G H Raisoni College of Engineering&Management, Wagholi, Pune

Department of Computer Engineering

Third Year Bachelor of Technology

DATABASE MANAGEMENT SYSTEMS (BCOP303)

Lab Manual

Prepared By

Faculty Name: Mrs. Sunita Nandgave

G H Raisoni College of Engineering & Management, Wagholi, Pune

Department of Computer Engineering

Database Management Systems (BCOP19303)		
Course Outcome		
CO1	Design the ER diagrams as well as interpret the design of the database	
CO2	Formulate the queries required to solve the issues in the database.	
CO3	Design queries using SQL DML/DDL commands.	
CO4	Perform PL/SQL programming using the concept of Cursor Management, Error Handling, Package, and Triggers	
Sr. No.	**Name of Experiment**	**CO Mapped**
1	Draw E-R diagrams for payroll database.	**CO1, CO2**
2	Illustrate the use of constraints on employee schema: null, not null, primary key, unique, check, default, references.	**CO1, CO2**
3	Design at least 10 SQL queries for suitable database applicationsusing SQL DML Statements: Insert, Select, Update, Delete with operators, Functions, Set Operators, Clauses.	**CO3**
4	Design and develop SQL DDL statements t h a t demonstrate the use of SQL Objects such as Table, View, Index, Sequence, Synonym.	**CO3**
5	Aggregate functions in SQL (Count, Sum, Max, Min, Avg), Commit, Rollback, and Save point command.	**CO2, CO3**
6	Design SQL queries for suitable database applications using SQL DML Statements: all types of Join, Sub-Query.	**CO2, CO3**
7	Write a PL/SQL block to calculate the grade of a minimum 10 students.	**CO4**
8	Write a PL/SQL block to implement all types of cursors.	**CO4**
9	Write a PL/SQL stored procedure and function.	**CO4**
10	Write a Row level and Statement level database Trigger.	**CO4**
	Content Beyond Syllabus	
11	NoSQL Databases: Implement CRUD operation in MongoDB	**CO2, CO3**

12	Cassandra case study	**CO2, CO3**

Experiment No-1

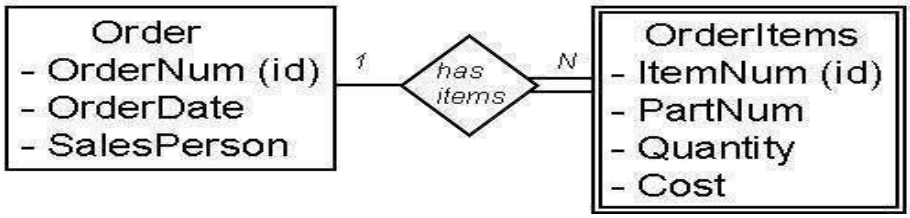
AIM: Draw E-R diagrams for payroll database.

Theory:

An entity-relationship diagram (ERD) shows the relationships of entity sets stored in a database. An entity in this context is an object, a component of data. An entity set is a collection of similar entities. These entities can have attributes that define their properties. By defining the entities, and their attributes, and showing the relationships between them, anER diagram illustrates the logical structure of databases.

ER diagrams are used to sketch out the design of a database

Chen Notation

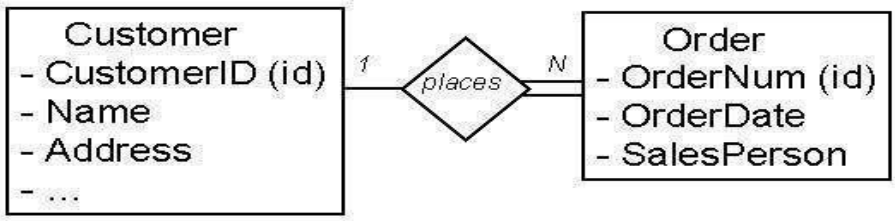


a. **ORDER** (<u>OrderNum</u> (key), OrderDate, SalesPerson)

   ORDERITEMS (<u>OrderNum</u> (key)(fk) , <u>ItemNum</u> (key), PartNum, Quantity, Cost)

b. In the above example, in the ORDERITEMS Relation:
   OrderNum is the *Foreign Key* and OrderNum plus ItemNum is the *Composite Key*.

Chen Notation



In the ORDER Relation: OrderNum is the *Key*.

Representing Relationships

b. **1:1** Relationships. The key of one relation is stored in the second relation. Look at example queries to determine which key is queried most often.

c. **1:N** Relationships.

Parent - Relation on the "1" side. **Child** - Relation on the "Many" side.

d. Represent each Entity as a relation.

Copy the key of the parent into the child relation.

e. **CUSTOMER (<u>CustomerID</u> (key), Name, Address, ...)**

ORDER (<u>OrderNum</u> (key), OrderDate, SalesPerson, CustomerID (fk))

Schema for Company Database:

EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo)

DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)

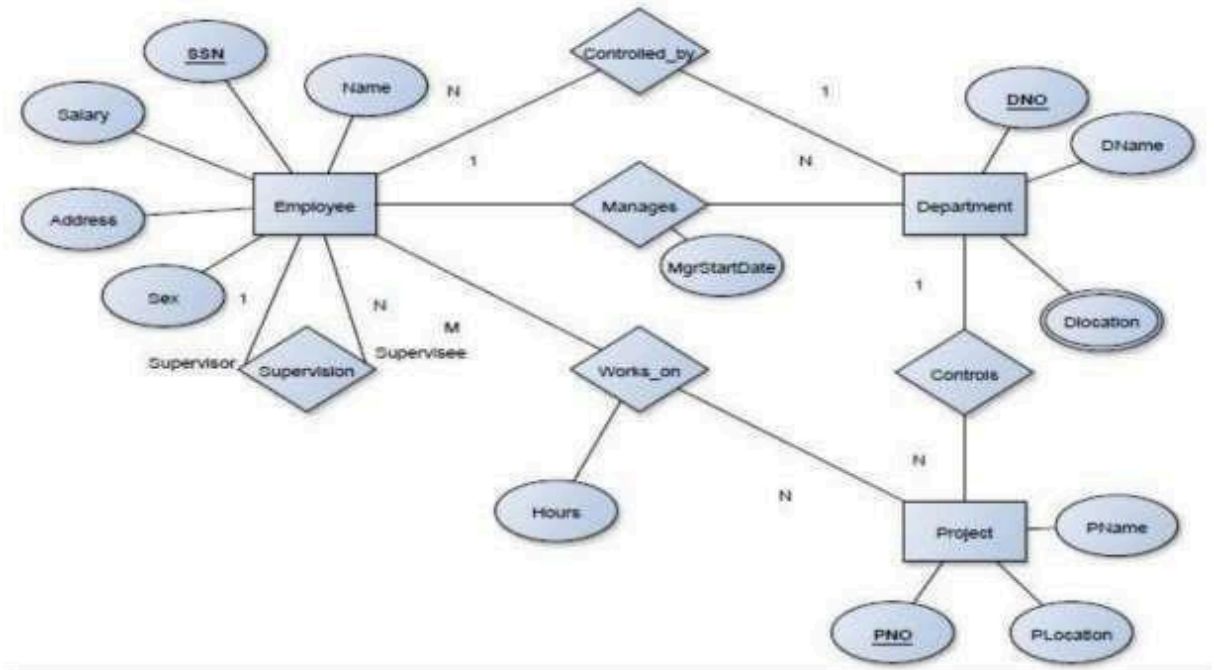
DLOCATION (DNo, DLoc)

PROJECT (PNo, PName, PLocation,

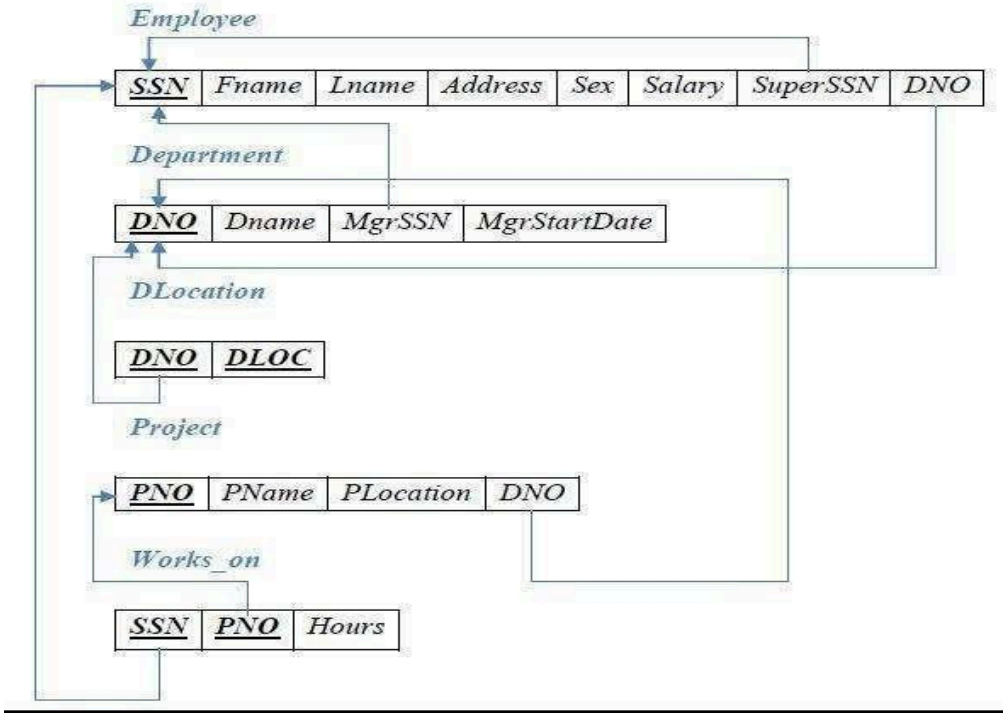
DNo) WORKS_ON (SSN, PNo,

Hours)

<u>ER-Diagram:</u>



SCHEMA:



Conclusion: In this experiment, we have studied Entity Relationships diagram notations and their use to draw the design of a database system.

****

Experiment No-2

AIM: Illustrate the use of constraints on employee schema: NULL, NOTNULL, PRIMARY KEY, UNIQUE, CHECK, DEFAULT, REFERENCES.

Theory:

CONSTRAINTS:
Integrity Constraints are a mechanism to prevent invalid data entry into the table to maintain data consistency. The whole purpose of constraints is to maintain the data integrity during the various transactions like update/delete/insert on a table.

Types of constraints:

- NOT NULL
- UNIQUE
- DEFAULT
- CHECK
- Key Constraints – PRIMARY KEY, FOREIGN KEY

NOT NULL:

NOT NULL constraint makes sure that a column does not hold NULL value. When we don't provide value for a particular column while inserting a record into a table, it takes NULL value by default. By specifying the NULL constraint, we can be sure that a particular column(s) cannot have NULL values.

UNIQUE:

UNIQUE Constraint enforces a column or set of columns to have unique values. If a column has a unique constraint, it means that a particular column cannot have duplicate values in a table.

DEFAULT:

The DEFAULT constraint provides a default value to a column when there is no value provided while inserting a record into a table.

CHECK:

This constraint is used for specifying a range of values for a particular column of a table. When this constraint is being set on a column, it ensures that the specified column must have the value falling in the specified range.

The primary key uniquely identifies each record in a table. It must have unique values and cannot contain nulls. In the below example the ROLL_NO field is marked as the primary key, which means the ROLL_NO field cannot have duplicate and null values.

FOREIGN KEY:

Foreign keys are the columns of a table that points to the primary key of another table. They act as a cross-reference between tables.

Read more about it here.

Create table tablename (column_name1 data_ type constraints, column_name2 data_type constraints …)

Example:

Create table Emp (EmpNo number(5), EName VarChar(15), Job Char(10) constraintun unique, DeptNo number(3) CONSTRAINT FKey2 REFERENCES DEPT(DeptNo));

Create table stud (sname varchar2(20) not null, rollno number(10) not null,dob date notnull);

DOMAIN INTEGRITY

Example: Create table cust(custid number(6) not null, name char(10));

Alter table cust modify (name not null);

CHECK CONSTRAINT

Example: Create table student (regno number (6), mark number (3) constraint b check(mark >=0 and mark <=100)); Alter table student add constraint b2 check (length(regno<=4));

ENTITY INTEGRITY

a) Unique key constraint

Example: Create table cust(custid number(6) constraint unique, name char(10)); Altertable cust add(constraint c unique(custid));

b) Primary Key Constraint

Example: Create table stud(regno number(6) constraint primary key, name char(20));

Queries:

Q1. Create a table called EMP with the following structure. Name Type

---

EMPNO NUMBER(6)

ENAME
VARCHAR2(20)JOB
VARCHAR2(10)
DEPTNO NUMBER(3)
SAL NUMBER(7,2)
Allow NULL for all columns except ename and job.
1. Understand create table syntax.
2. Use the create table syntax to create the said tables.
3. Create primary key constraints for each table as understood from logical table structure.

SQL> create table emp(empno number(6),ename varchar2(20)not null,job varchar2(10)not null, deptno number(3), sal number(7,2));
Table created.

Q2: Add a column experience to the emp table.
experience numeric null allowed.
Solution:
1. Learn to alter table syntax.
2. Define the new column and its data type.
3. Use the altered table syntax.
Ans: SQL> alter table emp add(experience number(2));Table altered.

