
-> BEGIN
-> DECLARE creditlim double;
->
-> SELECT creditlimit INTO creditlim
-> FROM customers
-> WHERE customerNumber = p_customerNumber;
->
-> IF creditlim > 50000 THEN
-> SET p_customerLevel = 'PLATINUM';
-> ELSEIF (creditlim <= 50000 AND creditlim >= 10000) THEN
-> SET p_customerLevel = 'GOLD';
-> ELSEIF creditlim < 10000 THEN
-> SET p_customerLevel = 'SILVER';
-> END IF;
-> END$$
Query OK, 0 rows affected (0.00 sec)
```

Create a stored procedure GetCustomerLevel() that accepts two parameters customer number and customer level.

- First, it gets the credit limit from the customers table.
- Then, based on the credit limit, it determines the customer level: PLATINUM, GOLD, and SILVER.
- The parameter p_customerlevel stores the level of the customer and is used by the calling program.

The following flowchart demonstrates the logic of determining customer level.

RESULT: Thus the program in MySQL executed successfully.

Ex:No: 15

Date:

HIGH LEVEL PROGRAMMING EXTENSIONS (FUNCTIONS)

Aim:

To implement Functions using program in MySQL.

FUNCTIONS:

A function is a subprogram that computes a value.

Creating a function

The CREATE FUNCTION statement is also used in MySQL to support UDFs (user-defined functions). A UDF can be regarded as an external stored function.

MySQL stored function syntax

```
CREATE FUNCTION function_name(param1,param2,...)
RETURNS datatype
[NOT] DETERMINISTIC
statements
```

Program 1:

Create a function that returns the level of a customer based on credit limit.(Use the IF statement to determine the credit limit).

The table 'customers' should have the following attributes:

customers(cno , cname, creditlimit)

If credit limit > 50000 then customer_level = PLATINUM

If credit limit >= 10000 AND credit limit <= 50000 then customer_level = GOLD

If credit limit credit limit < 10000 then customer_level = SILVER

RECURSION in Mysql Procedures

Mysql version should be >= 5.

Have to set system parameters. This means putting the recursion count limit.

SET @@GLOBAL.max_sp_recursion_depth = 255;

SET @@session.max_sp_recursion_depth = 255;

Program 2

Write a recursive MySQL procedure compute the factorial of a number .

OUTPUT

1

```
mysql> DELIMITER //
mysql> CREATE FUNCTION CustomerLevel(p_CREDITLIMIT INT) RETURNS VARCHAR(10)
-> DETERMINISTIC
-> BEGIN
-> DECLARE lvl VARCHAR(10);
-> IF p_CREDITLIMIT > 50000 THEN
-> SET lvl = 'PLATINUM';
-> ELSEIF (p_CREDITLIMIT <= 50000 AND p_CREDITLIMIT >= 10000) THEN
-> SET lvl = 'GOLD';
-> ELSEIF p_CREDITLIMIT < 10000 THEN
-> SET lvl = 'SILVER';
-> END IF;
-> RETURN (lvl);
-> END
-> //
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT NAME, CustomerLevel(CREDITLIMIT)
-> FROM CUSTOMER
-> ORDER BY NAME
-> //
ERROR 1054 (42S22): Unknown column 'NAME' in 'field list'
mysql> SELECT CNAME, CustomerLevel(CREDITLIMIT)
-> FROM CUSTOMER
-> ORDER BY NAME
-> //
ERROR 1054 (42S22): Unknown column 'NAME' in 'order clause'
mysql> SELECT CNAME, CustomerLevel(CREDITLIMIT) FROM CUSTOMER ORDER BY CNAME//
+-----+-----+
| CNAME   | CustomerLevel(CREDITLIMIT) |
+-----+-----+
| DINESH  | GOLD                        |
| NAGENDRA | PLATINUM                    |
| RAJA    | GOLD                        |
| RAMU    | SILVER                      |
+-----+-----+
4 rows in set (0.00 sec)
```

2)

