DATABASE MANAGEMENT SYSTEMS LAB

ETCS - 256

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Semester : 4th
Branch : ITE
Group : 2

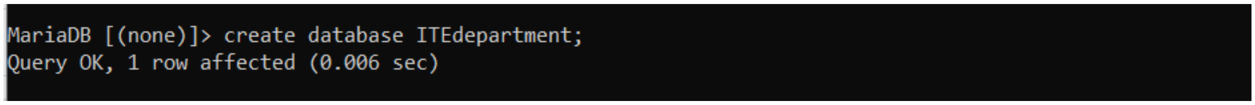
PRACTICAL RECORD

S.No.	Experiment Name	Date of Submisson	Teacher’s Sign/ Remarks
1.	Design a database and create required tables.		
2.	Apply constraints like primary key, foreign key, not null to the tables		
3.	Write a SQL statement for ALTER, INSERT, UPDATE and DELETE.		
4.	Write the queries to implement the joins.		
5.	Write the queries to implement the following functions : MAX( ),MIN( ), AVG( ), COUNT( ).		
6.	Write the queries to implement the concept of Integrity Constraints.		
7.	Write the queries to create the views.		
8.	Perform the queries for the triggers.		

EXPERIMENT - 1

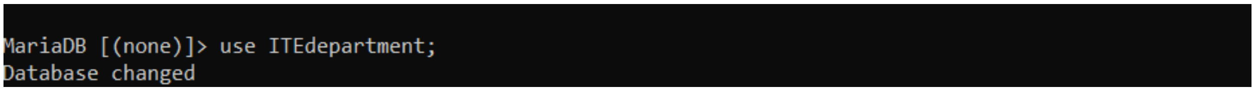
AIM : Design a database and create required tables.

1. **Creating a database:**



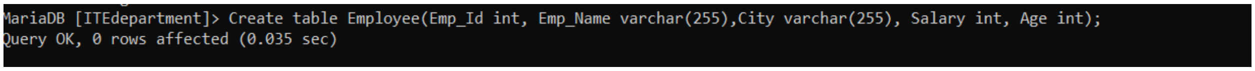
```
MariaDB [(none)]> create database ITEdepartment;
Query OK, 1 row affected (0.006 sec)
```

2. **Using this database:**



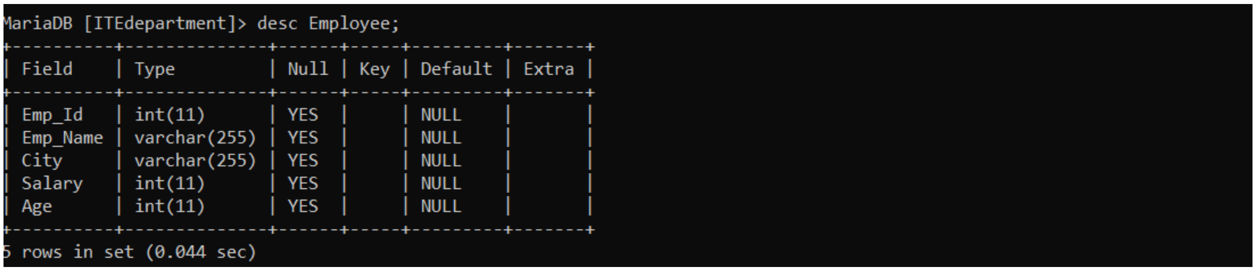
```
MariaDB [(none)]> use ITEdepartment;
Database changed
```

3. **Creating Table:**



```
MariaDB [ITEdepartment]> Create table Employee(Emp_Id int, Emp_Name varchar(255),City varchar(255), Salary int, Age int);
Query OK, 0 rows affected (0.035 sec)
```

4. **Describe Table:**

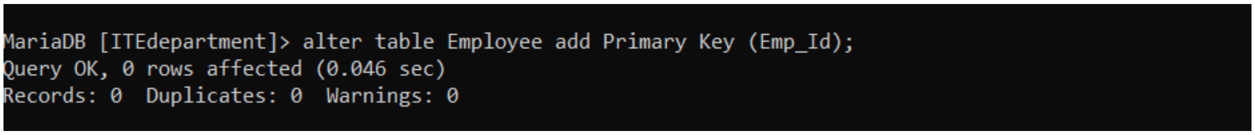


```
MariaDB [ITEdepartment]> desc Employee;
+----------+--------------+------+-----+---------+-------+
| Field    | Type         | Null | Key | Default | Extra |
+----------+--------------+------+-----+---------+-------+
| Emp_Id   | int(11)      | YES  |     | NULL    |       |
| Emp_Name | varchar(255) | YES  |     | NULL    |       |
| City     | varchar(255) | YES  |     | NULL    |       |
| Salary   | int(11)      | YES  |     | NULL    |       |
| Age      | int(11)      | YES  |     | NULL    |       |
+----------+--------------+------+-----+---------+-------+
5 rows in set (0.044 sec)
```

EXPERIMENT - 2

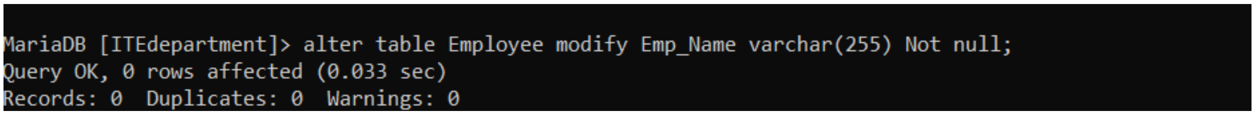
AIM : Apply constraints like primary key, foreign key, not null to the tables.

1. **Primary Key**



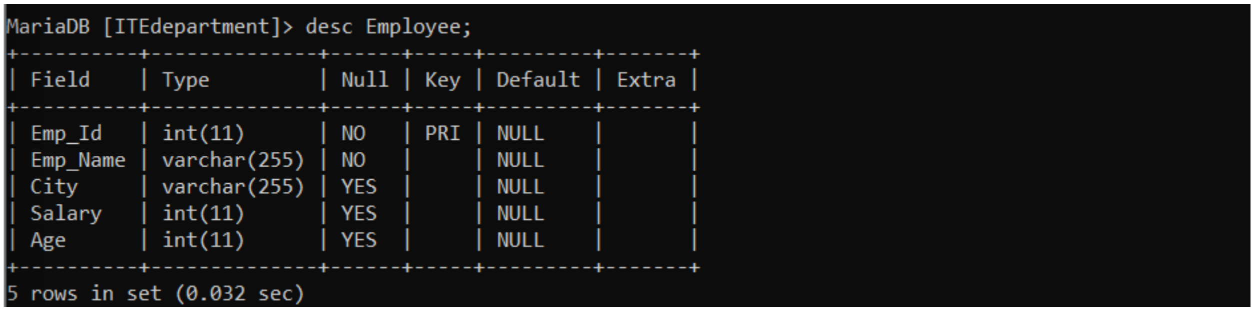
```
MariaDB [ITEdepartment]> alter table Employee add Primary Key (Emp_Id);
Query OK, 0 rows affected (0.046 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

2. **Not Null**



```
MariaDB [ITEdepartment]> alter table Employee modify Emp_Name varchar(255) Not null;
Query OK, 0 rows affected (0.033 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Describe table employee

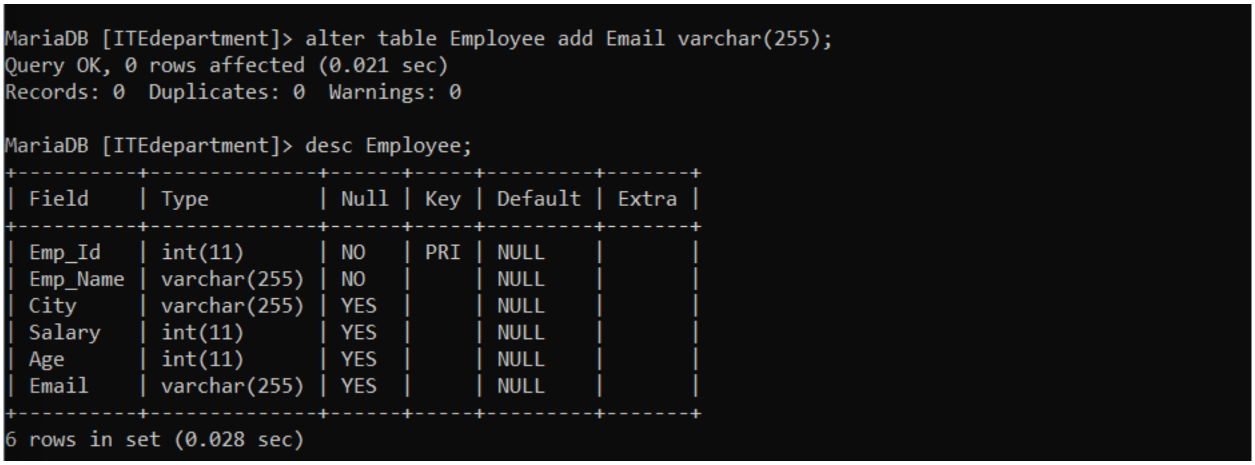


```
MariaDB [ITEdepartment]> desc Employee;
+----------+--------------+------+-----+---------+-------+
| Field    | Type         | Null | Key | Default | Extra |
+----------+--------------+------+-----+---------+-------+
| Emp_Id   | int(11)      | NO   | PRI | NULL    |       |
| Emp_Name | varchar(255) | NO   |     | NULL    |       |
| City     | varchar(255) | YES  |     | NULL    |       |
| Salary   | int(11)      | YES  |     | NULL    |       |
| Age      | int(11)      | YES  |     | NULL    |       |
+----------+--------------+------+-----+---------+-------+
5 rows in set (0.032 sec)
```