Q3: Modify the column width of the job field of the emp table.
Solution:
1. Use the altered table syntax.
2. Modify the column width and its data type.
Ans: SQL> alter table emp modify(job varchar2(12));
Table altered.

SQL> alter table emp modify(job varchar(13));
Table altered.

Q4: Create a dept table with the following structure.
Name Type

DEPT NUMBER(2)
DNAME VARCHAR2(10)
LOC VARCHAR2(10)
Deptno the primary key
Solution:
1. Understand create table syntax.

2. Decide the name of the table.
3. Decide the name of each column and its data type.
4. Use the create table syntax to create the said tables.
5. Create primary key constraint for each table as understand from logical table structure. Ans:

SQL> create table dept(deptno number(2) primary key,dname varchar2(10),loc varchar2(10));

Table created.

Q5: create the emp1 table with ename and empno, add constraints to check the empnovalue while entering (i.e) empno > 100.

Solution:

1. Learn alter table syntax.
2. Define the new constraint [columns name type]
3. Use the alter table syntax for adding constraints. Ans:

SQL> create table emp1(ename varchar2(10),empno number(6) constraint check(empno>100));

Table created.

Q6: drop a column experience to the emp table.

Solution:

1. Learn to alter table syntax. Use the alter table syntax to drop the column. Ans:

SQL> alter table emp drop column experience; Table altered.

Q7: Truncate the emp table and drop the dept table

Solution:

1. Learn drop, and truncate table syntax.

Ans: SQL> truncate table emp; Table truncated.

OUTPUT:

SQL> create table emp1(emp_no number(6),ename varchar2(20) not null,job varchar2(10) not null,dept_no number(3),sal number(7,2));

Table created.

```
SQL> desc emp1;

Name                                      Null?    Type
----------------------------------------- -------- ----------------------------

EMP_NO                                             NUMBER(6)
ENAME                                     NOT NULL VARCHAR2(20)
JOB                                       NOT NULL VARCHAR2(10)
DEPT_NO                                            NUMBER(3)
SAL                                                NUMBER(7,2)


SQL> alter table emp1 add(experience number(5));
Table altered.

SQL> desc emp1;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                            NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
 JOB                                       NOT NULL VARCHAR2(10)
 DEPT_NO                                           NUMBER(3)
 SAL                                               NUMBER(7,2)
 EXPERIENCE                                        NUMBER(5)

SQL> alter table emp1 modify(job varchar2(12));
Table altered.

SQL> desc emp1;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                            NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
 JOB                                       NOT NULL VARCHAR2(12)
 DEPT_NO                                           NUMBER(3)
 SAL                                               NUMBER(7,2)
 EXPERIENCE                                        NUMBER(5)

SQL> create table dept1(dept_no number(12) primary key,d_name varchar2(10),loc
varchar2(10));
Table created.

SQL> desc dept1;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 DEPT_NO                                   NOT NULL
 NUMBER(12) D_NAME                                  VARCHAR2(10)
 LOC                                                VARCHAR2(10)
```

```
SQL> alter table emp1 modify(emp_no number(6) check (emp_no>100));
Table altered.

SQL> desc emp1;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                             NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
 JOB                                       NOT NULL VARCHAR2(12)
 DEPT_NO                                            NUMBER(3)
 SAL                                                NUMBER(7,2)
 EXPERIENCE                                         NUMBER(5)


SQL> insert into emp1 values(120,'shiv','manager',13,30000,10);

1 row created.

SQL> select * from emp1;
   EMP_NO ENAME          JOB           DEPT_NO       SAL EXPERIENCE
---------- ---------- ---------- ----------
      120 shiv          manager         13      30000        10

SQL> alter table emp1
drop(experience); Table altered.
SQL> desc emp1;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                             NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
 JOB                                       NOT NULL VARCHAR2(12)
 DEPT_NO                                            NUMBER(3)
 SAL                                                NUMBER(7,2)

SQL> truncate table emp1;
Table truncated.

SQL> desc emp1;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                             NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
 JOB                                       NOT NULL VARCHAR2(12)
 DEPT_NO                                            NUMBER(3)
 SAL                                                NUMBER(7,2)

SQL> select * from emp1;
```

no rows selected

SQL> drop table emp1;
Table dropped.

SQL> create table dept(deptno number(5) constraint dept_deptno_pk primary key, dname varchar2(20),loc varchar2(20));
Table created.
SQL> desc
dept;

Name	Null?	Type
DEPTNO	NOT NULL	NUMBER(5)
DNAME		VARCHAR2(20)
LOC		VARCHAR2(20)

SQL> create table emp(empno number(5),ename varchar2(25) not null,job varchar2(15),mgr number(5),joindate date,salary number(7,2),comm number(7,2),deptno number(7) constraint emp_deptno_fk references dept(deptno));

Table created.
SQL> desc
emp;

Name	Null?	Type
EMPNO		NUMBER(5)
ENAME	NOT NULL	VARCHAR2(25)
JOB		VARCHAR2(15)
MGR		NUMBER(5)
JOINDATE		DATE
SALARY		NUMBER(7,2)
COMM		NUMBER(7,2)
DEPTNO		NUMBER(7)

SQL> insert into dept values(12,'computer','pune');
1 row created.
SQL> select * from dept;

DEPTNO	DNAME	LOC
12	computer	pune

SQL> insert into emp values(23,'shiv','manager',55,'12sep2019',30000,55,12);1 row created.

SQL> select * from emp;

```
EMPNO ENAME      JOB       MGR JOINDATE    SALARY       COMM     DEPTNO
---------- ---------- ---------- --------- ---------- ---------- ----------
        23 shivmanager 55       12-SEP-19      30000 55         12
```

SQL> create table emp1(emp_no number(6),ename varchar2(20) not null,job varchar2(10) not null,dept_no number(3),sal number(7,2));
Table created.

SQL> desc emp1;

```
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                             NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
 JOB                                       NOT NULL VARCHAR2(10)
 DEPT_NO                                            NUMBER(3)
 SAL                                                NUMBER(7,2)
```

SQL> alter table emp1 add(experience number(5));
Table altered.

SQL> desc emp1;

```
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                             NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
 JOB                                       NOT NULL VARCHAR2(10)
 DEPT_NO                                            NUMBER(3)
 SAL                                                NUMBER(7,2)
 EXPERIENCE                                         NUMBER(5)
```

SQL> alter table emp1 modify(job varchar2(12));
Table altered.

SQL> desc emp1;

```
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                             NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
 JOB                                       NOT NULL VARCHAR2(12)
 DEPT_NO                                            NUMBER(3)
 SAL                                                NUMBER(7,2)
 EXPERIENCE                                         NUMBER(5)
```

SQL> create table dept1(dept_no number(12) primary key,d_name varchar2(10),loc varchar2(10));
Table created.

SQL> desc dept1;

```
Name                                      Null?    Type
----------------------------------------- -------- ----------------------------

DEPT_NO                                   NOT NULL
NUMBER(12) D_NAME                         VARCHAR2(10)
LOC                                       VARCHAR2(10)

SQL> alter table emp1 modify(emp_no number(6) check (emp_no>100));
Table altered.

SQL> desc emp1;
 Name                                     Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                    NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
JOB                                       NOT NULL VARCHAR2(12)
DEPT_NO                                   NUMBER(3)
 SAL                                       NUMBER(7,2)
 EXPERIENCE                                NUMBER(5)


SQL> insert into emp1 values(120,'shiv','manager',13,30000,10);

1 row created.

SQL> select * from emp1;
  EMP_NO ENAME      JOB          DEPT_NO       SAL EXPERIENCE
---------- ---------- ---------- ---------- ---------- ----------

       120 shiv       manager            13      30000         10
SQL> alter table emp1
drop(experience); Table altered.

SQL> desc emp1;
 Name                                     Null?    Type
 ----------------------------------------- -------- ----------------------------
 EMP_NO          NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
 JOB                                       NOT NULL VARCHAR2(12)
 DEPT_NO                                   NUMBER(3)
 SAL                                       NUMBER(7,2)
SQL> truncate table emp1;
Table truncated.

SQL> desc emp1;
 Name                                     Null?    Type
 ----------------------------------------- -------- ----------------------------

 EMP_NO                                    NUMBER(6)
 ENAME                                     NOT NULL VARCHAR2(20)
```

```
JOB                                       NOT NULL VARCHAR2(12)
DEPT_NO                                          NUMBER(3)
SAL                                             NUMBER(7,2)

SQL> select * from emp1;
no rows selected

SQL> drop table
emp1;
Table dropped.

SQL> desc
emp1;
ERROR:
ORA-04043: object emp1 does not exist

SQL> create table dept(deptno number(5) constraint dept_deptno_pk primary key,dname
varchar2(20),loc varchar2(20));
Table created.


SQL> desc dept;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------

 DEPTNO                                    NOT NULL
 NUMBER(5) DNAME                                  VARCHAR2(20)
 LOC                                              VARCHAR2(20)

SQL> create table emp(empno number(5),ename varchar2(25) not null,job varchar2(15),mgr
number(5),joindate date,salary number(7,2),comm number(7,2),deptno number(7) constraint
emp_deptno_fk references dept(deptno));
Table created.

SQL> desc emp;
 Name                                      Null?  Type
 ----------------------------------------- -------- ----------------------------

 EMPNO                                             NUMBER(5)
 ENAME                                    NOT NULL VARCHAR2(25)
 JOB                                               VARCHAR2(15)
 MGR                                               NUMBER(5)
 JOINDATE                                          DATE
 SALARY                                            NUMBER(7,2)
 COMM                                              NUMBER(7,2)
 DEPTNO                                            NUMBER(7)
SQL> insert into dept values(12,'computer','pune');
1 row created.
```

```
SQL> select * from dept;

DEPTNO DNAME          LOC
---------- ---------- ----------
        12 computer   pune

SQL> insert into emp values(23,'shiv','manager',55,'12sep2019',30000,55,12);
1 row created.

SQL> select * from emp;

     EMPNO ENAME      JOB              MGR JOINDATE    SALARY       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
        23 shiv       manager          55 12-SEP-19      30000         55         12
```

Conclusion: In this experiment, we have studied the concept of constraint and executed all constraints such as NULL, NOTNULL, PRIMARY KEY, UNIQUE, CHECK, DEFAULT, and REFERENCES.

****

Experiment No-3

Aim: Design SQL queries for suitable database applications using SQL DML Statements: Insert, Select, Update, Delete with operators, Functions,Set Operators, Clauses.

Theory:

DML COMMANDS: DML commands are the most frequently used SQL commands and are used to query and manipulate the existing database objects. Some of the commands are Insert, Select, Update, and Delete.

Insert Command is used to add one or more rows to a table. The values are separated by commas and the data types char and date are enclosed in apostrophes. The values must beentered in the same order as they are defined.

Select Commands It is used to retrieve information from the table. It is generally referredto as querying the table. We can either display all columns in a table or only specify columns from the table.

Update Command It is used to alter the column values in a table. A single column maybe updated or more than one column could be updated.

Delete command after inserting a row in a table we can also delete them if required. The delete command consists of a from clause followed by an optional where clause.

Q1: Insert a single record into the dept table.

Ans: SQL> insert into dept values (1,'IT','Tholudur');1

row created.

Q2: Insert more than a record into emp table using a single insert command.
Ans: SQL> insert into emp values(&empno,'&ename','&job',&deptno,&sal);
Enter value for empno: 1
Enter value for ename: Mathi

Enter value for job: AP

Enter value for deptno: 1

Enter value for sal: 10000

old 1: insert into emp values(&empno,'&ename','&job',&deptno,&sal)

new 1: insert into emp values(1,'Mathi','AP',1,10000)1

row created.

SQL> / Enter value for empno: 2

Enter value for ename: Arjun

Enter value for job: ASP

Enter value for deptno: 2

Enter value for sal:

12000

old 1: insert into emp values(&empno,'&ename','&job',&deptno,&sal)new 1:

insert into emp values(2,'Arjun','ASP',2,12000)

1 row created.

SQL> / Enter value for empno: 3

Enter value for ename: Gugan

Enter value for job: ASP

Enter value for deptno: 1

Enter value for sal:

12000

old 1: insert into emp values(&empno,'&ename','&job',&deptno,&sal)new 1:

insert into emp values(3,'Gugan','ASP',1,12000)

1 row created.

Q3: Update the emp table to set the salary of all employees to Rs15000/- who areworking as ASP

Ans: SQL> select * from emp;
EMPNO ENAME JOB DEPTNO
SAL
1 Mathi AP 1 10000
2 Arjun ASP 2 12000
3 Gugan ASP 1 12000
SQL> update emp set sal=15000 where job='ASP'; 2 rows updated.SQL>

select * from emp;

EMPNO ENAME JOB DEPTNO SAL

---

1 Mathi AP 1 10000

2 Arjun ASP 2 15000

3 Gugan ASP 1 15000

Q4: Create a pseudo table employee with the same structure as the table emp and insertrows into the table using select clauses.

Ans: SQL> create table employee as select * from emp;

Table created.

SQL> desc

employee; Name

Null? Type

-EMPNO NUMBER(6)

ENAME NOT NULL

VARCHAR2(20)JOB NOT NULL

VARCHAR2(13) DEPTNO

NUMBER(3)

SAL NUMBER(7,2)

Q5: select employee name, job from the emp tableAns:

SQL> select ename, job from emp;

ENAME JOB

Mathi AP

Arjun ASP

Gugan ASP

Karthik Prof

Akalya AP

Suresh lect

6 rows were selected.