```
mysql> DELIMITER //
mysql> CREATE FUNCTION CustomerLevel(p_CREDITLIMIT INT) RETURNS VARCHAR(10)
-> DETERMINISTIC
-> BEGIN
-> DECLARE lvl VARCHAR(10);
-> IF p_CREDITLIMIT > 50000 THEN
-> SET lvl = 'PLATINUM';
-> ELSEIF (p_CREDITLIMIT <= 50000 AND p_CREDITLIMIT >= 10000) THEN
-> SET lvl = 'GOLD';
-> ELSEIF p_CREDITLIMIT < 10000 THEN
-> SET lvl = 'SILVER';
-> END IF;
-> RETURN (lvl);
-> END
-> //
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT NAME, CustomerLevel(CREDITLIMIT)
-> FROM CUSTOMER
-> ORDER BY NAME
-> //
ERROR 1054 (42S22): Unknown column 'NAME' in 'field list'
mysql> SELECT CNAME, CustomerLevel(CREDITLIMIT)
-> FROM CUSTOMER
-> ORDER BY NAME
-> //
```

RESULT: Thus the Functions using program in MySQL executed successfully .

HIGH LEVEL LANGUAGE EXTENSION WITH CURSORS

Program 1

Write a Cursor program using MySQL to retrieve the email-ids(build an email list) of employees from employees table.

SOLUTION :

```
create table employees(id integer, Name varchar(100), email varchar(100));
insert into employees(id, Name, email) values(1, "Harry Potter", "pharry@warnerbros.com");
insert into employees(id, Name, email) values(2, "Clark Kent", "kclark@dccomics.com");
insert into employees(id, Name, email) values(3, "Tony Stark", "stony@marvel.com");
```

Cursor is a **Temporary Memory** or **Temporary Work Station**. It is Allocated by Database Server at the Time of Performing DML(Data Manipulation Language) operations on Table by User. **Cursors are used to store Database Tables.**

1. Implicit Cursors:

Implicit Cursors are also known as **Default Cursors of SQL SERVER**. These Cursors are allocated by SQL SERVER when the user performs DML operations.

2. Explicit Cursors :

Explicit Cursors are Created by **Users whenever the user requires them**. Explicit Cursors are used for **Fetching data from Table in Row-By-Row Manner**.

How to create Explicit Cursor:

1. Declare Cursor Object.

Syntax : DECLARE cursor_name CURSOR FOR SELECT * FROM table_name

```
DECLARE s1 CURSOR FOR SELECT * FROM studDetails
```

2. Open Cursor Connection.

Syntax : OPEN cursor_connection

```
OPEN s1
```

3. Fetch Data from cursor.

There are total 6 methods to access data from cursor. They are as follows :

FIRST is used to fetch only the first row from cursor table.

LAST is used to fetch only last row from cursor table.

NEXT is used to fetch data in forward direction from cursor table.

PRIOR is used to fetch data in backward direction from cursor table.

ABSOLUTE n is used to fetch the exact nth row from cursor table.

RELATIVE n is used to fetch the data in incremental way as well as decremental way.

Syntax : FETCH NEXT/FIRST/LAST/PRIOR/ABSOLUTE n/RELATIVE n FROM cursor_name

```
FETCH FIRST FROM s1
FETCH LAST FROM s1
FETCH NEXT FROM s1
FETCH PRIOR FROM s1
FETCH ABSOLUTE 7 FROM s1
FETCH RELATIVE -2 FROM s1
```

4. **Close cursor connection.**

Syntax : CLOSE cursor_name
CLOSE s1

5. **Deallocate cursor memory.**

Syntax : DEALLOCATE cursor_name

```
DELIMITER $$
CREATE PROCEDURE build_email_list (INOUT email_list varchar(4000))
BEGIN
DECLARE v_finished INTEGER DEFAULT 0;
DECLARE v_email varchar(100) DEFAULT "";

-- declare cursor for employee email

DECLARE email_cursor CURSOR FOR
SELECT email FROM employees;