EXPERIMENT - 3

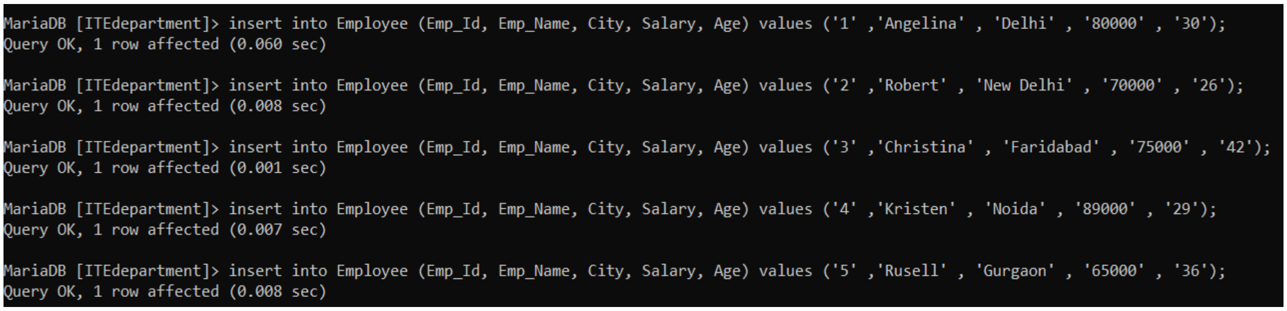
AIM : Write a SQL statement for ALTER, INSERT, UPDATE,and DELETE.

1. ALTER

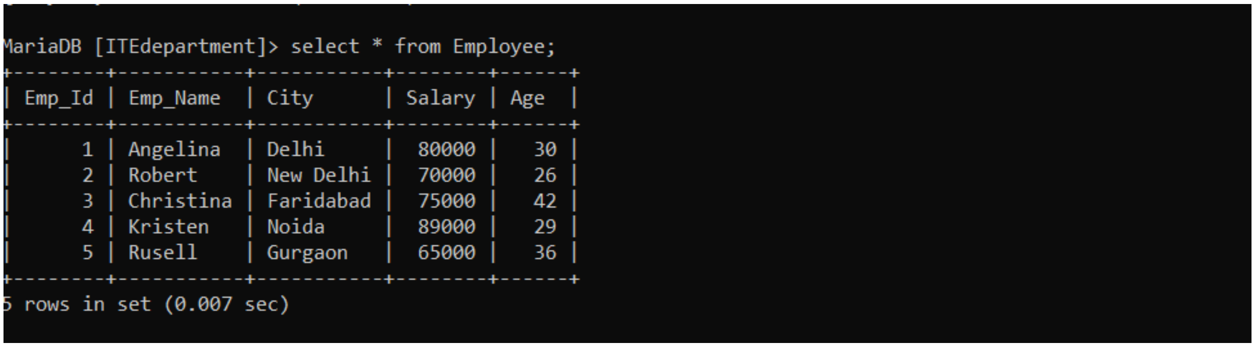


```
MariaDB [ITEdepartment]> alter table Employee add Email varchar(255);
Query OK, 0 rows affected (0.021 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [ITEdepartment]> desc Employee;
+----------+--------------+------+-----+---------+-------+
| Field    | Type         | Null | Key | Default | Extra |
+----------+--------------+------+-----+---------+-------+
| Emp_Id   | int(11)      | NO   | PRI | NULL    |       |
| Emp_Name | varchar(255) | NO   |     | NULL    |       |
| City     | varchar(255) | YES  |     | NULL    |       |
| Salary   | int(11)      | YES  |     | NULL    |       |
| Age      | int(11)      | YES  |     | NULL    |       |
| Email    | varchar(255) | YES  |     | NULL    |       |
+----------+--------------+------+-----+---------+-------+
6 rows in set (0.028 sec)
```

2. INSERT

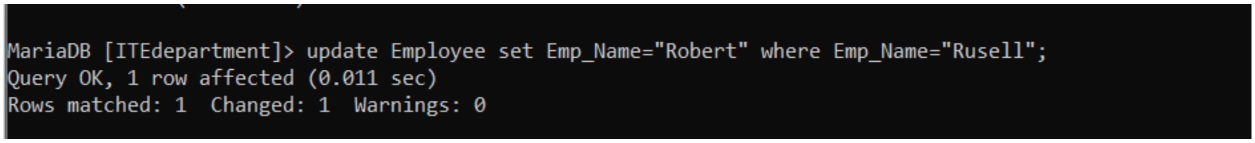


```
MariaDB [ITEdepartment]> insert into Employee (Emp_Id, Emp_Name, City, Salary, Age) values ('1' ,'Angelina' , 'Delhi' , '80000' , '30');
Query OK, 1 row affected (0.060 sec)

MariaDB [ITEdepartment]> insert into Employee (Emp_Id, Emp_Name, City, Salary, Age) values ('2' ,'Robert' , 'New Delhi' , '70000' , '26');
Query OK, 1 row affected (0.008 sec)

MariaDB [ITEdepartment]> insert into Employee (Emp_Id, Emp_Name, City, Salary, Age) values ('3' ,'Christina' , 'Faridabad' , '75000' , '42');
Query OK, 1 row affected (0.001 sec)

MariaDB [ITEdepartment]> insert into Employee (Emp_Id, Emp_Name, City, Salary, Age) values ('4' ,'Kristen' , 'Noida' , '89000' , '29');
Query OK, 1 row affected (0.007 sec)

MariaDB [ITEdepartment]> insert into Employee (Emp_Id, Emp_Name, City, Salary, Age) values ('5' ,'Rusell' , 'Gurgaon' , '65000' , '36');
Query OK, 1 row affected (0.008 sec)
```

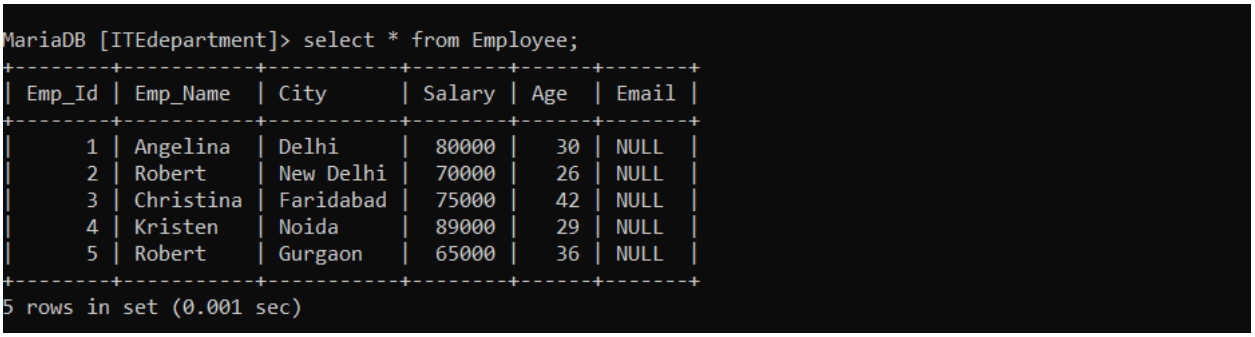


```
MariaDB [ITEdepartment]> select * from Employee;
+--------+-----------+-----------+--------+------+
| Emp_Id | Emp_Name  | City      | Salary | Age  |
+--------+-----------+-----------+--------+------+
|      1 | Angelina  | Delhi     |  80000 |   30 |
|      2 | Robert    | New Delhi |  70000 |   26 |
|      3 | Christina | Faridabad |  75000 |   42 |
|      4 | Kristen   | Noida     |  89000 |   29 |
|      5 | Rusell    | Gurgaon   |  65000 |   36 |
+--------+-----------+-----------+--------+------+
5 rows in set (0.007 sec)
```