Q6: Delete only those who are working as lecturersAns:

SQL> select * from emp;

EMPNO ENAME JOB DEPTNO SAL

1	Mathi	AP	1	10000
2	Arjun	ASP	2	15000
3	Gugan	ASP	1	15000
4	Karthik	Prof	2	30000
5	Akalya	AP	1	10000
6	Suresh	lect	1	8000

6 rows were selected.

SQL> delete from emp where job='lect';1
row deleted.

SQL> select * from emp;

EMPNO	ENAME	JOB	DEPTNO	SAL
1	Mathi	AP	1	10000
2	Arjun	ASP	2	15000
3	Gugan	ASP	1	15000
4	Karthik	Prof	2	30000
5	Akalya	AP	1	10000

Q7: List the records in the emp table order by salary in ascending order.Ans:
SQL> select * from emp order by sal;

EMPNO	ENAME	JOB	DEPTNO	SAL
1	Mathi	AP	1	10000
5	Akalya	AP	1	10000
2	Arjun	ASP	2	15000
3	Gugan	ASP	1	15000
4	Karthik	Prof	2	30000

Q8: List the records in the emp table order by salary in descending order.
Ans: SQL> select * from emp order by sal desc;
EMPNO ENAME JOB DEPTNO SAL

4 Karthik Prof 2 30000
2 Arjun ASP 2 15000
3 Gugan ASP 1 15000
1 Mathi AP 1 10000
5 Akalya AP 1 10000

Q9: Display only those employees whose deptno is 30.
Solution: Use SELECT FROM WHERE syntax.

Ans: SQL> select * from emp where deptno=1;
EMPNO ENAME JOB DEPTNO SAL
---------- ---------- ---------- ----------
-1 Mathi AP 1 10000
3 Gugan ASP 1 15000
5 Akalya AP 1 10000

Q10: Display deptno from the table employee avoiding the duplicated values.
Solution:
1. Use SELECT FROM syntax.
2. Select should include a distinct clause for the deptno. Ans: SQL> select distinct deptno from emp;
DEPTNO

1
2

IMPLEMENTATION OF DATA AND BUILT IN FUNCTIONS IN

SQL<u>CHARACTER/STRING FUNCTION:</u>

SQL> select upper('welcome') from dual;

WELCOM

E

SQL> select upper('hai') from dual;

HA

I

SQL> select lower('HAI') from dual;

LOW

---

hai

SQL> select initcap(‘hello world') from dual;
INITCAP('Hello world’)

Hello World
SQL> select ltrim(' hai') from dual;

LTR

---
hai
SQL> select rtrim('hai ')from dual;
RTR

---

hai

SQL> select rtrim(' hai ')from

dual; RTRIM('hai)

---

hai

SQL> select concat('GHRCEM',' Pune')from dual;

GHRCEM Pune

SQL> select length('SRM’)from dual;

LENGTH('SRM')

12

SQL> select replace('SRM university', 'SRM','Anna')from dual;

Anna university

```
SQL> select substr('SRM', 7,6)from dual;

SUBSTR
------
lingam

SQL> select rpad('hai',3,'*')from dual;

RPAD('
------
hai***

SQL> select lpad('hai',3,'*')from dual;

LPAD
------
***hai

SQL> select replace('Dany','y','ie')from dual;

REPLACE
-------
Danie

SQL> select translate('cold','ld','ol')from dual;

TRANSL
------
cool
```

SET OPERATORS

Set operations:

Union/ Intersect/ Except operations – These operations operate on relations, which mustbe compatible i.e. they must have the same no. of attributes with the same domain types. Syntax: (select query1) Union/ Intersect/Except (select query2)

Here set operations are applied to tuples in the results of multiple select queries.All these operations eliminate duplicate tuples from the result.

```
SELECT customerNumber id, contactLastname name FROM customers
 UNION
SELECT employeeNumber id, firstname name FROM employeesOutput:
id name
- - - - - - - - - - - - - -
103 Schmitt
112 King
114 Ferguson
119 Labrune
121 Bergulfsen


124 Nelson
125 Piestrzeniewicz
128 Keitel
129 Murphy
131 Lee
```

Conclusion: In this experiment, we have studied the concept of Data Manipulation Language and implemented Insert, Select, Update, Delete with operators, Functions, Set Operators, and Clauses.

****

Experiment No-4

AIM: Design and develop SQL DDL statements that demonstrate the use ofSQL Objects such as Table, View, Index, Sequence, and Synonym.

Theory:
Data Definition Language (DDL): This language allows the users to define data and its relationships to other types of data. It is used to create data tables, and files within databases.

1. The Create Table Command: - Defines each column of the table uniquely. Each column has a minimum of three attributes, a name, data type, and size.

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

<datatype><size>)); Ex: create table emp(empno number(4) primary key, ename

char(10));

2. Modifying the structure of tables.

a) Add new columns

Syntax:

Alter table <tablename> add(<new col><datatype(size),<new

col>datatype(size)); Ex:alter table emp add(sal number(7,2));

3. Dropping a column from a table.
Syntax:
Alter table <tablename> drop column
<col>; Ex: alter table emp drop column sal;

4. Modifying existing columns.

Syntax:
Alter table <tablename> modify(<col><newdatatype>(<newsize>));Ex:
alter table emp modify(ename varchar2(15));
5. Renaming the tables
Syntax:

Rename <oldtable> to <new table>;

Ex:rename emp to emp1;

6. truncating the tables.

Syntax:
Truncate table <tablename>;
Ex:trunc table emp1;
7. Destroying tables.

Syntax:

Drop table

<tablename>; Ex:drop

table emp; **CREATION**

OF TABLE:

SYNTAX:

create table<tablename>(column1 datatype,column2 datatype...);

EXAMPLE:

SQL>create table std(sno number(5),sname varchar(20),age number(5),sdobdate,sm1

number(4,2),sm2 number(4,2),sm3 number(4,4)); Table created.

SQL>insert into std values(101,"AAA",16,"03-jul-88",80,90,98);1

row created.

SQL>insert into std values(102,"BBB",18,"04-aug-89",88,98,90);1

row created.

OUTPUT:

Select * from std;

SNO	SNAME	AGE	SDOBSM1	SM2	SM3
101	AAA	16	03-jul-88 80	90	98
102	BBB	18	04-aug-89 88	98	90

ALTER TABLE WITH ADD:

SQL>create table student(id number(5),name varchar(10),gamevarchar(20));

Table created.

SQL>insert into student values(1,‟mercy‟,‟cricket‟);1

row created.

SYNTAX:

alter table<tablename>add(col1 datatype,col2 datatype..);

EXAMPLE:

SQL>alter table student add(age number(4));

SQL>insert into student values(2,‟sharmi‟,‟tennis‟,19);

OUTPUT:

ALTER: select * from student;

ID NAME GAME

1 Mercy Cricket

ADD: select * from student;

ID NAME GAME AGE

1 Mercy cricket

2 Sharmi Tennis 19

ALTER TABLE WITH MODIFY:

SYNTAX:

Alter table<tablename>modify(col1 datatype,col2 datatype..);

EXAMPLE:

SQL>alter table student modify(id number(6),game varchar(25));

OUTPUT:

MODIFY

desc student;

NAME NULL? TYPE

Id Number(6)

Name Varchar(20)

Game Varchar(25)

Age Number(4)

DROP:

SYNTAX: drop table<tablename>;

EXAMPLE:

SQL>drop table

student; SQL>Table

dropped.

TRUNCATE TABLE

SYNTAX: TRUNCATE TABLE <TABLE NAME>;

Example: Truncate table stud;

DESC

Example: desc
emp;

Name Null? Type

EmpNo NOT NULL number(5)

EName VarChar(15)

Job NOT NULL Char(10)

DeptNo NOT NULL number(3)

PHONE_NO number (10)

View:

- A database view is a virtual table or logical table which is defined as a SQL SELECT query with joins. Because a database view is similar to a database table, which consists of rows and columns, so you can query data against it. Most database management systems, including MySQL, allows you to update data in the underlyingtables through the database view with some prerequisites.
- A database view is dynamic because it is not related to the physical schema. The database system stores database views as a SQL SELECT statement with joins. Whenthe data of the tables changes, the view reflects that changes as well.

Advantages of database view:

- A database view allows you to simplify complex queries: a database view is defined by an SQL statement that associates with many underlying tables. You can use a database view to hide the complexity of underlying tables to the end-users and external applications. Through a database view, you only have to use simple SQL statements instead of complex ones with many joins.
- A database view helps limit data access to specific users: You may not want a subset of sensitive data that can be queryable by all users. You can use database views to expose only non-sensitive data to a specific group of users.
- A database view provides an extra security layer. Security is a vital part of any relational database management system. Database views provide extra security for a database management system. A database view allows you to create only a read-only view to expose read-only data to specific users. Users can only retrieve data in the read-only view but cannot update it.
- A database view enables computed columns. A database table should not have calculated columns however a database view should.
- Database view enables backward compatibility. Suppose you have a central database, which many applications are using it. One day you decided to redesign the database to adapt to the new business requirements. You remove some tables and create several new tables, and you don’t want the changes to affect other

applications. In this scenario, you can create database views with the sameschema as the legacy tables that you have removed.

Disadvantages of database view:

Besides the advantages above, there are several disadvantages of using database views:

- Performance: querying data from a database view can be slow especially if the view is created based on other views.
- Tables dependency: you create a view based on underlying tables of the database. Whenever you change the structure of those tables that view associates with, you have to change the view as well.

DDL COMMAND ON VIEW:

1. CREATE : Syntax :CREATE VIEW view_name AS SELECT column_name(s) FROM table_name WHERE condition;

   Example: CREATE VIEW Emp_View AS Select * From emp;

```
mysql> select * from emp;
+-----+--------+-------+--------+
| empid | emp_name | salary | Dept        |
+-----+--------+-------+--------+
|    1 | XYZ    | 10000 | COMPUTER |
|    2 | PQR    | 12000 | CIVIL    |
|    3 | LMN    | 15000 | E&TC     |
|    4 | ABC    | 25000 | COMPUTER |
+-----+--------+-------+--------+
4 rows in set (0.00 sec)
mysql> CREATE VIEW VEMP AS select * from
emp;Query OK, 0 rows affected (0.05 sec)
mysql> select * from VEMP;
+-----+--------+-------+--------+
| empid | emp_name | salary | Dept        |
+-----+--------+-------+--------+
|    1 | XYZ    | 10000 | COMPUTER |
|    2 | PQR    | 12000 | CIVIL    |
|    3 | LMN    | 15000 | E&TC     |
|    4 | ABC    | 25000 | COMPUTER |
+-----+--------+-------+--------+
4 rows in set (0.00 sec)
```

2. ALTER: Once a view is defined, you can modify it by using the ALTER VIEW statement. The syntax of the ALTER VIEW statement is similar to the CREATE VIEW statement except the CREATE keyword is replaced by the ALTER keyword

   Syntax : ALTER VIEW view_name AS SELECT column_name(s) FROM table_name WHERE condition;

   Example: ALTER VIEW Emp_View AS Select * From emp;
3. DROP: Syntax: DROP VIEW [IF EXISTS] [database_name].[view_name];

   Example: DROP VIEW emp_view; or DROP VIEW EMP.emp_view; // EMP is Database name.
4. TRUNCATE: We can't do truncate on view.

INDEX:

- A database index is a data structure that improves the speed of operations in a table. Indexes can be created using one or more columns, providing the basis for both rapid random lookups and efficient ordering of access to records.

- While creating an index, should be considered that what are the columns which will be used to make SQL queries and create one or more indexes on those columns.

- Practically, indexes are also types of tables, which keep the primary key or index field and a pointer to each record in the actual table.

- The users cannot see the indexes, they are just used to speed up queries and will beused by Database Search Engine to locate records very fast.
- INSERT and UPDATE statements take more time on tables having indexes whereas SELECT statements become fast on those tables. The reason is that while doing insert or update, the database needs to insert or update index values as well.

DDL Commands on Index:

1) CREATE:

Syntax : CREATE INDEX index_name ONtable_name(field_name1,filed_name2..);

Example: CREATE INDEX EINEDX ON emp(empid);

mysql> CREATE INDEX EINEDX ON emp(empid);Query OK, 0 rows affected (0.20 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> show index from emp;

+-----+--------+-------+---------+---------+-------+---------+-------+-----+---
--+--------+------+----------+
| Table | Non_unique | Key_name | Seq_in_index | Column_name |
Collation | Cardinality | Sub_part | Packed | Null | Index_type | Comment |
Index_comment |

+ + + + +
+ + ----- -------- ------- -
+ + + +-- ------+ -----+ ---- ---
+
| emp | 1 | EINEDX | 1 | empid | A
| 4 |
NULL
| NULL | YES | BTREE | | |
+ + + +---- -----+--- ------- -
+ +
+ + + +-- ------+ -----+ ---- ---
+
1 row in set (0.00 sec)

2) **ALTER** :

Syntax : ALTER TABLE
tbl_name ADD INDEX
index_name
(column_list)Example :
ALTER TABLE emp
ADD
INDEX(emp_name);

mysql> SHOW INDEX FROM emp;

+-----+--------+-------+---------+---------+-------+---------+-------+-----+---
---+--------+------+----------+
| Table | Non_unique | Key_name | Seq_in_index | Column_name | Collation | Cardinality |
Sub_part | Packed | Null | Index_type | Comment | Index_comment |
+-----+--------+-------+---------+---------+-------+---------+-------+-----+---
--- ------ ----------

```
-------------
| emp  |         1 | empid    |         1 | empid       | A       |         4 |     NULL | NULL | YES
|BTREE   |       |          |
+       +          +         +             +           +          +            +         +       +
    +          +        +             +
               +          +        +             +
```

```
 ----- -------- ------- --------- --------- ------- --------- ------- ------ --
--- -------- ------ ----------
```

1 row in set (0.00 sec)

Syntax : DROP INDEX index_name ON table_name;Example :

```
mysql> DROP INDEX empid on emp;
Query OK, 0 rows affected (0.12 sec)
Records: 0 Duplicates: 0 Warnings: 0
```

TRUNCATE: We can’t use the truncate command on INDEX.