-- declare NOT FOUND handler
DECLARE CONTINUE HANDLER FOR
NOT FOUND SET v_finished = 1;
OPEN email_cursor;
get_email: LOOP
FETCH email_cursor INTO v_email;
    IF v_finished = 1 THEN
        LEAVE get_email;
    END IF;
-- build email list
    SET email_list = CONCAT(v_email,";",email_list);
END LOOP get_email;
CLOSE email_cursor;
END$$
DELIMITER ;
```

-- Calling the procedure and getting the email list


```
SET @email_list = "";
CALL build_email_list(@email_list);
SELECT @email_list;
```

Program :-1

```
mysql> DELIMITER $$
mysql> CREATE PROCEDURE build_email_list (INOUT email_list varchar(4000))
-> BEGIN
-> DECLARE v_finished INTEGER DEFAULT 0;
-> DECLARE v_email varchar(100) DEFAULT "";
-> DECLARE email_cursor CURSOR FOR
-> SELECT email FROM employees;
-> DECLARE CONTINUE HANDLER FOR
-> NOT FOUND SET v_finished = 1;
-> OPEN email_cursor;
-> get_email:LOOP
-> FETCH email_cursor INTO v_email;
-> IF v_finished = 1 THEN
-> LEAVE get_email;
-> END IF;
-> SET email_list = CONCAT(v_email,";",email_list);
-> END LOOP get_email;
-> CLOSE email_cursor;
-> END $$
Query OK, 0 rows affected (0.00 sec)

mysql> DELIMITER ;
mysql> SET @email_list = "";
Query OK, 0 rows affected (0.00 sec)

mysql> CALL build_email_list(@email_list);
Query OK, 0 rows affected, 1 warning (0.00 sec)

mysql> select @email_list;
+-----+
| @email_list |
+-----+
| stony@marvel.com;kclark@deconics.com;pharry@warnerbros.com; |
+-----+
1 row in set (0.00 sec)
```

RESULT:

stony@marvel.com;kclark@dccomics.com;pharry@warnerbros.com;

Ex:No:17

Date:

TRIGGER

Aim:

To implement trigger in MySQL.

A trigger or database trigger is a stored program **executed automatically** to respond to a specific event e.g., insert, update or delete occurred in a table.

Create trigger syntax

```
CREATE TRIGGER trigger_name trigger_time trigger_event
ON table_name
FOR EACH ROW
BEGIN
...
END;
```

Program 1 :

Create a trigger in MySQL to log the changes of the EMPLOYEES table with fields ID, Name and Email. Also create a new table named EMPLOYEES_AUDIT to keep the changes of the employee table. Create a **BEFORE UPDATE trigger** that is invoked before a change is made to the employees table.

Program:-

```
mysql> DELIMITER //
mysql> CREATE TRIGGER before_student_update
-> BEFORE UPDATE ON student
-> FOR EACH ROW
-> BEGIN
-> INSERT INTO student_audit
-> SET action = 'update',
-> student_id = OLD.id,
-> lastname = OLD.Name,
-> changedat = NOW();
-> END //
Query OK, 0 rows affected (0.06 sec)

mysql> DELIMITER;
mysql> update student set name = 'tony stark_c' where id=3;
Query OK, 1 row affected (0.04 sec)
Rows matched: 1 Changed: 1 Warnings: 0

mysql> select * from student_audit;
+----+-----+-----+-----+-----+
| id | student_id | lastname | changedat | action |
+----+-----+-----+-----+-----+
| 1 | 3 | tony stark | 2019-08-12 13:07:44 | update |
+----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

RESULT: Thus the trigger is executed successfully.

Exp. No.:18

Date:

SQL String Functions- REPLACE, REPEAT, RIGHT, RPAD

AIM:

ASCII()

This function returns the numeric value of the leftmost character of the string str. Returns 0 if str is the empty string. Returns NULL if str is NULL

Syntax : ASCII(str)

Example : SELECT ASCII('2');

Output : 50

Example : SELECT ASCII(2);

Output : 50

Example : SELECT ASCII('An');

Output : 65

BIN()

Returns a string representation of the binary value of N, where N is a longlong (BIGINT) number. Returns NULL if N is NULL.