3. UPDATE

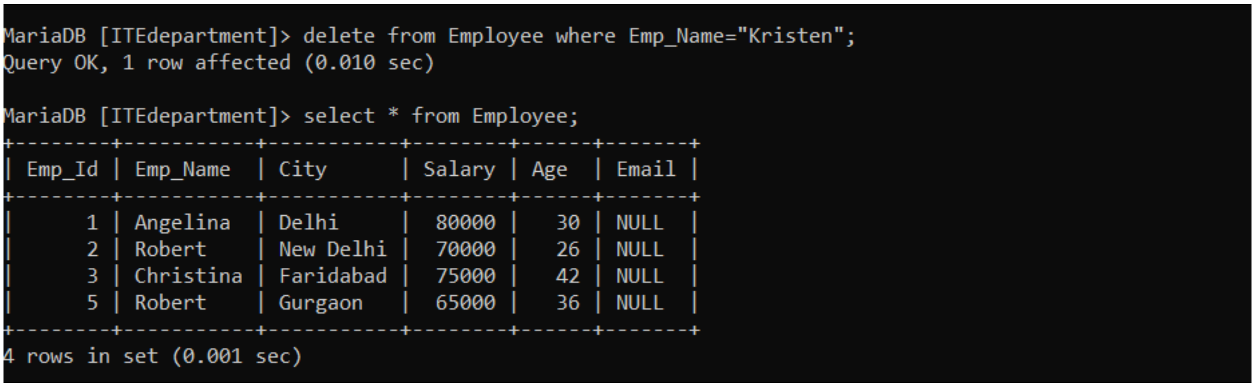


```
MariaDB [ITEdepartment]> update Employee set Emp_Name="Robert" where Emp_Name="Rusell";
Query OK, 1 row affected (0.011 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```



```
MariaDB [ITEdepartment]> select * from Employee;
+--------+-----------+-----------+--------+------+-------+
| Emp_Id | Emp_Name  | City      | Salary | Age  | Email |
+--------+-----------+-----------+--------+------+-------+
|      1 | Angelina  | Delhi     |  80000 |   30 | NULL  |
|      2 | Robert    | New Delhi |  70000 |   26 | NULL  |
|      3 | Christina | Faridabad |  75000 |   42 | NULL  |
|      4 | Kristen   | Noida     |  89000 |   29 | NULL  |
|      5 | Robert    | Gurgaon   |  65000 |   36 | NULL  |
+--------+-----------+-----------+--------+------+-------+
5 rows in set (0.001 sec)
```

4. DELETE



```
MariaDB [ITEdepartment]> delete from Employee where Emp_Name="Kristen";
Query OK, 1 row affected (0.010 sec)

MariaDB [ITEdepartment]> select * from Employee;
+--------+-----------+-----------+--------+------+-------+
| Emp_Id | Emp_Name  | City      | Salary | Age  | Email |
+--------+-----------+-----------+--------+------+-------+
|      1 | Angelina  | Delhi     |  80000 |   30 | NULL  |
|      2 | Robert    | New Delhi |  70000 |   26 | NULL  |
|      3 | Christina | Faridabad |  75000 |   42 | NULL  |
|      5 | Robert    | Gurgaon   |  65000 |   36 | NULL  |
+--------+-----------+-----------+--------+------+-------+
4 rows in set (0.001 sec)
```

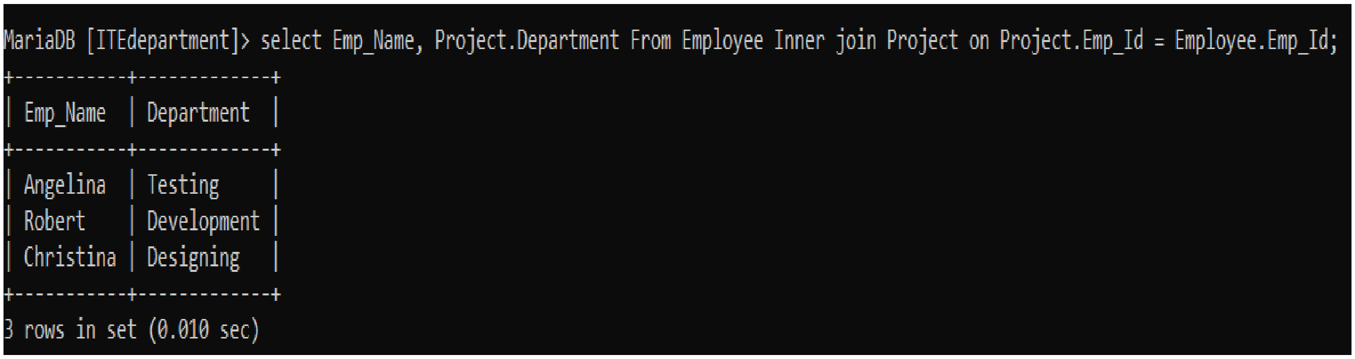
EXPERIMENT - 4

AIM : Write the queries to implement the joins.

JOINS :

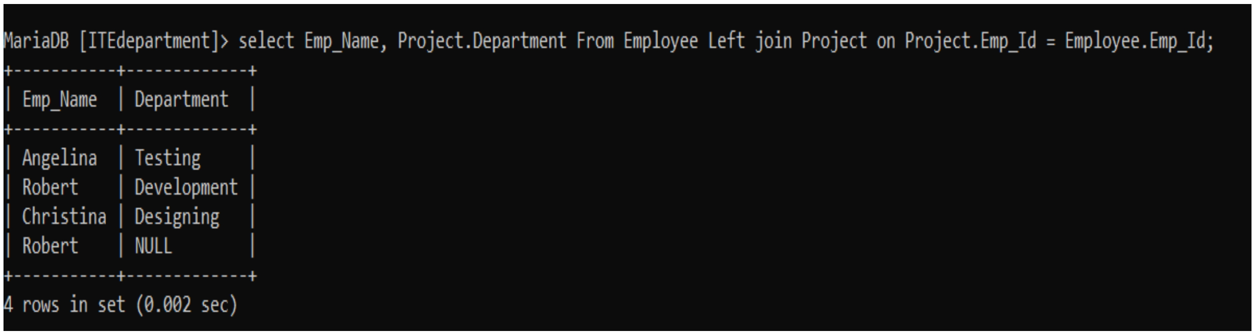
TYPES OF JOINS :-

1. **INNER JOIN**



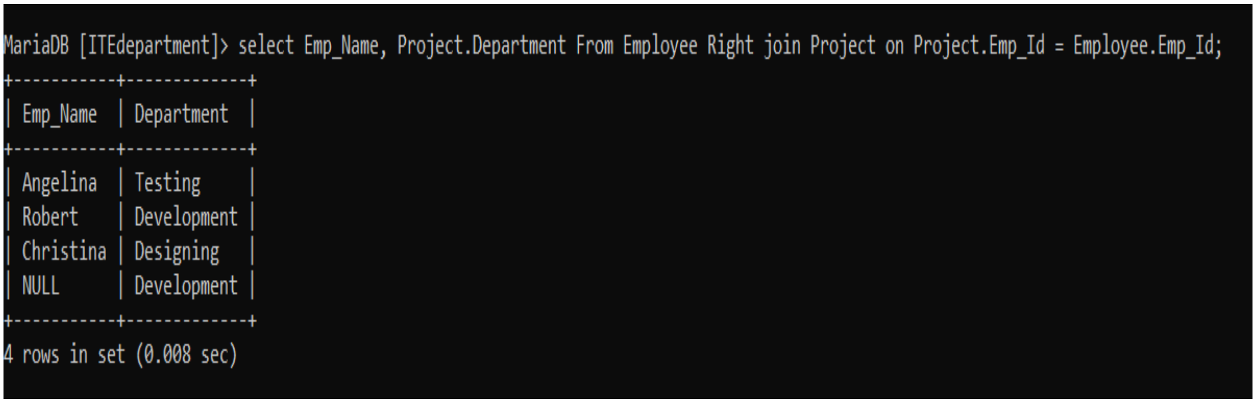
```
MariaDB [ITEdepartment]> select Emp_Name, Project.Department From Employee Inner join Project on Project.Emp_Id = Employee.Emp_Id;
+-----------+-------------+
| Emp_Name  | Department  |
+-----------+-------------+
| Angelina  | Testing     |
| Robert    | Development |
| Christina | Designing   |
+-----------+-------------+
3 rows in set (0.010 sec)
```

2. LEFT JOIN



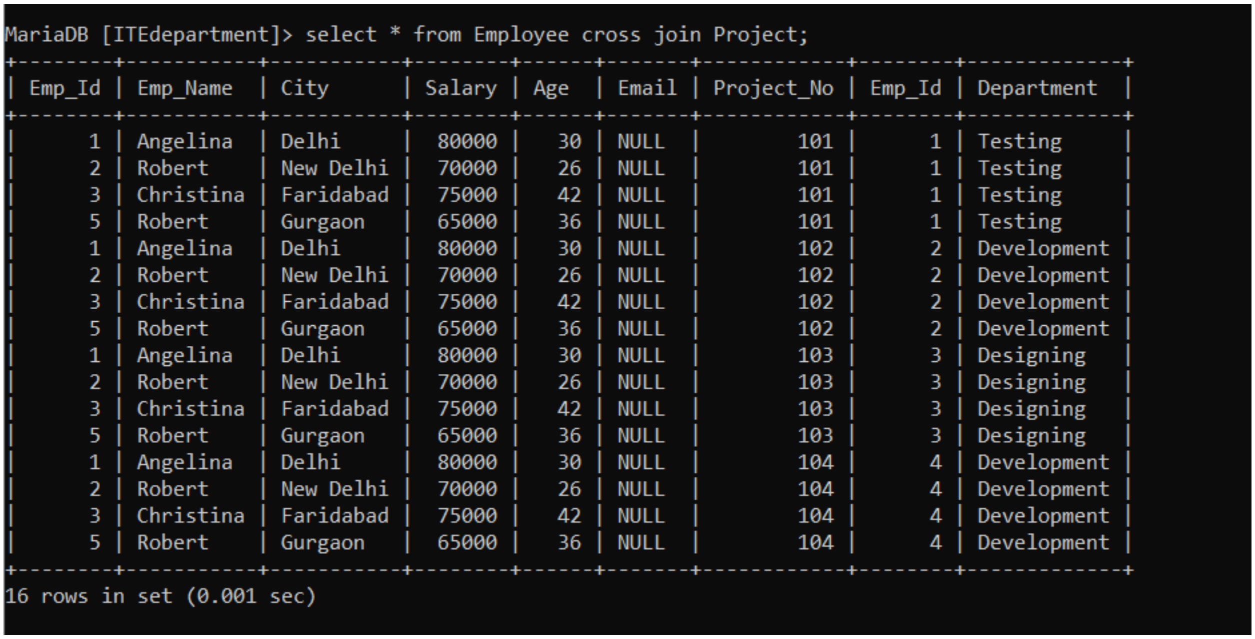
```
MariaDB [ITEdepartment]> select Emp_Name, Project.Department From Employee Left join Project on Project.Emp_Id = Employee.Emp_Id;
+-----------+------------+
| Emp_Name  | Department |
+-----------+------------+
| Angelina  | Testing    |
| Robert    | Development |
| Christina | Designing  |
| Robert    | NULL       |
+-----------+------------+
4 rows in set (0.002 sec)
```

3. RIGHT JOIN