Conclusion: In this experiment, we have studied SQL Data Definition Language statements and we have implemented SQL Objects such as Table, View, Index, Sequence, and Synonym.

****

Experiment No-5

AIM: Aggregate functions in SQL (Count, Sum, Max, Min, Avg), Commit,Rollback, and Savepoint commands

Theory:

Aggregate functions perform a calculation on a set of values and return a single value.There are different types of aggregate functions such as min, max, sum, avg, count, etc.

Why use aggregate functions: From a business perspective, different organization levels have different information requirements. Top levels managers are usually interested in knowing whole figures and not necessary the individual details.

Aggregate functions allow us to easily produce summarized data from our database.

Aggregate Functions are all about

- Performing calculations on multiple rows
- Of a single column of a table
- And returning a single value.

TCL COMMAND: Transaction Language Commands allows us to control and manage transactions to maintain the integrity of data within SQL statements

COMMIT: command is used to save the Records.

ROLLBACK: command is used to undo the Records.

SAVEPOINT command is used to undo the Records in a particular transaction.

Queries:

Tables Used: Consider the following tables namely “DEPARTMENTS” and “EMPLOYEES”

Their schemas are as follows , Departments (dept _no , dept_ name , dept_location);Employees (emp_id , emp_name , emp_salary);

Q1: Develop a query to grant all privileges of employees table into departments tableAns:

SQL> Grant all on employees to departments;

Grant succeeded.

Q2: Develop a query to grant some privileges of employees table into departments table

Ans: SQL> Grant select, update, insert on departments to departments with grantoption;
Grant succeeded.

Q3: Develop a query to revoke all privileges of employees table from departments tableAns:

SQL> Revoke all on employees from departments; Revoke succeeded.

Q4: Develop a query to revoke some privileges of employees table from departments tableAns:
SQL> Revoke select, update, insert on departments from departments;

Revoke succeeded.

Q5: Write a query to implement the save point

Ans: SQL> SAVEPOINT S1;

Savepoint created.

SQL> select * from
emp;

EMPNO	ENAME	JOB	DEPTNO	SAL
1	Mathi	AP	1	10000
2	Arjun	ASP	2	15000
3	Gugan	ASP	1	15000
4	Karthik	Prof	2	30000

SQL> INSERT INTO EMP VALUES(5,'Akalya','AP',1,10000); 1 row created.

SQL> select * from emp;

EMPNO	ENAME	JOB	DEPTNO	SAL
1	Mathi	AP	1	10000
2	Arjun	ASP	2	15000
3	Gugan	ASP	1	15000
4	Karthik	Prof	2	30000
5	Akalya	AP	1	10000

Q6: Write a query to implement the rollback Ans:

SQL> rollback s1; SQL> select * from emp;

EMPNO	ENAME	JOB	DEPTNO	SAL
1	Mathi	AP	1	10000
2	Arjun	ASP	2	15000
3	Gugan	ASP	1	15000
4	Karthik	Prof	2	30000

Q6: Write a query to implement the commit

Ans: SQL> COMMIT;
Commit complete.

Example:
For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

```
SELECT      DNO,
COUNT(SSN)FROM THE
EMPLOYEE

 WHERE SALARY>600000 AND
          DNOIN(SELECT DNO

                    FROM THE
                    EMPLOYEEGROUP
                    BY DNO
                    HAVING COUNT(SSN)>5)

GROUP BY DNO ;
```

DNO	COUNT(SSN)
	3

ubuntu@ubuntu-OptiPlex-380:~$ MySQL -u root

-p Enter password:

Welcome to the MySQL monitor. Commands end with; or \g.

Your MySQL connection id is 36

Server version: 5.5.62-0ubuntu0.14.04.1 (Ubuntu)

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

```
mysql> show databases;
+--------------+
| Database          |
+--------------+
| information_schema |
| anya              |


| book              |
| first             |
| info              |
| jn                |
| job               |
| last              |
| MySQL             |

| performance_schema |
| se                |
| sec               |
| sece              |
| second            |
| suraj             |
| third             |
| universalbank       |
| viju              |
+--------------+
18 rows in set (0.13 sec)
```

mysql> use mysql;

Reading table information for completion of table and column namesYou

can turn off this feature to get a quicker startup with -A

Database changed

mysql> create table product(id int(4),pname varchar(9) NOT NULL,pprice int(8)

NOT NULL,discount int(5));Query OK, 0 rows affected (0.08 sec)

```
mysql> desc product;
+-------+--------+----+---+------+-----+
| Field   | Type      | Null | Key | Default | Extra |
+-------+--------+----+---+------+-----+
| id      | int(4)     | YES |    | NULL  |       |
| pname    | varchar(9) | NO |       | NULL  |       |
| pprice | int(8)        | NO  |     | NULL |       |
| discount | int(5)      | YES |    | NULL  |       |
+-------+--------+----+---+------+-----+
4 rows in set (0.00 sec)

mysql> insert into product VALUES(1,'AMIT',2000,100);
Query OK, 1 row affected (0.04 sec)

mysql> insert into product
VALUES(2,'CORNFLAKES',800,50); Query OK, 1 row
affected, 1 warning (0.04 sec)

mysql> insert into product VALUES(3,'PARLE',90,5);
Query OK, 1 row affected (0.04 sec)

mysql> insert into product VALUES(4,'NESTLE',70,2);
Query OK, 1 row affected (0.04 sec)

mysql> insert into product VALUES(5,'CADBOURY',100,10);
Query OK, 1 row affected (0.04 sec)

mysql> insert into product VALUES(6,'AMUL',200,20);
Query OK, 1 row affected (0.03 sec)

mysql> insert into product
VALUES(7,'JAM',70,8); Query OK, 1 row affected
(0.04 sec)

mysql> select * from product;
+----+-------+-----+-------+
| id | pname       | pprice | discount |
+----+-------+-----+-------+
|    1 | AMIT     | 2000 |        100 |
|    2 | CORNFLAKE | 800 |        50 |
|    3 | PARLE    |    90 |        5 |
|    4 | NESTLE  |     70 |        2 |
|    5 | CADBOURY | 100 |        10 |
|    6 | AMUL    |    200 |       20 |
|    7 | JAM     |    70 |        8 |
+----+-------+-----+-------+
7 rows in set (0.00 sec)
```

```
mysql> select count(id) AS Numberofproducts FROM product;
```

```
+-------------+
| Numberofproducts |
+-------------+
|              7 |
+-------------+
1 row in set (0.00 sec)
mysql> select Sum(pprice) AS Totalprice FROM product;
+---------+
| Totalprice |
+---------+
|       3330 |
+---------+
1 row in set (0.00 sec)

mysql> select Max(discount) AS Largestdiscount FROM product;


+-------------+
| Largestdiscount |
+-------------+
|           100 |

+-------------+
1 row in set (0.00 sec)


mysql> select Min(pprice) AS Smallestprice FROM product;
+-----------+
| Smallestprice |
+-----------+
|          70 |
+-----------+
1 row in set (0.00 sec)


mysql> select Avg(pprice) AS AveragePrice FROM product;
+----------+
| AveragePrice |
+----------+
|     475.7143 |
+----------+
1 row in set (0.00 sec)
```

Conclusion: In this experiment, we have studied aggregate functions and Transection Control Language and implemented Count, Sum, Max, Min, Avg, Commit,Rollback, and Savepoint commands.

****

Experiment No-6

AIM: Design SQL queries for suitable database applications using SQL DMLStatements: all types of Join, Sub-Query.

Theory:

1. Equi-join/Inner join
2. Non-equi-join
3. Self-join
4. Outer join

Equi-join:

A join that is based on equalities is called equi-join. '=' operator is used in equi- join comparison. It retrieves rows from tables having a common column. It is also called simple join.

Non-equi-join:

A join that specifies the relationship between columns belonging to different tables by making use of the relational operators (<, >, <=, >=, !=) other than the '=' operator is calledas non-equi-join

Self-join:

Joining a table to itself is known as self-join i.e. it joins one row in a table to another. Itcan compare each row of the table to itself and also with other rows of the same table.

Outer join:

An outer join returns all the rows returned by simple join or equi join as well as those rowsfrom one table that do not match any row from the other table.
The symbol (+) represents outer join.

Implementation:

1. Equi join:

```
select e.empno, e.ename, e.dept, d.deptno, d.loc, d.dname from emp e, dept d
where e.dept=d.deptno;
```

Output:

EMPNO	ENAME	DEPT	DEPTNO	LOC	DNAME
1001	Nilesh Joshi	10	10	Fourth	Computer
1002	Avinash Pawar	30	30	Second	Electrical
1003	Amit Kumar	30	30	Second	Electrical
1005	Niraj Sharma	20	20	First	Mechanical
1006	Pushkar Deshpande	30	30	Second	Electrical
1007	Sumit Patil	20	20	First	Mechanical
1008	ravi sawant	20	20	First	Mechanical

2. Non-equi-join:

Select e.ename, e.salary, s.grade from emp e, salgrade s
where e.salary>=s.losal and e.salary<=s.hisal;

Output:

ENAME	SALARY	GRADE
Amit Kumar	2000	3
Nilesh Joshi	2800	3
Avinash Pawar	5000	4
Pushkar Deshpande	6500	4

3. Self Join:

select worker.ename “employee”, manager.ename “manager” from emp worker, empmanager
where worker.mgr=manager.empno;

Output:

Employee Manager Avinash
Pawar Amit KumarPushkar
Deshpande Amit KumarNiraj
Sharma Amit
Kumar
Sumit Patil nitin kulkarni
Amit kumar nitin kulkarni

DEPARTMENT

INSERT INTO DEPARTMENT

VALUES(&DNO,'&DNAME',&MGRSSN,'&MGRSTARTDATE');SELECT * FROM

DEPARTMENT;

DNO	DNAME	N	MGRSS	MGRSTARTD
				10-AUG-

1	RESEARCH	111111	12 10-AUG-
2	ACCOUNTS	222222	10 15-APR-
3	AI	333333	12 18-MAY-
4	NETWORKS	111111	14
5	BIGDATA	666666	21-JAN-10

5 rows were selected.

EMPLOYEE

```
INSERT INTO EMPLOYEE
VALUES('&SSN','&NAME','&ADDRESS','&SEX',&SALARY,'&SUPERSS
N',& DNO);

SELECT * FROM EMPLOYEE;
```

SSN	NAME	ADDRESS	SEX	SALARY	SUPERSSN	DNO
111111	RAJ	BENGALURU	M	700000		1
222222	RASHMI	MYSORE	F	400000	111111	2
333333	RAGAVI	TUMKUR	F	800000		3
444444	RAJESH	TUMKUR	M	650000	333333	3
555555	RAVEESH	BENGALURU	M	500000	333333	3
666666	SCOTT	ENGLAND	M	700000	444444	5
777777	NIGANTH	GUBBI	M	200000	222222	2
888888	RAMYA	GUBBI	F	400000	222222	3
999999	VIDYA	TUMKUR	F	650000	333333	3
100000	GEETHA	TUMKUR	F	800000		3

10 rows selected.

DLOCATION

```
INSERT INTO DLOCATION VALUES(&DNO,'&DLOC');

  SELECT * FROM DLOCATION;
```

DNO	DLOC
1	MYSORE
1	TUMKUR
2	BENGALUR

U

> GUBBI

> DELHI

> BENGALURU

6 rows were selected.

PROJECT

INSERT INTO PROJECT

VALUES(&PNO,'&PNAME','&PLOCATION','&DNO');SELECT * FROM

PROJECT;

PNO	PNAME	PLOCATION	DNO
111	IOT	GUBBI	3
222	TEXTSPEECH	GUBBI	3
333	IPSECURITY	DELHI	4
444	TRAFICANAL	BENGALURU	5
555	CLOUDSEC	DELHI	1

5 rows were selected.

WORKS_ON

INSERT INTO WORKS_ON VALUES('&SSN',&PNO,&HOURS);
SELECT * FROM WORKS_ON;

SSN	PNO	HOURS
666666	333	4
666666	111	2
111111	222	3
555555	222	2
333333	111	4
444444	111	6
222222	111	2

8 rows were selected.