Syntax : BIN(N)

Example : SELECT BIN(12);

Output : 1100

BIT_LENGTH()

Returns the length of the string str in bits.

Syntax : BIT_LENGTH(str)

Example : SELECT BIT_LENGTH('text');

Output : 32

CHAR_LENGTH()

Returns the length of the string str, measured in characters. A multi-byte character counts as a single character. This means that for a string containing five 2-byte characters, LENGTH() returns 10, whereas CHAR_LENGTH() returns 5.

Syntax : CHAR_LENGTH(str)

Example : SELECT CHAR_LENGTH('test string');

Output : 11

CONCAT()

Returns the string that results from concatenating one or more arguments. If all arguments are nonbinary strings, the result is a nonbinary string. If the arguments include any binary strings, the result is a binary string. A numeric argument is converted to its equivalent nonbinary string form.

Syntax : CONCAT(str1,str2,...)

```
mysql> SELECT CONCAT('data','base','system');
+-----+
| CONCAT('data','base','system') |
+-----+
| databasesystem                  |
+-----+
1 row in set (0.00 sec)
```

INSTR()

MySQL INSTR() takes a string and a substring of it as arguments, and returns an integer which indicates the position of the first occurrence of the substring within the string

Syntax : INSTR(str,substr)

Example : SELECT INSTR('myteststring','st');

Output : 5

LCASE()

MySQL LCASE() converts the characters of a string to lower case characters.

Syntax : LCASE(str)

Example : SELECT LCASE('MYTESTSTRING');

Output : myteststring

LEFT()

MySQL LEFT() returns a specified number of characters from the left of a given string. Both the number and the string are supplied in the arguments as str and len of the function.

Syntax : LEFT(str,len)

```
mysql> SELECT LEFT('Database', 5);
+-----+
| LEFT('Database', 5) |
+-----+
| Datab                |
+-----+
1 row in set (0.00 sec)
```

LENGTH()

MySQL LENGTH() returns the length of a given string.

Syntax : LENGTH(str)

Example : `SELECT LENGTH('text');`

Output : 4

LOCATE()

MySQL LOCATE() returns the position of the first occurrence of a string within a string. Both of these strings are passed as arguments. An optional argument may be used to specify from which position of the string (i.e. string to be searched) searching will start. If this position is not mentioned, searching starts from the beginning.

Syntax : `LOCATE(substr,str,pos)`

Example : `SELECT LOCATE('st','myteststring');`

Output : 5

LOWER()

MySQL LOWER() converts all the characters in a string to lowercase characters.

Syntax : `LOWER(str)`

Example : `SELECT LOWER('MYTESTSTRING');`

Output : myteststring

LPAD()

MySQL LPAD() left pads a string with another string. The actual string, a number indicating the length of the padding in characters (optional) and the string to be used for left padding - all are passed as arguments.

Syntax : `LPAD(str,len,padstr)`

```
mysql> SELECT LPAD('Database',20,'$');
+-----+
| LPAD('Database',20,'$') |
+-----+
| $$$$$$$$$$$$Database   |
+-----+
1 row in set (0.00 sec)
```

```
mysql> SELECT LPAD('Database',4,'$');
+-----+
| LPAD('Database',4,'$') |
+-----+
| Data                    |
+-----+
1 row in set (0.00 sec)
```

LTRIM(str)

MySQL LTRIM() removes the leading space characters of a string passed as argument.

Syntax : LTRIM(str)

```
mysql> SELECT LTRIM('      Database');
+-----+
| LTRIM('      Database') |
+-----+
| Database                |
+-----+
1 row in set (0.00 sec)
```

MAKE_SET()

MySQL MAKE_SET() returns a set value (a string containing substrings separated by “,” characters) consisting of the strings that have the corresponding bit in the first argument.