```
MariaDB [ITEdepartment]> select Emp_Name, Project.Department From Employee Right join Project on Project.Emp_Id = Employee.Emp_Id;
+-----------+------------+
| Emp_Name  | Department |
+-----------+------------+
| Angelina  | Testing    |
| Robert    | Development |
| Christina | Designing  |
| NULL      | Development |
+-----------+------------+
4 rows in set (0.008 sec)
```

4. CROSS JOIN

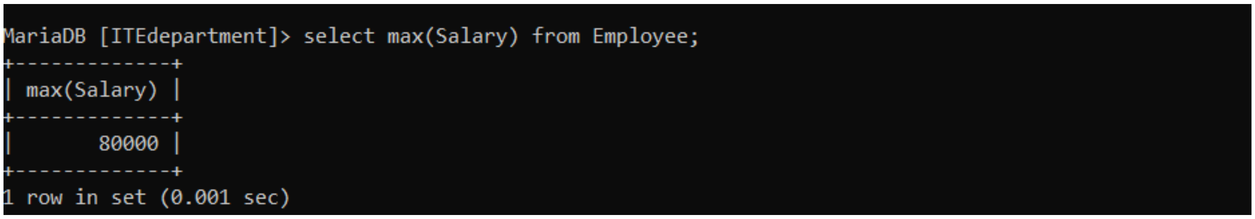