> Make a list of all project numbers for projects that involve an employee whose last

>

> name is ‘Scott’, either as a worker or as a manager of the department that controlsthe project.

```
(SELECT DISTINCT PNO
   FROM PROJECT P, DEPARTMENT D,
   EMPLOYEE E WHERE P.DNO=D.DNO
   AND
            SSN=MGRSSN
            AND
            NAME='SCOTT')


  UNION
(SELECT DISTINCT P.PNO
  FROM PROJECT P, WORKS_ON W,
  EMPLOYEE E WHERE P.PNO=W.PNO
  AND

           W.SSN=E.SSN
           AND
           NAME='SCOTT');
```

PNO

111

333

444

> Show the resulting salaries if every employee working on the ‘IoT’ project is given a10 percent raise.

```
SELECT FNAME, LNAME, 1.1*SALARY AS
INCR_SALFROM EMPLOYEE E, WORKS_ON W,
PROJECT P
         WHERE E.SSN=W.SSN

          ANDW.PNO=P.PNO AND

          P.PNAME=’IOT’;
```

SSN	NAME ADDRESS SEX	SALARY SUPERSSN	DNO

111111	RAJ	BENGALURU	M	700000	1
222222	RASHMI	MYSORE	F	440000 111111	2
333333	RAGAVI	TUMKUR	F	880000	3
444444	RAJESH	TUMKUR	M	715000 333333	3
555555	RAVEESH	BENGALURU	M	500000 333333	3
666666	SCOTT	ENGLAND	M	770000 444444	5
777777	NIGANTH	GUBBI	M	200000 222222	2
888888	RAMYA	GUBBI	F	400000 222222	3
999999	VIDYA	TUMKUR	F	650000 333333	3
100000	GEETHA	TUMKUR	F	800000	3

1. rows selected.

3. Find the sum of the salaries of all employees of the ‘Accounts’ department, as wellas the maximum salary, the minimum salary, and the average salary in this department.

```
SELECT      SUM(SALARY),      MAX(SALARY),

            MIN(SALARY),AVG(SALARY) FROM EMPLOYEE E,

DEPARTMENT D
WHERE DNAME='ACCOUNTS'
      ANDD.DNO=E.DNO;
```

SUM(SALARY) MAX(SALARY) MIN(SALARY) AVG(SALARY)

```
-------

 40000     200000           320000
 mysql> create database jn;
Query OK, 1 row affected (0.00 sec)

mysql> use jn;
Database changed
mysql> create table orders(orderID int NOT NULL,custID int NOT NULL,empID
VARCHAR(10) NOT NULL,PRIMARY KEY(orderID));
Query OK, 0 rows affected (0.08 sec)

mysql> DESC orders;
+_______+_________+____+___+_______+_____+
| Field  | Type         | Null | Key | Default | Extra |
+_______+_________+____+___+_______+_____+
| orderID | int(11)     | NO  | PRI | NULL     |       |
| custID | int(11)      | NO  |     | NULL     |       |
| empID  | varchar(10) | NO  |     | NULL     |       |
+_______+_________+____+___+_______+_____
+ 3 rows in set (0.00 sec)


mysql> create table customers(custID int NOT NULL,cust_name VARCHAR(30) NOT
NULL,city varchar(20) NOT NULL);
Query OK, 0 rows affected (0.07 sec)
mysql> desc customers;
+________+_________+____+___+_______+_____+
| Field     | Type        | Null | Key | Default | Extra |
+________+_________+____+___+_______+_____+
| custID    | int(11)     | NO  |     | NULL     |       |


| cust_name | varchar(30) | NO  |     | NULL     |       |
| city      | varchar(20) | NO  |     | NULL     |       |


+________+_________+____+___+_______+_____+
3 rows in set (0.00 sec)

mysql> INSERT INTO orders VALUES(101,1,'emp1');
Query OK, 1 row affected (0.04 sec)

mysql> INSERT INTO orders VALUES(103,2,'emp2');
Query OK, 1 row affected (0.03 sec)

mysql> INSERT INTO orders VALUES(136,3,'emp3');
Query OK, 1 row affected (0.02 sec)
```

```
mysql> INSERT INTO customers VALUES(5,'riya','delhi');
Query OK, 1 row affected (0.05 sec)

mysql> INSERT INTO customers VALUES(7,'raj','goa');
Query OK, 1 row affected (0.03 sec)

mysql> INSERT INTO customers VALUES(8,'priya','pune');
Query OK, 1 row affected (0.04 sec)

mysql> SELECT orders.orderID,customers.cust_name,customers.city FROM orders INNER
JOIN customers ON orders.custID=customers.custID;
Empty set (0.00 sec)

mysql> INSERT INTO customers VALUES(2,'puja','pune');
Query OK, 1 row affected (0.03 sec)

//INNER JOIN

mysql> SELECT orders.orderID,customers.cust_name,customers.city FROM orders INNER
JOIN customers ON orders.custID=customers.custID;
+_____+_____+____+
| orderID | cust_name | city |
+_____+_____+____+
|    103 | puja      | pune |
+_____+_____+____+
1 row in set (0.00 sec)

mysql> INSERT INTO customers VALUES(3,'divya','mumbai');
Query OK, 1 row affected (0.05 sec)

mysql> INSERT INTO customers VALUES(1,'jay','mumbai');
Query OK, 1 row affected (0.04 sec)


mysql> SELECT orders.orderID,customers.cust_name,customers.city FROM orders INNER

JOIN customers ON orders.custID=customers.custID;

+_____+_____+_____+
| orderID | cust_name | city  |
+_____+_____+_____+
|    103 | puja      | pune |
|    136 | divya     | mumbai |
|    101 | jay       | mumbai |
+_____+_____+_____
+ 3 rows in set (0.00 sec)

mysql> INSERT INTO orders VALUES(171,7,'emp7');
Query OK, 1 row affected (0.04 sec)
```

```
mysql> INSERT INTO orders VALUES(172,6,'emp8');
Query OK, 1 row affected (0.05 sec)

mysql> SELECT orders.orderID,customers.cust_name,customers.city FROM orders INNER
JOIN customers ON orders.custID=customers.custID;
+_______+________+_____+
| orderID | cust_name | city  |
+_______+________+_____+
|     171 | raj       | goa    |
|     103 | puja      | pune |
|     136 | divya     | mumbai |
|     101 | jay       | mumbai |
+_______+________+_____
+ 4 rows in set (0.00 sec)

// LEFT JOIN

mysql> SELECT orders.orderID, customers.cust_name FROM orders LEFT JOIN customers
ON orders.custID=customers.custID;
+_______+________+
| orderID | cust_name |
+_______+________+
|     101 | jay       |
|     103 | puja      |
|     136 | divya     |
|     171 | raj       |
|     172 | NULL      |


+_______+________+
5 rows in set (0.00 sec)

mysql> select * from

orders;

| orderID | custID | empID |
+_______+_____+_____+
|     101 |      1 | emp1  |
|     103 |      2 | emp2  |
|     136 |      3 | emp3  |
|     171 |      7 | emp7  |
|     172 |      6 | emp8  |
+_______+_____+_____+
5 rows in set (0.00 sec)
```

```
mysql> SELECT orders.orderID,customers.cust_name,customers.city FROM orders LEFT JOIN
customers ON orders.custID=customers.custID;
+_____+_____+_____+
```

| orderID | cust_name | city |
+_____+_____+_____+
101	jay	mumbai
103	puja	pune
136	divya	mumbai
171	raj	goa
172	NULL	NULL
+_____+_____+_____
+ 5 rows in set (0.00 sec)

RIGHT JOIN

mysql> SELECT orders.orderID,customers.cust_name,customers.city FROM orders RIGHT JOIN customers ON orders.custID=customers.custID;
+_____+_____+_____+
| orderID | cust_name | city |
+_____+_____+_____+
NULL	riya	delhi
171	raj	goa
NULL	priya	pune
103	puja	pune
136	divya	mumbai
101	jay	mumbai

+_____+_____+_____
+ 6 rows in set (0.00 sec)

mysql> select * from customers;
+_____+_____+_____+
| custID | cust_name | city |
+_____+_____+_____+
5	riya	delhi
7	raj	goa
8	priya	pune
2	puja	pune

| 3 | divya | mumbai |

| 1 | jay | mumbai |
+_____+_____+_____+
6 rows in set (0.00 sec)

mysql> SELECT * FROM orders JOIN customers ON orders.custID=customers.custID;
+_____+_____+_____+_____+_____+_____+
| orderID | custID | empID | custID | cust_name | city |
+_____+_____+_____+_____+_____+_____+

```
|    171 |     7 | emp7 |       7 | raj       | goa    |
|    103 |     2 | emp2  |      2 | puja      | pune |
|    136 |     3 | emp3  |      3 | divya     | mumbai |
|    101 |     1 | emp1  |      1 | jay       | mumbai |
+_____+_____+_____+_____+_____+_____+
4 rows in set (0.00 sec)
```

//EQUI JOIN

```
mysql> SELECT orders.orderID,customers.cust_name,customers.city FROM orders JOIN
customers ON orders.custID=customers.custID;
+_____+_____+_____+
| orderID | cust_name | city  |
+_____+_____+_____+
|    171 | raj       | goa    |
|    103 | puja      | pune |
|    136 | divya     | mumbai |
|    101 | jay       | mumbai |
+_____+_____+_____+

4 rows in set (0.00 sec)
```

//NON-EQUI JOIN

```
mysql> SELECT orders.orderID,customers.cust_name,customers.city FROM orders JOIN
customers WHERE orders.custID BETWEEN 3 AND 10;
+_____+_____+_____+
| orderID | cust_name | city  |

|    136 | riya      | delhi  |
|    171 | riya      | delhi  |
|    172 | riya      | delhi  |
|    136 | raj       | goa
+_____+_____+_____+



                              |
|    171 | raj       | goa    |
|    172 | raj       | goa    |
|    136 | priya     | pune   |
|    171 | priya     | pune   |
|    172 | priya     | pune   |


|    136 | puja      | pune   |
|    171 | puja      | pune   |
|    172 | puja      | pune   |
```

136	divya	mumbai
171	divya	mumbai
172	divya	mumbai
136	jay	mumbai
171	jay	mumbai

+_____+_____+_____
+ 18 rows in set (0.00 sec)

Conclusion: In this experiment, we have studied SQL queries for suitable database applications using SQL DMLStatements and implemented all types of joins, and Sub-Query.

****

Experiment No-7

AIM: Write a PL/SQL block to calculate the grade of minimumof 10 students

Theory:

PL/SQL is a combination of SQL along with the procedural features of programming languages. It was developed by Oracle Corporation in the early 90s to enhance the capabilities of SQL. PL/SQL is one of three key programming languages embedded in the Oracle Database, along with SQL itself and Java. This tutorial will give you a great understanding of PL/SQL to proceed with Oracle database and other advanced RDBMS concepts. PL/SQL programming language provides the following types of decision-making statements.

Decision-making statements: PL/SQL provides IF statement to execute a statement or sequence of statements conditionally. There are 3 forms of IF statement –IF-THEN, IF-THEN-ELSE, and IF-THEN-ELSIF.

1. IF-THEN Statement:

Syntax:

IF<condition>THEN

Statement(s)

END IF;

1. IF-THEN-ELSE Statement

   IF condition

   THEN

   Statement(s);

   ELSE

   Statement(s);

   END IF;

2. IF-THEN-ELSIF

   This form of IF statement is used when we have to implement logic that hasmany alternatives.

Syntax: IF condition 1 THENStatement 1;

ELSIF condition 2 THEN

Statement 2;

ELSE

Statement 3;

```
END IF;
```

Program:

The following program calculates the grade of students when t h e percentage of marks obtained is entered.
Percentage>=80 -Grade A
80>Percentage>=60 -Grade B
60>Percentage>=45 -Grade C
45>Percentage -Fail

```
DECLARE v_student Students%rowtype;
v_result Dev_2000_result%rowtype; grade
varchar2(10);

CURSOR c1 ISSELECT
*FROM Students;

BEGIN
FOR v_student IN c1 LOOP IF v_student.class='Computer' THEN IF
v_student.Dev_2000 <50 THEN grade:='FAIL';
ELSE grade:='PASS';
END IF;
elsif v_student.class='Student' THEN IF v_student.Dev_2000 >=80 THEN
grade:='HONOURS';
elsif v_student.Dev_2000 >=60 THEN grade:='A'; elsif
v_student.Dev_2000 >=50 THEN grade:='B'; elsif
v_student.Dev_2000 >=40 THEN grade:='C'; ELSE
grade:='B';
END IF;
END IF;

INSERT INTO Dev_2000_result
VALUES(v_student.Roll_no,
        v_student.Oracle,
        v_student.Dev_2000,grade);

END
LOOP;
END;
/
```

Output:

```
create table Students(roll_no varchar(20), name varchar(20), section varchar(20),class varchar(20),
ORACLE varchar(20),DEV_2000 varchar(20));

Table created.

SQL> insert into Students values('1','Naveen','A','Computer','89','87');
1 row created.
```

SQL> insert into Students

values('2','Veena','A','Computer','90','56'); 1 row was created.

SQL> insert into Students values('3','Kiran','A','Computer','34','43');

1 row was created.

SQL> insert into Students values('4','Ganesh','A','E&TC','88','100');
Enter value for tc: 7
old 1: insert into Students values('4','Ganesh','A','E&TC','88','100')
new 1: insert into Students

values('4','Ganesh','A','E7','88','100') 1 row was created.