Syntax : MAKE_SET(bits,str1,str2,...)

```
mysql> SELECT MAKE_SET(1,'Data','base','Management');
+-----+
| MAKE_SET(1,'Data','base','Management') |
+-----+
| Data                                   |
+-----+
1 row in set (0.00 sec)
```

MID()

MySQL MID() extracts a substring from a string. The actual string, position to start extraction and length of the extracted string - all are specified as arguments.

Syntax : MID(str,pos,len)

```
mysql> SELECT MID('Database',5,4);
+-----+
| MID('Database',5,4) |
+-----+
| base                |
+-----+
1 row in set (0.00 sec)

mysql> SELECT MID('Database',1,4);
+-----+
| MID('Database',1,4) |
+-----+
| Data                |
+-----+
1 row in set (0.00 sec)
```

OCT()

Returns a string representation of the octal value of N, where N is a longlong (BIGINT) number. Returns NULL if N is NULL.

Syntax : OCT(N)

Example : SELECT OCT(12);

Output : 14

POSITION()

MySQL POSITION() returns the position of a substring within a string..

Syntax : POSITION(substr IN str)

```
mysql> SELECT POSITION("ta" IN "Database");
+-----+
| POSITION("ta" IN "Database") |
+-----+
|                             3 |
+-----+
1 row in set (0.00 sec)
```

REPEAT()

MySQL REPEAT() repeats a string for a specified number of times.

The function returns NULL either any either of the arguments are NULL.

Syntax : REPEAT(str,count)

```
mysql> SELECT REPEAT('DBMS',10);
+-----+
| REPEAT('DBMS',10) |
+-----+
| DBMSDBMSDBMSDBMSDBMSDBMSDBMSDBMSDBMS |
+-----+
1 row in set (0.00 sec)
```

```
mysql> SELECT REPEAT(' DBMS ',10);
+-----+
| REPEAT(' DBMS ',10) |
+-----+
| DBMS  DBMS  DBMS  DBMS  DBMS  DBMS  DBMS  DBMS  DBMS  DBMS |
+-----+
1 row in set (0.00 sec)
```

REPLACE()

MySQL REPLACE() replaces all the occurrences of a substring within a string.

Syntax : REPLACE(str,from_str,to_str)

```
mysql> SELECT Replace("Database Management Systems","Management","");
+-----+
| Replace("Database Management Systems","Management","") |
+-----+
| Database Systems |
+-----+
1 row in set (0.01 sec)
```

REVERSE()

Returns a given string with the order of the characters reversed.

Syntax : REVERSE(str)

```
mysql> SELECT Reverse("Database");
+-----+
| Reverse("Database") |
+-----+
| esabataD             |
+-----+
1 row in set (0.00 sec)
```

RIGHT()

MySQL RIGHT() extracts a specified number of characters from the right side of a given string.

Syntax : RIGHT(str,len)

```
mysql> SELECT Right("Database",4);
+-----+
| Right("Database",4) |
+-----+
| base                 |
+-----+
1 row in set (0.00 sec)
```

RPAD()

MySQL RPAD() function pads strings from right. The actual string which is to be padded as str, length of the string returned after padding as len and string which is used for padding as padstr is used as a parameters within the argument.

Syntax : RPAD(str,len,padstr)

```
mysql> SELECT Rpad("Database",14,'#');
+-----+
| Rpad("Database",14,'#') |
+-----+
| Database#####          |
+-----+
1 row in set (0.00 sec)
```

RTRIM()

MySQL RTRIM() removes the trailing spaces from a given string.

Syntax : RTRIM(str)

```
mysql> SELECT RTRIM('Database      ');
+-----+
| RTRIM('Database      ') |
+-----+
| Database                  |
+-----+
1 row in set (0.00 sec)
```

SPACE()

MySQL SPACE() returns the string containing a number of spaces as specified in the argument.

Syntax : SPACE(N)

```
mysql> SELECT 'start', SPACE(20), 'end';
+-----+
| start | SPACE(20)          | end |
+-----+
| start |                    | end |
+-----+
1 row in set (0.00 sec)
```

SUBSTRING() / SUBSTR()

MySQL SUBSTRING() returns a specified number of characters from a particular position of a given string.