```
MariaDB [ITEdepartment]> select * from Employee cross join Project;
+--------+-----------+-----------+--------+-----+-------+------------+--------+-------------+
| Emp_Id | Emp_Name  | City      | Salary | Age | Email | Project_No | Emp_Id | Department  |
+--------+-----------+-----------+--------+-----+-------+------------+--------+-------------+
|      1 | Angelina  | Delhi     |  80000 |  30 | NULL  |        101 |      1 | Testing     |
|      2 | Robert    | New Delhi |  70000 |  26 | NULL  |        101 |      1 | Testing     |
|      3 | Christina | Faridabad |  75000 |  42 | NULL  |        101 |      1 | Testing     |
|      5 | Robert    | Gurgaon   |  65000 |  36 | NULL  |        101 |      1 | Testing     |
|      1 | Angelina  | Delhi     |  80000 |  30 | NULL  |        102 |      2 | Development |
|      2 | Robert    | New Delhi |  70000 |  26 | NULL  |        102 |      2 | Development |
|      3 | Christina | Faridabad |  75000 |  42 | NULL  |        102 |      2 | Development |
|      5 | Robert    | Gurgaon   |  65000 |  36 | NULL  |        102 |      2 | Development |
|      1 | Angelina  | Delhi     |  80000 |  30 | NULL  |        103 |      3 | Designing   |
|      2 | Robert    | New Delhi |  70000 |  26 | NULL  |        103 |      3 | Designing   |
|      3 | Christina | Faridabad |  75000 |  42 | NULL  |        103 |      3 | Designing   |
|      5 | Robert    | Gurgaon   |  65000 |  36 | NULL  |        103 |      3 | Designing   |
|      1 | Angelina  | Delhi     |  80000 |  30 | NULL  |        104 |      4 | Development |
|      2 | Robert    | New Delhi |  70000 |  26 | NULL  |        104 |      4 | Development |
|      3 | Christina | Faridabad |  75000 |  42 | NULL  |        104 |      4 | Development |
|      5 | Robert    | Gurgaon   |  65000 |  36 | NULL  |        104 |      4 | Development |
+--------+-----------+-----------+--------+-----+-------+------------+--------+-------------+
16 rows in set (0.001 sec)
```

EXPERIMENT - 5

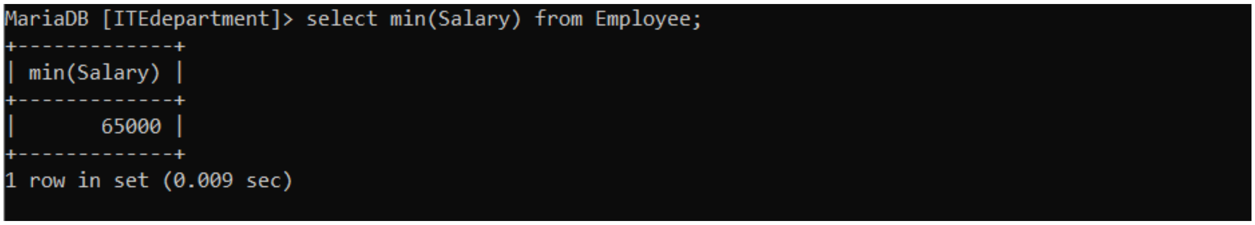
AIM : Write the queries to implement the following functions : MAX( ),MIN( ), AVG( ), COUNT( ).

1. **MAX( )**



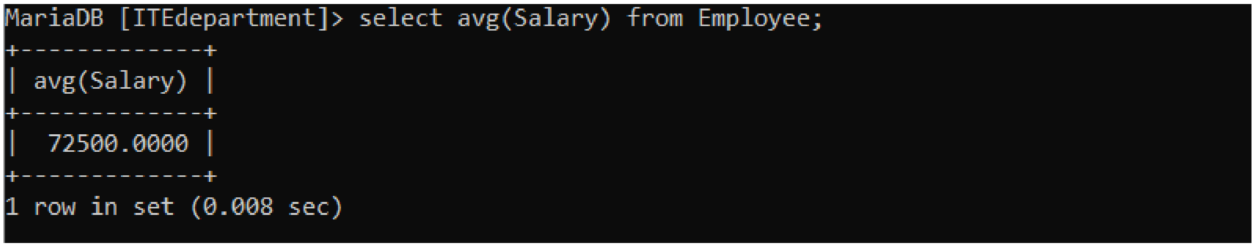
```
MariaDB [ITEdepartment]> select max(Salary) from Employee;
+-------------+
| max(Salary) |
+-------------+
|       80000 |
+-------------+
1 row in set (0.001 sec)
```

2. **MIN( )**



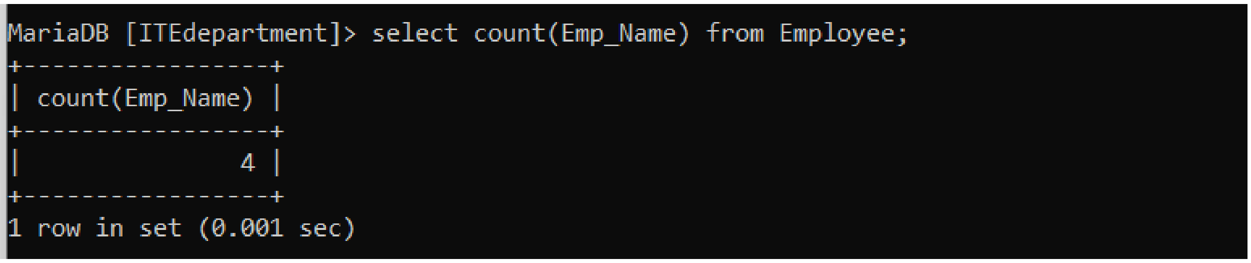
```
MariaDB [ITEdepartment]> select min(Salary) from Employee;
+-------------+
| min(Salary) |
+-------------+
|       65000 |
+-------------+
1 row in set (0.009 sec)
```

3. AVG( )



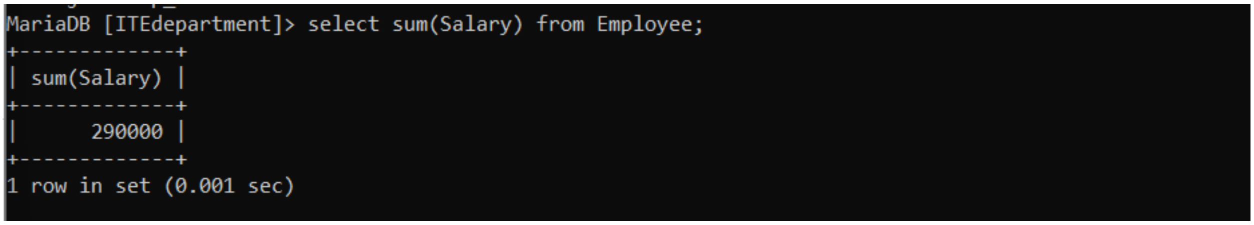
```
MariaDB [ITEdepartment]> select avg(Salary) from Employee;
+-------------+
| avg(Salary) |
+-------------+
|  72500.0000 |
+-------------+
1 row in set (0.008 sec)
```

4. COUNT( )



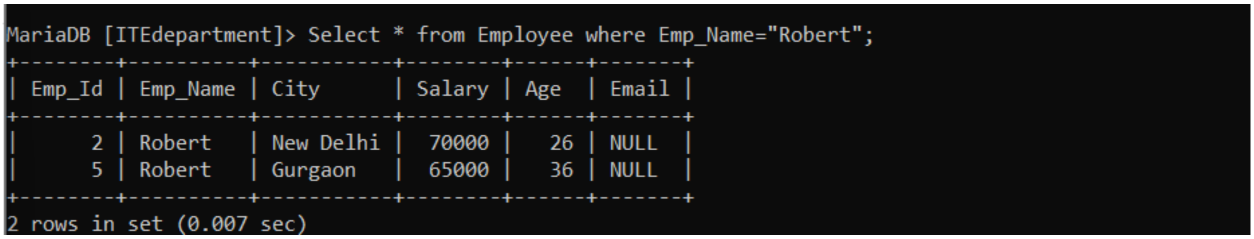
```
MariaDB [ITEdepartment]> select count(Emp_Name) from Employee;
+-----------------+
| count(Emp_Name) |
+-----------------+
|               4 |
+-----------------+
1 row in set (0.001 sec)
```

5. SUM( )



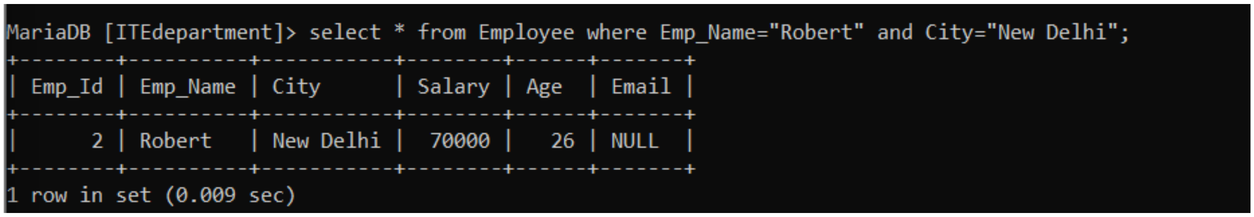
```
MariaDB [ITEdepartment]> select sum(Salary) from Employee;
+-------------+
| sum(Salary) |
+-------------+
|      290000 |
+-------------+
1 row in set (0.001 sec)
```

5. WHERE



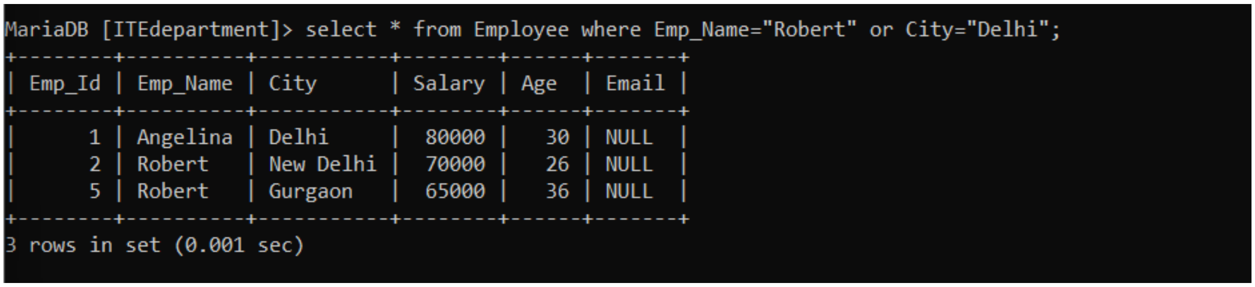
```
MariaDB [ITEdepartment]> Select * from Employee where Emp_Name="Robert";
+--------+----------+-----------+--------+------+-------+
| Emp_Id | Emp_Name | City      | Salary | Age  | Email |
+--------+----------+-----------+--------+------+-------+
|      2 | Robert   | New Delhi |  70000 |   26 | NULL  |
|      5 | Robert   | Gurgaon   |  65000 |   36 | NULL  |
+--------+----------+-----------+--------+------+-------+
2 rows in set (0.007 sec)
```

6. AND



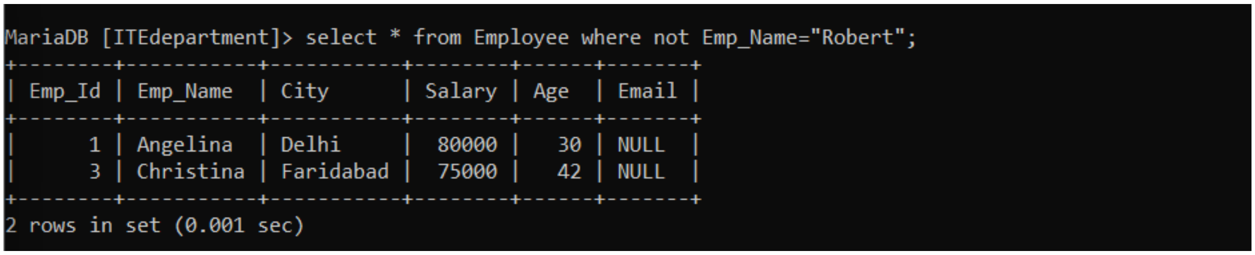
```
MariaDB [ITEdepartment]> select * from Employee where Emp_Name="Robert" and City="New Delhi";
+--------+----------+-----------+--------+------+-------+
| Emp_Id | Emp_Name | City      | Salary | Age  | Email |
+--------+----------+-----------+--------+------+-------+
|      2 | Robert   | New Delhi |  70000 |   26 | NULL  |
+--------+----------+-----------+--------+------+-------+
1 row in set (0.009 sec)
```

7. OR



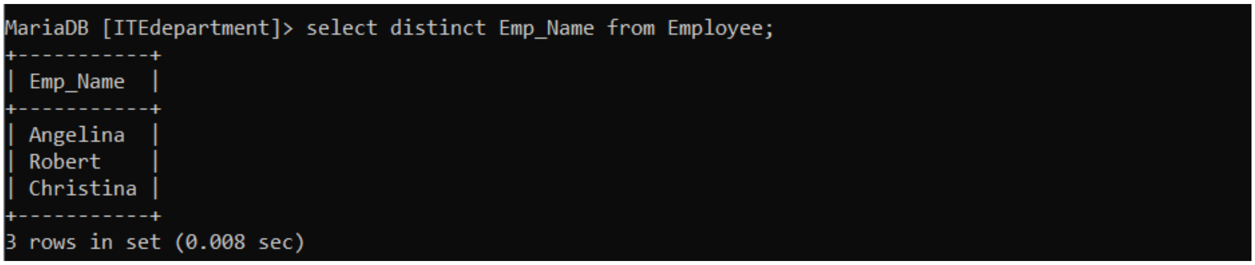
```
MariaDB [ITEdepartment]> select * from Employee where Emp_Name="Robert" or City="Delhi";
+--------+----------+-----------+--------+------+-------+
| Emp_Id | Emp_Name | City      | Salary | Age  | Email |
+--------+----------+-----------+--------+------+-------+
|      1 | Angelina | Delhi     |  80000 |   30 | NULL  |
|      2 | Robert   | New Delhi |  70000 |   26 | NULL  |
|      5 | Robert   | Gurgaon   |  65000 |   36 | NULL  |
+--------+----------+-----------+--------+------+-------+
3 rows in set (0.001 sec)
```

8. NOT



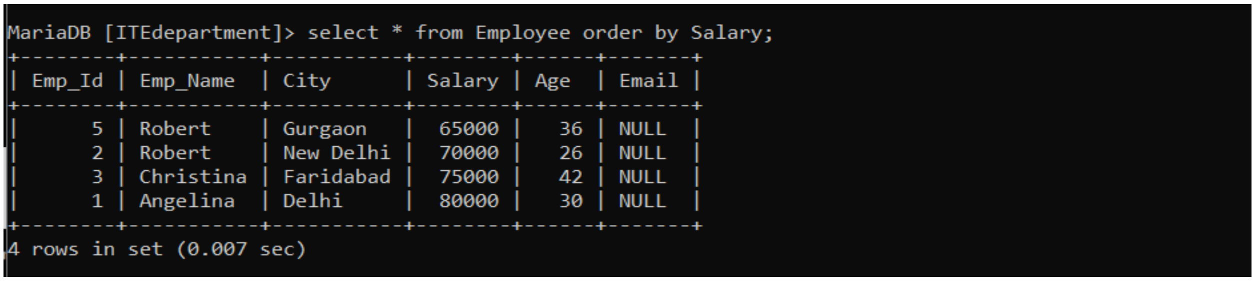
```
MariaDB [ITEdepartment]> select * from Employee where not Emp_Name="Robert";
+--------+-----------+-----------+--------+------+-------+
| Emp_Id | Emp_Name  | City      | Salary | Age  | Email |
+--------+-----------+-----------+--------+------+-------+
|      1 | Angelina  | Delhi     |  80000 |   30 | NULL  |
|      3 | Christina | Faridabad |  75000 |   42 | NULL  |
+--------+-----------+-----------+--------+------+-------+
2 rows in set (0.001 sec)
```

9. DISTINCT