SQL> insert into Students

values('5','Madhuri','A','Civil','56','90'); 1 row was created.

SQL> insert into Students values('6','Sanket','A','Computer','78','23');
1 row created.

SQL> insert into Students

values('7','Mohit','A','Computer','46','67'); 1 row was created.

SQL> insert into Students values('8','Ashutosh','A','IT','50','28');

1 row was created.

SQL> insert into Students values('9','Pragati','A','IT','67','50');

1 row was created.

SQL> insert into Students

values('10','Rushikesh','A','Mechanical','89','65'); 1 row was created.

SQL> @grade1.sql

PL/SQL procedure successfully completed.SQL>

select *from Dev_2000_result;

ROLL_NO	TOTAL	PERCENT GRADE
1	89	87 PASS
2	90	56 PASS

3	34	43	FAIL
4	8	10	FAIL
5	56	45	FAIL
6	78	23	FAIL
7	46	67	PASS
8	50	28	PASS
9	67	50	PASS
10	89	65	PASS

10 rows selected.

Conclusion: In this experiment, we have studied Procedural Language/Structured Query Language decision-making statements and implemented a PL/SQL block to calculate the grade of a minimumof 10 students.

Experiment No-8

AIM: Write a PL/SQL block to implement all types of cursors.

Theory:

Cursor:

A cursor is a type of pointer built into PL/SQL for querying the database, retrieving a set of records, and allowing a developer to access the active data set, a row at a time. This allows the programmers to accomplish tasks that require procedural code to be performed oneach record in a result set individually.

When a cursor is loaded with multiple rows using a query, the oracle engine opens and maintains a row pointer into the active data set.

The row pointer will be moved within the active data set depending on the user's request.

Types of Cursors

1. Implicit cursor
2. Explicit cursor

Implicit cursors are cursors that are opened by the oracle engine for its internal processing. This kind of cursor is called implicit because oracle automatically handles many of the cursor-related operations such as open, fetch, close, etc.

Explicit cursors are the cursors open by the user for processing data as required. It is also known as a user-defined cursor. The user explicitly performs operations such as open, fetch, control, etc. against the cursor.

General Cursor Attributes:

Name	**Description**
%FOUND	Returns true if the record was fetched successfully,falses otherwise.
%NOTFOUND	Returns true if the record was not fetched successfully, falseotherwise
%ROWCOUNT	Returns numbers of records fetched from cursors at that point in time
%ISOPEN	Return True if the cursor is open, false otherwise

Implicit Cursor:

PL/SQL declared and manages an implicit cursor every time you execute a SQL DML statement such as Insert, Update, or a SELECT INFO statement that returns a single row

from the database. This Kind of cursor is called implicit because Oracle automatically or implicitly handles many of the cursor related operations such as

- Reserving area in memory
- Populating this area with appropriate data
- Processing the data in the memory area
- Related to the memory area when processing is complete

Oracle allows you to access information about the most recently executed implicit cursorby referencing special implicit cursor attributes. These attributes can be used to access information about the status of the most recently executed SQL statement (insert, update, delete, etc.) regardless of the block or from which the SQL statement was executed. All theimplicit cursor attributes return NULL if no implicit cursor has been executed in thesession.
Because the cursor are implicit, they have no name and therefore the keyword‘SQL’ is used to denote the implicit cursor.

- SQL%FOUND - It is used to determine if any rows were retrieved. This attribute will return TRUE if an INSERT, UPDATE, DELETE statement affected one or more rows or aSELECTED INTO statement returns one or more rows, otherwise it returns FALSE. SQL%FOUND

  This attribute is opposite to the SQL %FOUND. It returns true if no rules were found otherwise it returns false.
  SQL% ROW COUNT This attribute is used to determine the no of rows affected by INSERT, UPDATE OR DELETE OR SELECT INTO statement.
  SQL% is open this attribute always return false because implicit cursor is open andclose implicitly before you can reference SQL% is open to check their status.

  2. **Explicit cursor**
  An explicit cursor is a SELECT statement that is explicitly defined in the declaration section of code and is also assigned a name. We cannot use an explicit cursor for UPDATE,

DELETE AND INSERT statements.

Explicit cursor handling involves steps.

Declaring the Cursor

Opening the Cursor

Fetching rows from the cursor one at a time

Closing the Cursor

Declaration of the explicit cursor,

Declaring a cursor means giving it a name and specifying the select statement with which the cursor is associated. There is no memory allocation at this point. Declaration of PL/SQL block may declare more than one cursor at a time but of different names.

Syntax:

CURSOR<cursorname>

IS SQL select statement;

Opening an explicit cursor: After declaration, the cursor is open with an open statementfor processing rows in the cursor. While opening the cursor, actual memory allocation to the cursor takes place. When you open the cursor, then select statement associated with the cursor is executed. It also identifies active data sets that are rows from all involved tables that meet the criteria in the where clause and the join condition.

This syntax
OPEN<cursorname>;
Fetching records
Syntax of fetch statement
FETCH<cursorname>INTO<var_list>;

CLOSING THE CURSOR

After processing the rows in the cursor it is released with a closing statement.The syntax for closed command is

CLOSE<cursorname>;

CURSOR FOR LOOP:

The cursor for loop should be preferred when you need to fetch and process each and every record from the cursor.

The cursor for the loop reduces the volume if the code needs to write to fetch data from a cursor.

Syntax:

FOR loop_index IN <cursorname>
LOOP
Executable_staement;
END LOOP;

The cursor for the loop automatically does the following;

- Implicitly declares its loop index as a %ROWTYPE record.
- Open a cursor
- Fetches a row from the cursor for each loop iteration. After each execution of loops body, PL/SQL performs another fetch. If the % is not found attribute of the cursor evaluates a true, thenthe loop terminates. The loop never executes its body if the cursor returns no rows.

Close the cursor when all rows have been fetched. we can also terminate the loops with an exitstatement but this is not recommended.

PASSING PARAMETERS TO CURSORS

Syntax for declaring parameterized cursor is

CURSOR<cursorname>(var_name datatype)IS

{

SELECT statement

};

You can pass multiple parameters in the cursor

OPEN<cursorname>(variable/value/expression);

Program:
1) Implicit Cursor:
Output:

```
SQL*Plus: Release 11.2.0.2.0 Production on Thu Jan 1 01:20:36 2009

Copyright (c) 1982, 2010, Oracle. All rights reserved.

SQL> connect
Enter user-name: system
Enter password:
Connected.


SQL> edit shubham

SQL> SET SERVEROUTPUT
ON;SQL> BEGIN
  2    UPDATE N_ROLLCALL SET ATTENDANCE='a' WHERE NAME='shrikant';
  3    IF SQL%FOUND THEN
  4          dbms_output.put_line('Updated - If Found');
  5    END IF;
  6    IF SQL%NOTFOUND THEN
  7          dbms_output.put_line('NOT Updated - If NOT Found');
  8    END IF;
  9    IF SQL%ROWCOUNT>0 THEN
 10           dbms_output.put_line(SQL%ROWCOUNT||' Rows Updated');
 11     ELSE
 12           dbms_output.put_line('NO Rows Updated Found');
 13        EN
D IF;14
END;
15 /


Updated - If Found
1 Rows Updated

PL/SQL procedure successfully completed.


SQL> select * from n_rollcall;

  ROLL_NO NAME       ATTDATE     ATTENDANCE
---------- ---------- ---------
         1 shrikant                 02-JAN-09    a
```

2 shubham 02-JAN-09 p

3 pragati 02-JAN-09 a

2) Explicit Cursor

```
SQL> edit sham
SQL> DECLARE
  CURSOR EXPLICIT_CUR is select ROLL_NO, NAME, ATTDATE from N_ROLLCALL where
ATTENDANCE='a';
     tmp EXPLICIT_CUR
  %rowtype;BEGIN
     dbms_output.put_line('HI THIS IS TEST');
    OPEN EXPLICIT_CUR;
     Loop exit when
          EXPLICIT_CUR%NOTFOUND;FETCH
          EXPLICIT_CUR into tmp;
     dbms_output.put_line('ROLL NO :' || tmp.ROLL_NO || 'NAME : ' || tmp.NAME || 'DATE :'
|| tmp.ATTDATE);
    END Loop;
  IF EXPLICIT_CUR%ROWCOUNT>0 THEN
    dbms_output.put_line(SQL%ROWCOUNT||' ROWS
  FOUND');ELSE
    dbms_output.put_line('NO ROWS
  FOUND'); END IF;
  CLOSE
  EXPLICIT_CUR;
  END;
  /
HI THIS IS A TEST
ROLL NO :1NAME: shrikantDATE:02-JAN-
09ROLL NO :3NAME: pragatiDATE :02-JAN-
09 ROLL NO :3NAME: pragatiDATE :02-
JAN-09 ROWS FOUND
```

PL/SQL procedure successfully completed.

3) Cursor For Loop

```
SQL> edit new
SQL>
DECLARE
   cursor FOR_CUR is select ROLL_NO,NAME, ATTDATE from N_ROLLCALL where
ATTENDANCE='ABSENT';
```

```
 tmp FOR_CUR %rowtype;
  BEGIN
  FOR tmp IN
  FOR_CURLOOP
  dbms_output.put_line('ROLL NO :' || tmp.ROLL_NO ||' '|| 'NAME : ' || tmp.NAME ||' '||'DATE
:' || tmp.ATTDATE);
  END
  Loop;
  END;
  /
```

PL/SQL procedure successfully completed.

SQL> select * from n_rollcall;

ROLL_NO	NAME	ATTDATE	ATTENDANCE
1	shrikant	02-JAN-09	A
2	shubham	02-JAN-09	P
3	pragati	02-JAN-09	a

4) Parametrized cursor

SQL> edit shree

```
    SQL>
    DECLARE
     CURSOR PARAM_CURSOR (ROLL NUMBER) IS SELECT * FROM
     N_ROLLCALLWHERE ROLL_NO = ROLL;
     TMP PARAM_CURSOR
  %ROWTYPE;BEGIN
     FOR TMP IN PARAM_CURSOR (101) LOOP
     dbms_output.put_line('NAME     '||TMP.NAME);
    dbms_output.put_line('DATE '||TMP.ATTDATE);
    dbms_output.put_line('ATTENDANCE: '||TMP.ATTENDANCE);
```

```
   END Loop;
 END;
 /
```

PL/SQL procedure successfully completed.

SQL> select * from n_rollcall;

ROLL_NO	NAME	ATTDATE	ATTENDANCE
1	shrikant	02-JAN-09	a
2	shubham	02-JAN-09	p
3	pragati	02-JAN-09	a

ROLL_NO	NAME	ATTDATE	ATTENDANCE
5	rushikesh	02-JAN-09	p
4	krishna	02-JAN-09	p

CURSOR PROGRAM FOR ELECTRICITY BILL CALCULATION:

SQL> create table bill(name varchar2(10), address varchar2(20), city varchar2(20),unit number(10));

Table created.

SQL> insert into bill values('&name','&addess','&city','&unit');

Enter value for name: yuva

Enter value for addess: srivi Enter

value for city: srivilliputurEnter

value for unit: 100

old 1: insert into bill values('&name','&addess','&city','&unit')new 1: insert into bill values('yuva','srivi','srivilliputur','100') 1 row created.

SQL> /

Enter value for name: nithya

Enter value for addess: Lakshmi nagar

Enter value for city: sivakasi

Enter value for unit: 200

old 1: insert into bill values('&name','&addess','&city','&unit')

new 1: insert into bill values('nithya','Lakshmi nagar','sivakasi','200')1

row created.

SQL> /

Enter value for name: maya

Enter value for addess: housing board

Enter value for city: sivakasi

Enter value for unit: 300

old 1: insert into bill values('&name','&address','&city','&unit')

new 1: insert into bill values('maya','housing

board','sivakasi','300')

1 row
created.

SQL> /

Enter value for name: jeeva

Enter value for addess: RRR nagar

Enter value for city: sivaganagai

Enter value for unit: 400

old 1: insert into bill values('&name','&addess','&city','&unit')

new 1: insert into bill values('jeeva','RRR nagar','sivaganagai','400')1

row created.

SQL> select * from bill;

NAME	ADDRESS	CITY	UNIT
yuva	srivi	srivilliputur	100
nithya	Lakshmi nagar	sivakasi	200
maya	housing board	Sivakasi	300

```
jeeva    RRR nagar          sivaganagai              400

SQL> declare

cursor c is select * from bill;

    b bill %ROWTYPE;

    begin

    open c;

  dbms_output.put_line('Name      Address    city Unit

    Amount'); loop

    fetch c into b;
  if(c%notfound) then 10

  exit;

 else

  if(b.unit<=100) then
  dbms_output.put_line(b.name||' '||b.address||' '||b.city||' '||b.unit||' '||b.unit*1);elsif(b.unit>100 and

b.unit<=200) then

  dbms_output.put_line(b.name||' '||b.address||' '||b.city||' '||b.unit||' '||b. unit*2);
      elsif(b.unit>200 and b.unit<=300) then

 dbms_output.put_line(b.name|    '||b.address|    '||b.city||'   '||b.unit|     '||b.unit*
 |' dbms_output.put_line(b.name|  |' '||b.address|  '||b.city||   |' '||b.unit|

|'                                |'               '            |'             '||b.unit*4);
 Else
dbms_output.put_line(b.name|     '||b.address|    '||b.city||'   '||b.unit|
|'                                |'                            |'             '||b.unit*5);
 end if;
      dbms_output.put_line(b.name||' '||b.address||' '||b.city||' '||b.unit||' '||b. unit*3);
      elsif(b.unit>300 and b.unit<=400) then
```

```
end if;
    end loop;
    close c;
```

end;

/

Name	Address	city	Unit	Amount
yuva	srivi	srivilliputur	100	100
nithya	Lakshmi nagar	Sivakasi	200	400
maya	housing board	Sivakasi	300	900
jeeva	RRR nagar	sivaganagai	400	1600

Conclusion: In this experiment, we have studied the cursor concept and implemented implicit, explicit, cursor for loop, and parameterized types of cursors.