Syntax : SUBSTRING(str,pos,len)

MySQL SUBSTR() returns the specified number of characters from a particular position of a given string. SUBSTR() is a synonym for SUBSTRING().

Syntax : SUBSTR(str,pos,len)

UPPER()

MySQL **UPPER()** converts all the characters in a string to uppercase characters.

Syntax : **UPPER(str)**

```
mysql> SELECT UPPER('database');
+-----+
| UPPER('database') |
+-----+
| DATABASE          |
+-----+
```

LOWER()

MySQL **LOWER()** converts all the characters in a string to lowercase characters.

Syntax: **LOWER (str);**

```
mysql> SELECT lower('DATABASE');
+-----+
| lower('DATABASE') |
+-----+
| database          |
+-----+
```

```
mysql> select * from employees1;
+-----+-----+-----+-----+-----+
| employee_id | first_name | last_name | device_serial | salary |
+-----+-----+-----+-----+-----+
| 1 | John | Smith | ABC123 | 60000 |
| 2 | Jane | Doe | DEF456 | 65000 |
| 3 | Bob | Johnson | GHI789 | 70000 |
| 4 | Sally | Fields | JKL012 | 75000 |
| 5 | Michael | Smith | MNO345 | 80000 |
| 6 | Emily | Jones | PQR678 | 85000 |
| 7 | David | Williams | STU901 | 90000 |
| 8 | Sarah | Johnson | VWX234 | 95000 |
| 9 | James | Brown | YZA567 | 100000 |
| 11 | William | Davis | EFG123 | 110000 |
| 12 | Olivia | Garcia | HIJ456 | 115000 |
| 13 | Christopher | Rodriguez | KLM789 | 120000 |
| 14 | Isabella | Wilson | NOP012 | 125000 |
| 15 | Matthew | Martinez | QRS345 | 130000 |
| 16 | Sophia | Anderson | TUV678 | 135000 |
| 17 | Daniel | Smith | WXY901 | 140000 |
| 18 | Mia | Thomas | ZAB234 | 145000 |
| 19 | Joseph | Hernandez | CDE567 | 150000 |
| 20 | Abigail | Smith | FGH890 | 155000 |
| 101 | NULL | NULL | NULL | 100001 |
+-----+-----+-----+-----+-----+
20 rows in set (0.14 sec)
```

```
mysql> select * from employees1 where first_name regexp '^D';
+-----+-----+-----+-----+-----+
| employee_id | first_name | last_name | device_serial | salary |
+-----+-----+-----+-----+-----+
|          7 | David     | Williams | STU901       | 90000  |
|         17 | Daniel    | Smith   | WXY901       | 140000 |
+-----+-----+-----+-----+-----+
2 rows in set (0.03 sec)
```

Exp No:20

Date:

DATABASECONNECTIVITYUSINGPHP AND MYSQL

AIM:

To connect the MySQL using PHP and MySQL and to execute the CREATE, INSERT, SELECT command in MySQL

PROGRAM:

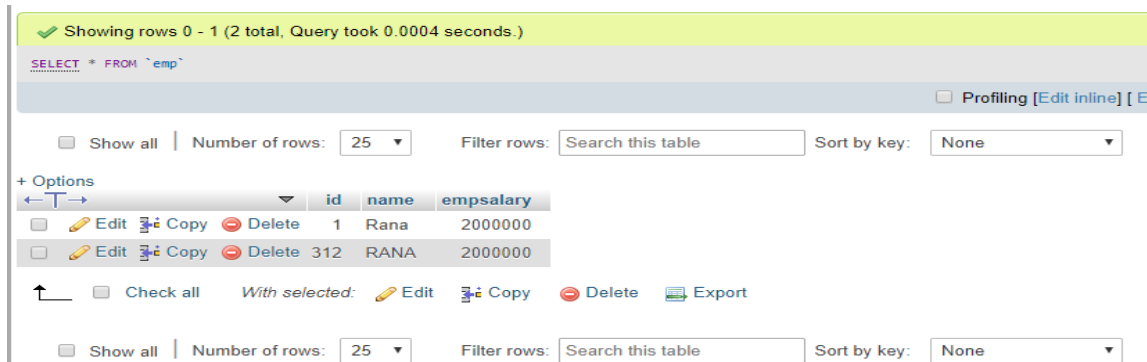
```
<?php
$host=
$password="";
$conn=mysqli_connect($host,$user,$password);
if(!$conn)
{
    Die('couldnot connect:',mysqli_connect_error());
}
echo"connectsuccessfully('br/>')";
$sql='Create database mydb';
$sql="create table emp(id int,namevarchar(10) NOT NULL,empsalary INT NOT NULL,primary key(id))";
$sql="insert into emp(id,name,empsalary) values(312,RANA,200000)";
$sql="delete from emp where id=1";
$sql="updateemp set empsalary=9000000 where id=312";
if(mysqli_query($conn,$sql))
{echo "operations failed failed",mysqli_error($conn);
}
mysqli_close($conn);
?>
```

OUTPUT:

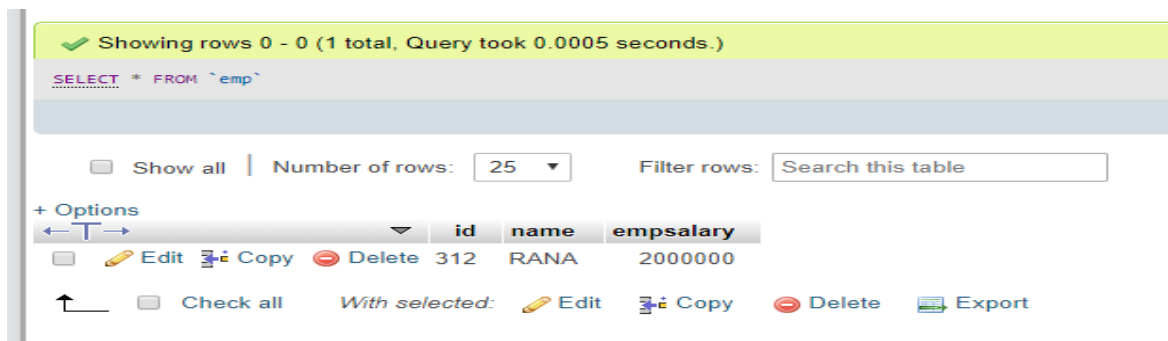
After creation of database and emp table



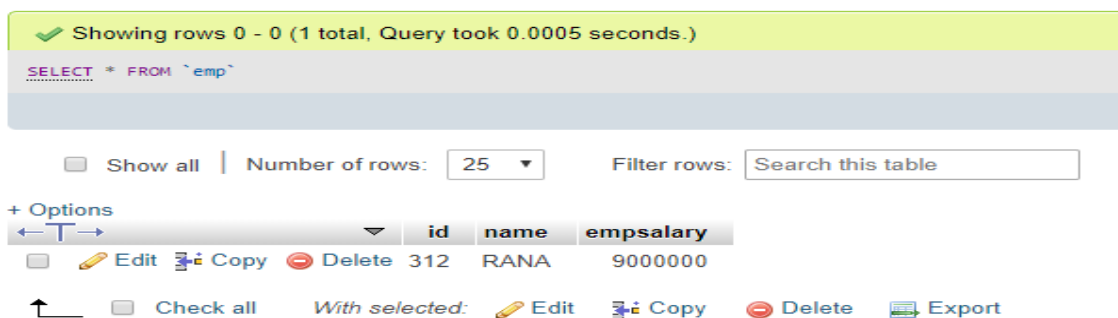
After insertion:



After deletion:



After updation:



RESULT: Thus the Mysql connected using PHP and MYSQL and executed the CREATE, INSERT, SELECT command in MySQL.