```
MariaDB [ITEdepartment]> select distinct Emp_Name from Employee;
+-----------+
| Emp_Name  |
+-----------+
| Angelina  |
| Robert    |
| Christina |
+-----------+
3 rows in set (0.008 sec)
```

10. ORDER BY



```
MariaDB [ITEdepartment]> select * from Employee order by Salary;
+--------+-----------+-----------+--------+------+-------+
| Emp_Id | Emp_Name  | City      | Salary | Age  | Email |
+--------+-----------+-----------+--------+------+-------+
|      5 | Robert    | Gurgaon   |  65000 |   36 | NULL  |
|      2 | Robert    | New Delhi |  70000 |   26 | NULL  |
|      3 | Christina | Faridabad |  75000 |   42 | NULL  |
|      1 | Angelina  | Delhi     |  80000 |   30 | NULL  |
+--------+-----------+-----------+--------+------+-------+
4 rows in set (0.007 sec)
```

EXPERIMENT - 6

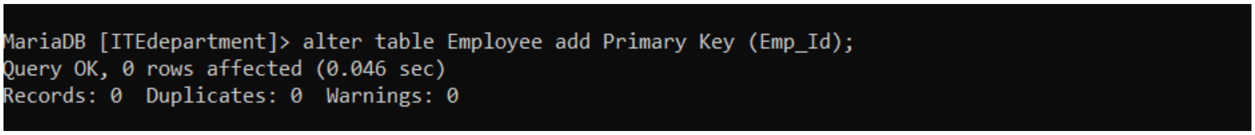
AIM : Write the queries to implement the concept of Integrity Constraints.

INTEGRITY CONSTRAINTS :

1. **Domain constraint :**

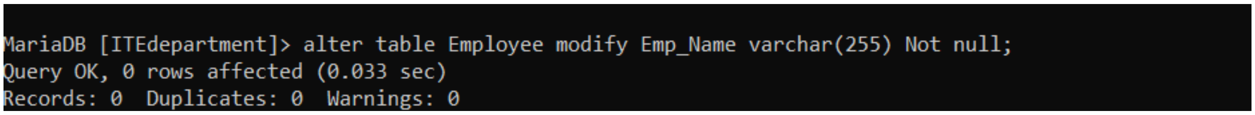
2. **Entity Intergrity Constraint :**

a. **Primary key**



```
MariaDB [ITEdepartment]> alter table Employee add Primary Key (Emp_Id);
Query OK, 0 rows affected (0.046 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

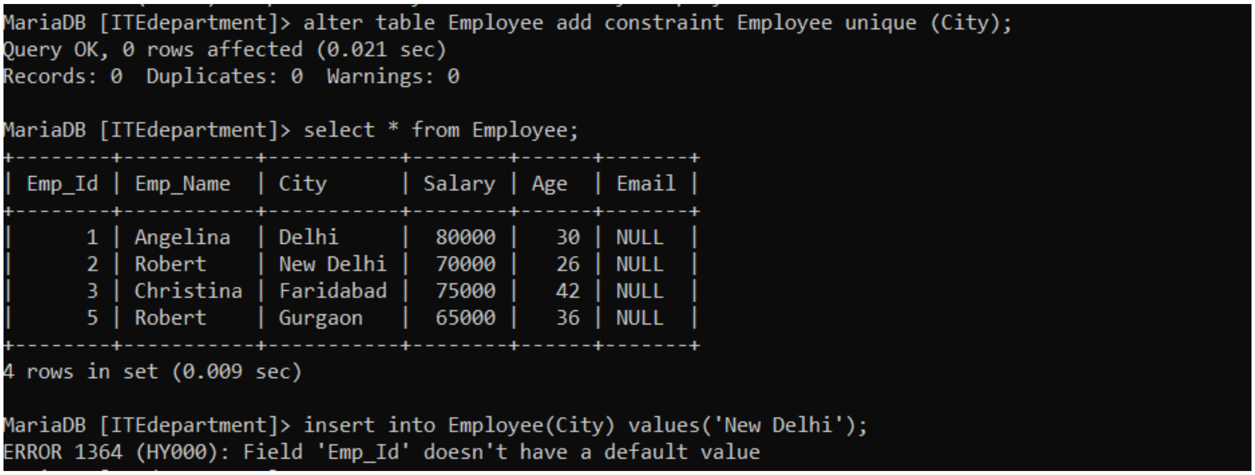
b.Not null



```
MariaDB [ITEdepartment]> alter table Employee modify Emp_Name varchar(255) Not null;
Query OK, 0 rows affected (0.033 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

3. Referential Integrity Constraint :

4. Key Constraints or Uniqueness Constraint :



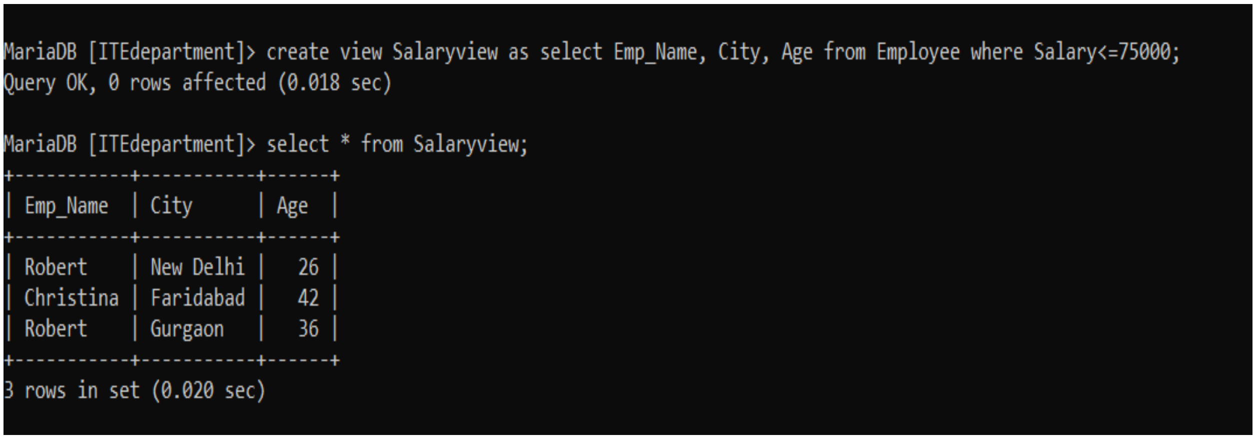
```
MariaDB [ITEdepartment]> alter table Employee add constraint Employee unique (City);
Query OK, 0 rows affected (0.021 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [ITEdepartment]> select * from Employee;
+--------+-----------+-----------+--------+------+-------+
| Emp_Id | Emp_Name  | City      | Salary | Age  | Email |
+--------+-----------+-----------+--------+------+-------+
|      1 | Angelina  | Delhi     |  80000 |   30 | NULL  |
|      2 | Robert    | New Delhi |  70000 |   26 | NULL  |
|      3 | Christina | Faridabad |  75000 |   42 | NULL  |
|      5 | Robert    | Gurgaon   |  65000 |   36 | NULL  |
+--------+-----------+-----------+--------+------+-------+
4 rows in set (0.009 sec)