****

Experiment No-9

AIM: Write PL/SQL stored procedure and function.

Theory: The stored procedure is a group of SQL statements that can be executed repeatedly. Create **a stored procedure** to debit a bank account. The user must enter the account number and amount to be debited. The minimum balance in the account should be 500. Suppose that a table BANK contains the account number (Accno) and balance(balance) fields and has 10 records in it. **Creating a Procedure:**

A procedure is created with the CREATE OR REPLACE PROCEDURE statement. The simplified syntax for the CREATE OR REPLACE PROCEDURE statement is as follows −

```
CREATE [OR REPLACE] PROCEDURE procedure_name
[(parameter_name [IN | OUT | IN OUT] type [, ...])]
{IS | AS}
BEGIN
  < procedure_body >
END procedure_name;
```

Where,

- procedure-name specifies the name of the procedure.
- [OR REPLACE] option allows the modification of an existing procedure.
- The optional parameter list contains the name, mode, and types of the parameters. IN represents the value that will be passed from outside and OUT represents the parameter that will be used to return a value outside of the procedure.
- procedure-body contains the executable part.
- The AS keyword is used instead of the IS keyword for creating a standalone procedure.

Creating a function:

A standalone function is created using the CREATE FUNCTION statement.

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

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

Where,

- function-name specifies the name of the function.
- [OR REPLACE] option allows the modification of an existing function.
- The optional parameter list contains the name, mode, and types of the parameters. IN represents the value that will be passed from outside and OUT represents the parameter that will be used to return a value outside of the procedure.
- The function must contain a return statement.
- The RETURN clause specifies the data type you are going to return from the function.
- function-body contains the executable part.
- The AS keyword is used instead of the IS keyword for creating a standalone function.

```
Ed bal.sql
create or replace procedure chk_balance (ACC number, Amount number) As LESS_balance
EXCEPTION;
curr_amount number(8,2);
Begin
Select balance INTO curr_amount FROM Bank
Where Accno=Acc;
IF curr_amount>500 THEN
UPDATE Bank set balance=balance-amount where accno=acc;
dbms_output.put_line (‘updation successful’);
ELSE
dbms_output.put_line (‘Minium balance should be 500’);
END IF;
EXCEPTION
When No_data_found THEN
Dbms_output.put_line(‘Acc number ‘||Acc||’not exists’);END
chk_balance;
/
SQL> @ BAL
Procedure created.
```

Stored function:

Create a stored function that computes the greatest of the three numbers.SQL>

```
ED GREAT
Create or Replace Function Great (A number, B number, C number) Return numberAS
Begin
IF (A>B AND A>C) THEN
Return A;
ELSEIF (A<B AND B>C) THEN
Return B;
ELSE
Return C;
```

```
END IF;
END Great;
/
```

On execution, it will create a function ‘Great’.

Step 1: SQL> @ GREAT

Step 2(optional): SQL>SHOW ERRORS;

Step 3: SQL>Select GREAT (7,10,12) FROM DUAL;

On execution of the above statement, it will run the function ‘Great’ and return the correctvalue.

Conclusion: In this experiment, we have studied the concept of procedure and functions and implemented PL/SQL stored procedure and function

****

Experiment No-10

AIM: Write a database Trigger (Row-level and Statement level)

Theory:

The trigger is a set-off action that gets executed automatically when a specified changeoperation (SQL INSERT, UPDATE or DELETE statement) is performed on a particular table.

Triggers are stored programs, which are automatically executed or fired when some events occur. Triggers are, in fact, written to be executed in response to any of the following events

The syntax for Creating a Trigger

CREATE TRIGGER name BEFORE|AFTER **INSERT**|**UPDATE**|**DELETE** ON tablename FO R EACH ROW code

c. after delete

trigger mysql>

delimiter $$

```
mysql> CREATE TRIGGER myTrigger
-> BEFORE DELETE ON employee
   -> FOR EACH ROW
   -> BEGIN
   ->       INSERT into transaction_log
   ->            (user_id, description)
   ->       VALUES (user(), 'Employee deleted ');
   -> END$$

Query OK, 0 rows affected (0.00 sec)

mysql> delimiter ;

mysql> delete from employee where id = 1;
Query OK, 1 row affected (0.00 sec)
```

f. AFTER UPDATE

```
trigger mysql> delimiter $$

mysql>
mysql> CREATE TRIGGER myTrigger
   -> AFTER UPDATE ON employee FOR EACH ROW ->
   BEGIN
   ->       INSERT into transaction_log
   ->            (user_id, description)
   -
```

```
>         VALUES (user(), CONCAT('Adjusted account ',NEW.id,' from
',OLD.salary, ' to ', NEW.salary));
   -> END$$
Query OK, 0 rows affected (0.00 sec)


mysql> delimiter ;

mysql> update Employee set salary = salary +1000;
Query OK, 8 rows affected (0.00 sec) Rows
matched: 8 Changed: 8 Warnings: 0

mysql> drop trigger myTrigger;

Query OK, 0 rows affected (0.01 sec)
```

c. Before insert

trigger mysql>

delimiter $$

```
mysql>
mysql> CREATE TRIGGER myTrigger
   -> BEFORE INSERT ON employee
    -> FOR EACH ROW
    -> BEGIN
    ->     IF NEW.salary > 500 THEN
    ->        SET NEW.first_name='Y';
    ->     ELSE
    ->        SET NEW.first_name='N';
    ->     END IF;
   -> END$$
Query OK, 0 rows affected (0.00 sec)
mysql>

mysql> delimiter
; mysql>
mysql>  update  Employee  set  salary  =
400, first_name=''; Query OK, 8 rows affected (0.00
sec)
Rows matched: 8 Changed: 8 Warnings: 0
```

d. Before update

trigger mysql>

delimiter $$

```
mysql> CREATE TRIGGER myTrigger
-> BEFORE UPDATE ON employee
                -> FOR EACH ROW
                -> BEGIN
```

```
    ->    IF NEW.salary <5000 THEN
    -> SET NEW.first_name=CONCAT('NEW.first_name','*'); -
    >ELSE
    ->      SET NEW.last_name=CONCAT('NEW.last_name','*');


    ->    END IF;
    -> END$$

  Query OK, 0 rows affected (0.01 sec)

  mysql> delimiter ;

  mysql>
  mysql> update employee set salary = 1000, first_name='new first Name';
  Query OK, 8 rows affected (0.00 sec) Rows matched: 8 Changed: 8
  Warnings: 0
```

e. Change the NEW value based on the input in a BEFORE INSERT trigger mysql> DELIMITER //

```
  mysql>
  mysql> CREATE TRIGGER myTrigger BEFORE INSERT ON employee
    -> FOR EACH ROW
    -> BEGIN
    -> IF NEW.salary IS NULL OR NEW.salary = 0 THEN
    ->       SET NEW.salary = 100;
    -> ELSE
    ->       SET NEW.salary = NEW.salary + 100;
    -> END IF;
    ->
    -> END
    -> //
  Query OK, 0 rows affected (0.02 sec)

  mysql> DELIMITER
;mysql>

mysql> delimiter
; mysql>
mysql>  update  Employee  set  salary  =
400, first_name=''; Query OK, 8 rows affected (0.00
sec)
Rows matched: 8 Changed: 8 Warnings: 0
```

e. Before update trigger mysql>

```
  delimiter $$
mysql> CREATE TRIGGER myTrigger
-> BEFORE UPDATE ON employee
    -> FOR EACH ROW
```

```
-> BEGIN
->    IF NEW.salary <5000 THEN

-> SET NEW.first_name=CONCAT('NEW.first_name','*'); -
>ELSE


->      SET NEW.last_name=CONCAT('NEW.last_name','*');

->    END IF;
-> END$$


Query OK, 0 rows affected (0.01 sec)

mysql> delimiter ;

mysql>
mysql> update employee set salary = 1000, first_name='new first Name';
Query OK, 8 rows affected (0.00 sec) Rows matched: 8 Changed: 8
Warnings: 0
```

e. Change the NEW value based on the input in a BEFORE INSERT trigger

```
mysql> DELIMITER //
mysql>
mysql> CREATE TRIGGER myTrigger BEFORE INSERT ON employee
   -> FOR EACH ROW
   -> BEGIN
   -> IF NEW.salary IS NULL OR NEW.salary = 0 THEN
   ->       SET NEW.salary = 100;
   -> ELSE
   ->       SET NEW.salary = NEW.salary + 100;
   -> END IF;
   ->
   -> END
   -> //
Query OK, 0 rows affected (0.02 sec)

mysql> DELIMITER ;
```

f. Row level trigger

```
create table test(
percent decimal

);

delimiter $$
```

```
CREATE TRIGGER test_before_insert

BEFORE INSERT ON test FOR

EACH ROW

BEGIN
   IF NEW.percent < 0.0 OR NEW.percent > 1.0 THEN


      SET NEW.percent = NULL;

   END IF;

END$$

delimiter

;
```

g. Viewing Triggers

```
mysql> DELIMITER //
mysql>

mysql> CREATE TRIGGER mytrigger BEFORE UPDATE ON employee
   -> FOR EACH ROW
   -> BEGIN
   ->
   -> IF NEW.id > 5 THEN
   ->    SET NEW.first_name = NEW.first_name+ " *";
   -> END IF;
   ->
   -> IF NEW.salary IS NULL OR NEW.salary = 0 THEN
   ->       SET NEW.salary = 100;
   -> ELSE
   ->       SET NEW.salary = NEW.salary + 100;
   -> END IF;

   -> END
   -> //

Query OK, 0 rows affected (0.00 sec)

mysql> DELIMITER ;

mysql>
mysql> SELECT * FROM INFORMATION_SCHEMA.TRIGGERS;
```

Conclusion: In this experiment, we have studied the PL/SQL concept of the trigger and implemented row-

level and statement-level triggers.

Experiment No-11

AIM: Design and Develop MongoDB Queries using CRUDoperations.

Theory: MongoDB CRUD Operations

- Create Operations
- Read Operations
- Update Operations
- Delete Operations

Create Operations

Create or insert operations and add new documents to a collection. If the collection does not currentlyexist, insert operations will create the collection.

MongoDB provides the following methods to insert documents into a collection:

- db.collection.insertOne() *New in version 3.2*
- db.collection.insertMany() *New in version 3.2*

In MongoDB, insert operations target a single collection. All write operations in MongoDB are atomic on the level of a single document.

Read Operations

Read operations retrieves documents from a collection; i.e. queries a collection for documents. MongoDB provides the following methods to read documents from a collection:

- db.collection.find()

You can specify query filters or criteria that identify the documents to return.

Update Operations

Update operations modify existing documents in a collection. MongoDB provides the following methods to update documents of a collection:

- db.collection.updateOne() *New in version 3.2*
- db.collection.updateMany() *New in version 3.2*
- db.collection.replaceOne() *New in version 3.2*

In MongoDB, update operations target a single collection. All write operations in MongoDB are atomic on the level of a single document.

You can specify criteria, or filters, that identify the documents to update. These filters use the same syntax as reading operations.

For examples, see Update Documents.

Delete Operations

Delete operations remove documents from a collection. MongoDB provides the following methods to delete documents of a collection:

- db.collection.deleteOne() *New in version 3.2*
- db.collection.deleteMany() *New in version 3.2*

In MongoDB, delete operations target a single collection. All write operations in MongoDB are atomic on the level of a single document.

You can specify criteria, or filters, that identify the documents to remove. These filters use the same syntax as reading operations.

1.1. **The Use Command:** MongoDB **uses DATABASE_NAME** is used to create a database. The command will create a new database; if it doesn't exist otherwise it will return the existing database.

Syntax: Use DATABASE_NAME;

Example: If you want to create a database with the name **<mydb>**, then **use the database** the statement would be as follows:
>use mydb
switched to db mydb

To check your currently selected database use the command **db**
>db
Mydb
If you want to check your databases list, then use the command **show dbs**.
>show dbs
local 0.78125GB
test 0.23012GB

Your created database (mydb) is not present in list. To display database you need to insert at least one document into it.
>db.movie.insert({"name":"tutorials point"})
>show dbs
local 0.78125GB
mydb 0.23012GB

test 0.23012GB

In Mongo DB default database is tested. If you didn't create any database then collections will bestored in the test database.

2. **MongoDB Drop Database:**
   2.1. **The Drop Database:** MongoDB **db.dropDatabase ()** command is used to drop an existing database.