MariaDB [ITEdepartment]> insert into Employee(City) values('New Delhi');
ERROR 1364 (HY000): Field 'Emp_Id' doesn't have a default value
```

EXPERIMENT - 7

AIM : Write the queries to create the views.

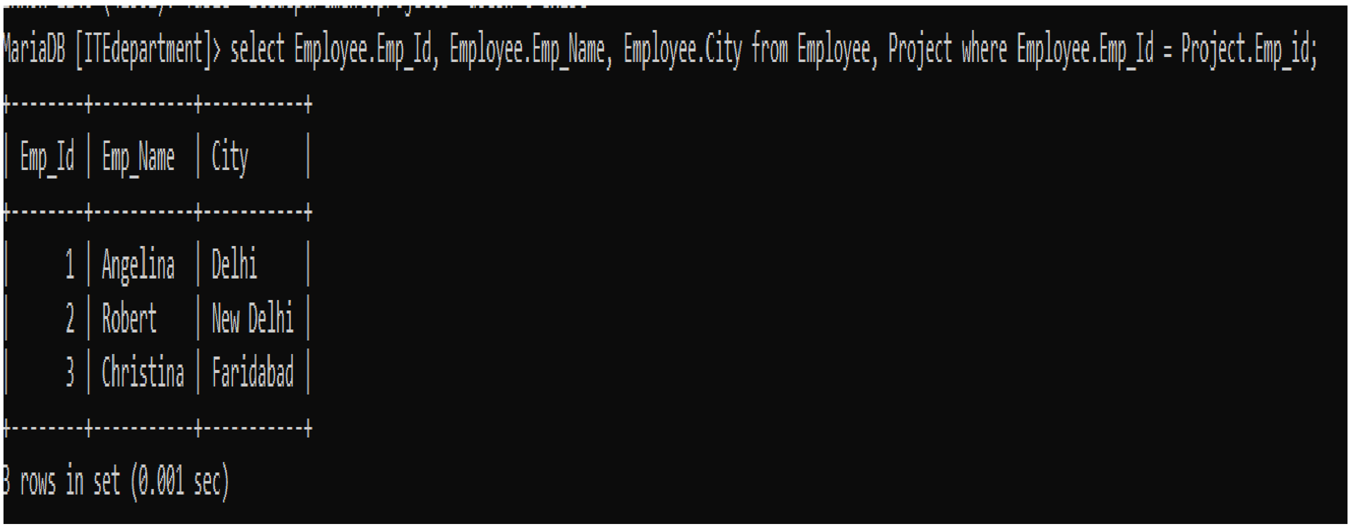
VIEW :

a. **Creating View from a single table :**



```
MariaDB [ITEdepartment]> create view Salaryview as select Emp_Name, City, Age from Employee where Salary<=75000;
Query OK, 0 rows affected (0.018 sec)

MariaDB [ITEdepartment]> select * from Salaryview;
+-----------+-----------+------+
| Emp_Name  | City      | Age  |
+-----------+-----------+------+
| Robert    | New Delhi |   26 |
| Christina | Faridabad |   42 |
| Robert    | Gurgaon   |   36 |
+-----------+-----------+------+
3 rows in set (0.020 sec)
```

b. Creating View from multiple tables :



```
MariaDB [ITEdepartment]> select Employee.Emp_Id, Employee.Emp_Name, Employee.City from Employee, Project where Employee.Emp_Id = Project.Emp_id;
+--------+----------+-----------+
| Emp_Id | Emp_Name | City      |
+--------+----------+-----------+
|      1 | Angelina | Delhi     |
|      2 | Robert   | New Delhi |
|      3 | Christina| Faridabad |
+--------+----------+-----------+
3 rows in set (0.001 sec)
```

EXPERIMENT - 8

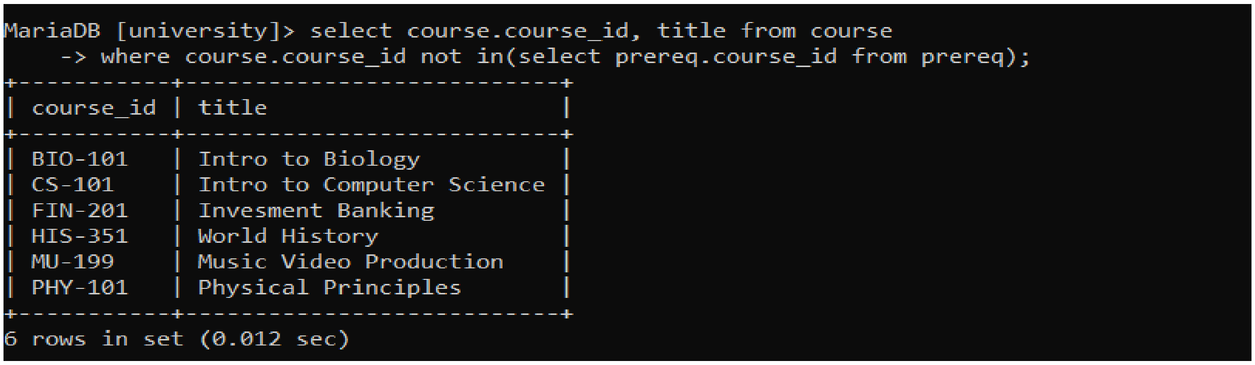
AIM : Perform the queries for the triggers.

TRIGGERS :

EXPERIMENT - 9

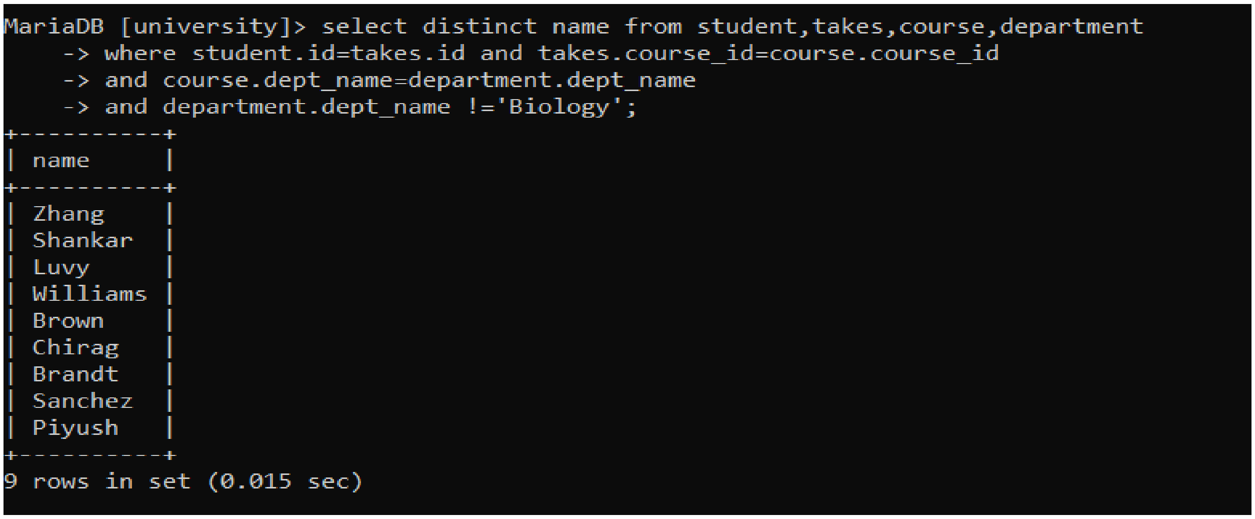
AIM : Nested Subqueries and SQL Updates

1. **Find the id and title of all courses which do not require any prerequisites.**