   Syntax:
   Basic syntax of **dropDatabase ()** command is as follows:
   db.dropDatabase()

   This will delete the selected database. If you have not selected any database, then it will delete the default 'test' database

   Example:
   First, check the list of available databases by using the command **show dbs**
   >show dbs
   local 0.78125GB
   mydb 0.23012GB
   test 0.23012GB

   If you want to delete new database **<mydb>**, then **dropDatabase()** command would be as follows:
   >use mydb
   switched to db mydb
   >db.dropDatabase()
   >{ "dropped" : "mydb", "ok" : 1 }

   Now check list of databases
   >show dbs
   local 0.78125GB
   test 0.23012GB

3. **Basic Operations with the Shell:** We can use the four basic operations, create, read, update, and delete (CRUD) to manipulate and view data in the shell.
   3.1. **Create:** The insert function adds a document to a collection. For example, suppose we want to store a blog post. First, we'll create a local variable called post which is a JavaScript object representing our document. It will have the keys "title", "content", and "date". (the date that it was published):

   > post = {"title" : "My Blog Post",
   ... "content": "Here's my blog post.",
   ... "date" : new Date()}
   {
   "title" : "My Blog Post",
   "content" : "Here's my blog post.",
   "date" : ISODate("2012-08-24T21:12:09.982Z")
   }

This object is a valid MongoDB document, so we can save it to the blog collection using the insert method:

```
> db.blog.insert(post)
```

3.2. **Read:** Find and findOne can be used to query a collection. If we just want to see one document from a collection, we can use findOne.

```
> db.blog.findOne()
{
"_id" :
ObjectId("5037ee4a1084eb3ffeef7228"), "title"
: "My Blog Post",
"content" : "Here's my blog post.",
"date" : ISODate("2012-08-24T21:12:09.982Z")
}
```

Find and findOne can also be passed criteria in the form of a query document. This will restrict the documents matched by the query. The shell will automatically display up to 20 documents matching a find, but more can be fetched. See Chapter 4 for more information on querying.

3.3. **Update:** If we would like to modify our post, we can use an update. The update takes (at least) two parameters: the first is the criteria to find which document to update, and the second is the new document. Suppose we decide to enable comments on the blog post we created earlier. We'll need to add an array of comments as the value for a new key in our document.

The first step is to modify the variable post and add a "comments" key:

```
>       post.commen
ts = [] [ ]
```

Then we perform the update, replacing the post titled "My Blog Post" with our new version of the document:

```
> db.blog.update({title : "My Blog Post"}, post)
```

Now the document has a "comments" key. If we call find again, we can see the new key:

```
> db.blog.find()
{
"_id" :
ObjectId("5037ee4a1084eb3ffeef7228"), "title"
: "My Blog Post",
"content" : "Here's my blog post.",
"date" : ISODate("2012-08-24T21:12:09.982Z"),
"comments" : [ ]
}
```

3.4. **Delete:** Remove permanently deletes documents from the database. Called with no parameters, it removes all documents from a collection. It can also take a document specifying criteria for removal. For example, this would remove the post we just created:

```
> db.blog.remove({title : "My Blog Post"})
```

```
[Sunita@localhost bin]$
./mongo MongoDB shell
version: 2.6.1 connecting to: test

> show databases;
VBK
0.078GB
admin       (empty)
local       0.078GB
newsletter 0.078GB

>          use COEM // Created a new Database named
"COEM" switched to db COEM

> db.createCollection("TE") // Created new Collection named as "TE"
{ "ok" : 1 }

>          db.TE.insert({Roll:1,Name:"ABC",Address:"Pune",Pe
r:76}) WriteResult({ "nInserted" : 1 })

>          db.TE.insert({Roll:2,Name:"PQR",Address:"Pune",Pe
r:75}) WriteResult({ "nInserted" : 1 })

>          db.TE.insert({Roll:3,Name:"LMN",Address:"Hadapsar",Pe
r:70}) WriteResult({ "nInserted" : 1 })

> db.TE.find({})
{ "_id" : ObjectId("541963be2741c7552caef0a9"), "Roll" : 1, "Name" : "ABC", "Address" :
"Pune", "Per" : 76 }
{ "_id" : ObjectId("541963cb2741c7552caef0aa"), "Roll" : 2, "Name" : "PQR", "Address" :
"Pune", "Per" : 75 }
{ "_id" : ObjectId("541963dc2741c7552caef0ab"), "Roll" : 3, "Name" : "LMN", "Address" :
"Hadapsar", "Per" : 70 }

> db.TE.find({})
{ "_id" : ObjectId("541963be2741c7552caef0a9"), "Roll" : 1, "Name" : "ABC", "Address" :
"Pune", "Per" : 76 }
{ "_id" : ObjectId("541963cb2741c7552caef0aa"), "Roll" : 2, "Name" : "PQR", "Address" :
"Pune", "Per" : 75 }
{ "_id" : ObjectId("541963dc2741c7552caef0ab"), "Roll" : 3, "Name" : "LMN", "Address" :
"Hadapsar", "Per" : 70 }

>          db.TE.update({Roll:2},{$set:{Name:"Wagholi"}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1
})

> db.TE.find({})
{ "_id" : ObjectId("541963be2741c7552caef0a9"), "Roll" : 1, "Name" : "ABC", "Address" :
"Pune", "Per" : 76 }
{ "_id" : ObjectId("541963cb2741c7552caef0aa"), "Roll" : 2, "Name" : "Wagholi", "Address" :
```

"Pune", "Per" : 75 }

{ "_id" : ObjectId("541963dc2741c7552caef0ab"), "Roll" : 3, "Name" : "LMN", "Address" : "Hadapsar", "Per" : 70 }

```
> db.TE.remove({Roll:3})
WriteResult({ "nRemoved" : 1 })

> db.TE.find({})
{ "_id" : ObjectId("541963be2741c7552caef0a9"), "Roll" : 1, "Name" : "ABC", "Address" : "Pune", "Per" : 76 }
{ "_id" : ObjectId("541963cb2741c7552caef0aa"), "Roll" : 2, "Name" : "Wagholi", "Address" : "Pune", "Per" : 75 }

> db.TE.
drop() true

> db.TE.find({})

> show
collections
system.indexes
```

Output:

```
> show databases;
COEM
0.078GB
VBK 0.078GB
admin (empty)
local 0.078GB
newsletter 0.078GB

> db.dropDatabase("COEM")
2014-09-17T16:17:18.278+0530 dropDatabase doesn't take arguments at src/mongo/shell/db.js:141

> db.dropDatabase()
{ "dropped" : "COEM", "ok" : 1 }

> show databases;
VBK
0.078GB
admin (empty)
local 0.078GB
newsletter 0.078GB
```

Conclusion: In this experiment, we have studied NoSQL and implemented CRUD operations for MongoDB

****

Content Beyond Syllabus

Experiment No-12.
Cassendra Query Execution

Aim: Cassandra case study

Theory: Apache Cassandra is a highly scalable, high-performance distributed database designed to handle large amounts of data across many commodity servers, providing high availability with no single point of failure. Apache Cassandra is an open-source NoSQL distributed database trusted by thousands of companies for scalability and high availability without compromising performance It is a type of NoSQL database.

A NoSQL database (sometimes called as Not Only SQL) is a database that provides a mechanism to store and retrieve data other than the tabular relations used in relational databases. These databases are schema-free, support easy replication, have simple API, are eventually consistent, and can handle huge amounts of data.

Features of Cassandra

Cassandra has become so popular because of its outstanding technical features. Given below are some of the features of Cassandra:

- Elastic scalability − Cassandra is highly scalable; it allows to add of more hardware to accommodate more customers and more data as per requirement.
- Always on architecture − Cassandra has no single point of failure and it is continuously available for business-critical applications that cannot afford a failure.
- Fast linear-scale performance − Cassandra is linearly scalable, i.e., it increases your throughput as you increase the number of nodes in the cluster. Therefore it maintains a quick response time.
- Flexible data storage − Cassandra accommodates all possible data formats including structured, semi-structured, and unstructured. It can dynamically accommodate changes to your data structures according to your need.
- Easy data distribution − Cassandra provides the flexibility to distribute data where you need it by replicating data across multiple data centers.
- Transaction support − Cassandra supports properties like Atomicity, Consistency, Isolation, and Durability (ACID).
- Fast writes − Cassandra was designed to run on cheap commodity hardware. It performs blazingly fast writes and can store hundreds of terabytes of data, without sacrificing the read efficiency.

```
C:\apache-cassandra-3.11.6\bin>cqlsh Connected to Test Cluster at 127.0.0.1:9042.

[cqlsh 5.0.1 | Cassandra 3.11.6 | CQL spec 3.4.4 | Native protocol v4]
Use HELP for help.
(6 rows)
```

```
cqlsh> CREATE KEYSPACE test
```

```
   .       WITH REPLICATION = { 'class' : 'NetworkTopologyStrategy', 'datacenter1' : 3 }
   .       AND DURABLE_WRITES = false;
SyntaxException: line 2:0 mismatched input '.' expecting K_WITH (CREATE KEYSPACE
test[.]   )
cqlsh> SELECT * FROM system_schema.keyspaces;

 keyspace_name      | durable_writes | replication
____________________+________________+_____________________________________________
-----
system_auth |                True | {'class': 'org.apache.cassandra.locator.SimpleStrategy',
'replication_factor': '1'}
     system_schema |          True |
{'class': 'org.apache.cassandra.locator.LocalStrategy'}
    tutorialspoint |          True | {'class': 'org.apache.cassandra.locator.SimpleStrategy',
'replication_factor': '3'}
 system_distributed |          True | {'class': 'org.apache.cassandra.locator.SimpleStrategy',
'replication_factor': '3'}
           system |          True |
{'class': 'org.apache.cassandra.locator.LocalStrategy'}
     system_traces |          True | {'class': 'org.apache.cassandra.locator.SimpleStrategy',
'replication_factor': '2'}
cqlsh> USE tutorialspoint;
cqlsh:tutorialspoint> INSERT INTO emp (emp_id, emp_name, emp_city,
                  ...    emp_phone, emp_sal) VALUES(1,'ram', 'Hyderabad', 9848022338, 50000);
InvalidRequest: Error from server: code=2200 [Invalid query] message="unconfigured table
emp"

 cqlsh:tutorialspoint> CREATE TABLE emp(
                   ...    emp_id int PRIMARY KEY,
                  ...    emp_name text,
                  ...    emp_city text,
                  ...    emp_sal varint,

                  ...    emp_phone varint
                  ...    );
cqlsh:tutorialspoint> INSERT INTO emp (emp_id, emp_name, emp_city,
                  ...    emp_phone, emp_sal) VALUES(1,'ram', 'Hyderabad', 9848022338, 50000);
cqlsh:tutorialspoint> INSERT INTO emp (emp_id, emp_name, emp_city,
                  ...    emp_phone, emp_sal) VALUES(2,'robin', 'Hyderabad', 9848022339, 40000);
cqlsh:tutorialspoint> INSERT INTO emp (emp_id, emp_name, emp_city,
                  ...    emp_phone, emp_sal) VALUES(3,'rahman', 'Chennai', 9848022330, 45000);
cqlsh:tutorialspoint> SELECT * FROM emp;

 emp_id | emp_city | emp_name | emp_phone | emp_sal
_______+__________+__________+___________+_________
      1 | Hyderabad |      ram | 9848022338 |   50000
      2 | Hyderabad |    robin | 9848022339 |   40000
      3 |  Chennai |  rahman | 9848022330 |    45000

(3 rows)
```

```
cqlsh:tutorialspoint> UPDATE emp SET emp_city='Delhi',emp_sal=50000
                ...    WHERE emp_id=2;

cqlsh:tutorialspoint> select * from

emp;

 emp_id | emp_city | emp_name | emp_phone | emp_sal
_______+__________+_________+___________+_________
      1 | Hyderabad |      ram | 9848022338 | 50000
      2 |     Delhi |    robin | 9848022339 | 50000
      3 | Chennai |  rahman | 9848022330 |  45000

(3 rows)
cqlsh:tutorialspoint> select * from emp;

 emp_id | emp_city | emp_name | emp_phone | emp_sal
_______+__________+_________+___________+_________
      1 | Hyderabad |      ram | 9848022338 | 50000
      2 |     Delhi |    robin | 9848022339 | 50000
      3 | Chennai |  rahman | 9848022330 |  45000

(3 rows)
cqlsh:tutorialspoint> SELECT emp_name, emp_sal from emp;

 emp_name | emp_sal
__________+_________

    ram | 50000
    robin | 50000
   rahman | 45000

(3 rows)

cqlsh> DELETE emp_sal FROM emp WHERE emp_id=3;
InvalidRequest: Error from server: code=2200 [Invalid query] message="No keyspace has been
specified. USE a keyspace, or explicitly specify keyspace.tablename"
cqlsh> USE tutorialspoint;
cqlsh:tutorialspoint> DELETE FROM emp WHERE emp_id=3;
cqlsh:tutorialspoint> select * from emp;

 emp_id | emp_city | emp_name | emp_phone | emp_sal
_______+__________+_________+___________+_________
      1 | Hyderabad |      ram | 9848022338 | 50000
      2 |     Delhi |    robin | 9848022339 | 50000

(2 rows)
```

Conclusion: In this experiment, we have studied Cassandra and implemented Cassandra queries creating keyspace,

insert, select, and delete operations.