```
MariaDB [university]> select course.course_id, title from course
    -> where course.course_id not in(select prereq.course_id from prereq);
+-----------+--------------------------+
| course_id | title                    |
+-----------+--------------------------+
| BIO-101   | Intro to Biology         |
| CS-101    | Intro to Computer Science |
| FIN-201   | Invesment Banking        |
| HIS-351   | World History            |
| MU-199    | Music Video Production   |
| PHY-101   | Physical Principles      |
+-----------+--------------------------+
6 rows in set (0.012 sec)
```

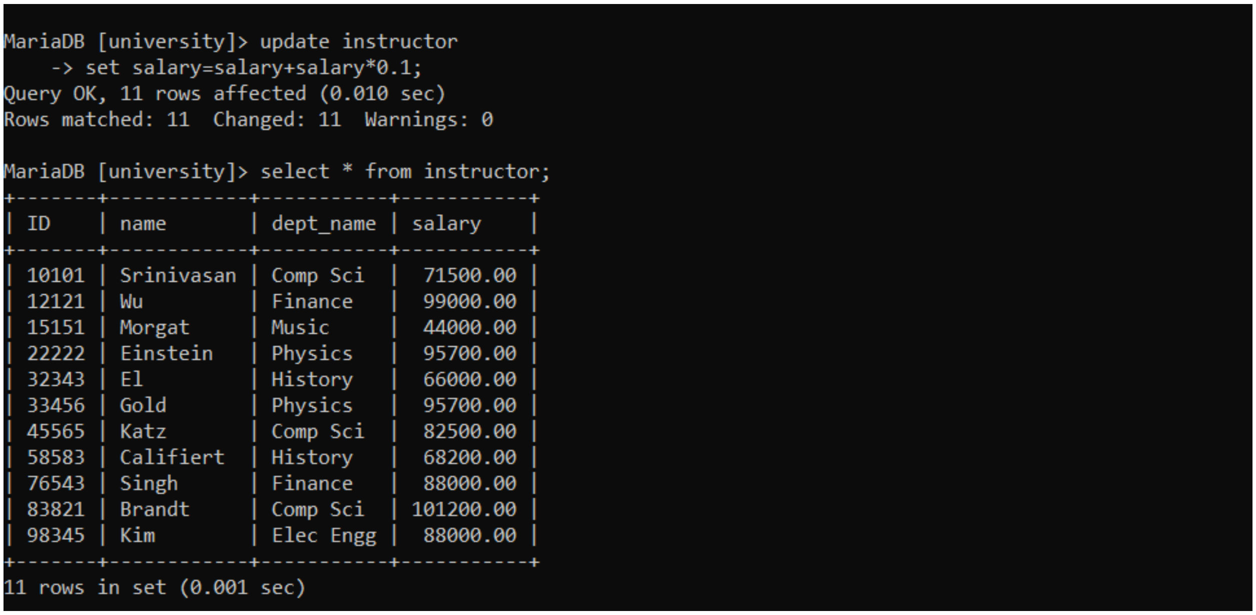
2. **Find the names of students who have not taken any biology dept courses.**



```
MariaDB [university]> select distinct name from student,takes,course,department
    -> where student.id=takes.id and takes.course_id=course.course_id
    -> and course.dept_name=department.dept_name
    -> and department.dept_name !='Biology';
+----------+
| name     |
+----------+
| Zhang    |
| Shankar  |
| Luvy     |
| Williams |
| Brown    |
| Chirag   |
| Brandt   |
| Sanchez  |
| Piyush   |
+----------+
9 rows in set (0.015 sec)
```

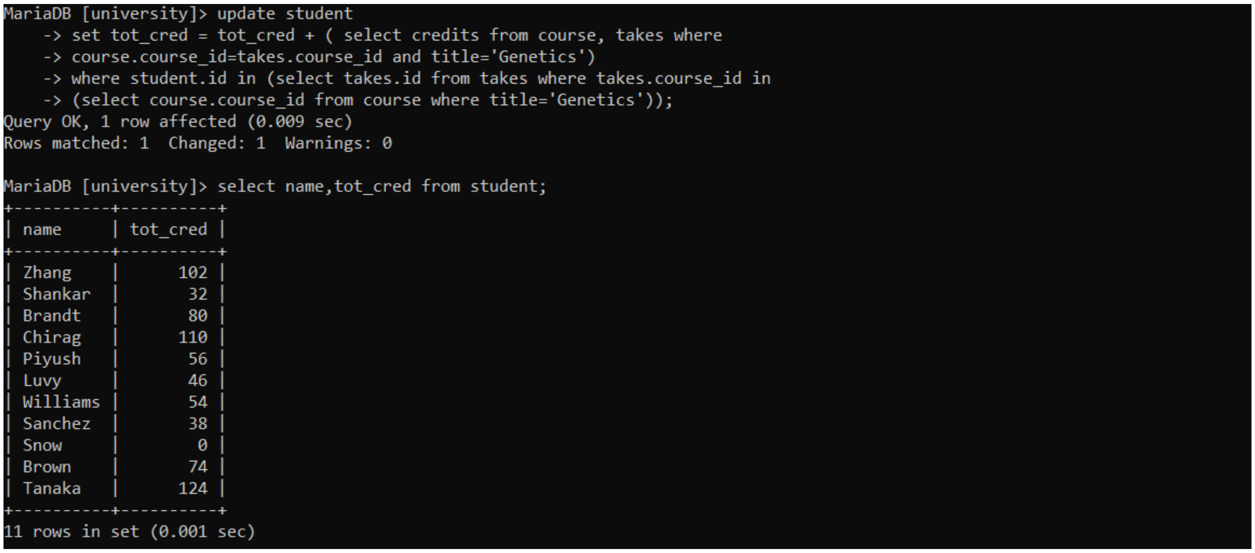
3. **Write SQL update queries to perform the following (queries 2 and 4 are pretty meaningless, but still fun to write):**

a. **Give a 10% hike to all instructors.**



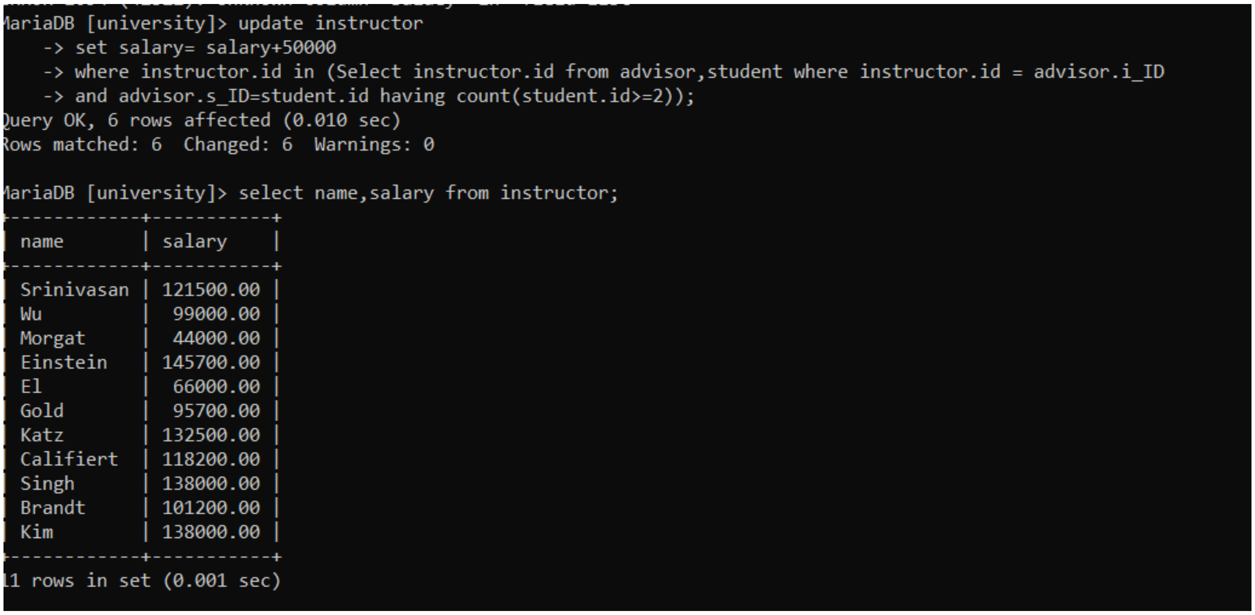
```
MariaDB [university]> update instructor
    -> set salary=salary+salary*0.1;
Query OK, 11 rows affected (0.010 sec)
Rows matched: 11  Changed: 11  Warnings: 0

MariaDB [university]> select * from instructor;
+-------+------------+-----------+-----------+
| ID    | name       | dept_name | salary    |
+-------+------------+-----------+-----------+
| 10101 | Srinivasan | Comp Sci  |  71500.00 |
| 12121 | Wu         | Finance   |  99000.00 |
| 15151 | Morgat     | Music     |  44000.00 |
| 22222 | Einstein   | Physics   |  95700.00 |
| 32343 | El         | History   |  66000.00 |
| 33456 | Gold       | Physics   |  95700.00 |
| 45565 | Katz       | Comp Sci  |  82500.00 |
| 58583 | Califiert  | History   |  68200.00 |
| 76543 | Singh      | Finance   |  88000.00 |
| 83821 | Brandt     | Comp Sci  | 101200.00 |
| 98345 | Kim        | Elec Engg |  88000.00 |
+-------+------------+-----------+-----------+
11 rows in set (0.001 sec)
```

b. Increase the tot_creds of all students who have taken the course titled "Genetics" by the number of credits associated with that course



```
MariaDB [university]> update student
    -> set tot_cred = tot_cred + ( select credits from course, takes where
    -> course.course_id=takes.course_id and title='Genetics')
    -> where student.id in (select takes.id from takes where takes.course_id in
    -> (select course.course_id from course where title='Genetics'));
Query OK, 1 row affected (0.009 sec)
Rows matched: 1  Changed: 1  Warnings: 0

MariaDB [university]> select name,tot_cred from student;
+----------+----------+
| name     | tot_cred |
+----------+----------+
| Zhang    |      102 |
| Shankar  |       32 |
| Brandt   |       80 |
| Chirag   |      110 |
| Piyush   |       56 |
| Luvy     |       46 |
| Williams |       54 |
| Sanchez  |       38 |
| Snow     |        0 |
| Brown    |       74 |
| Tanaka   |      124 |
+----------+----------+
11 rows in set (0.001 sec)
```

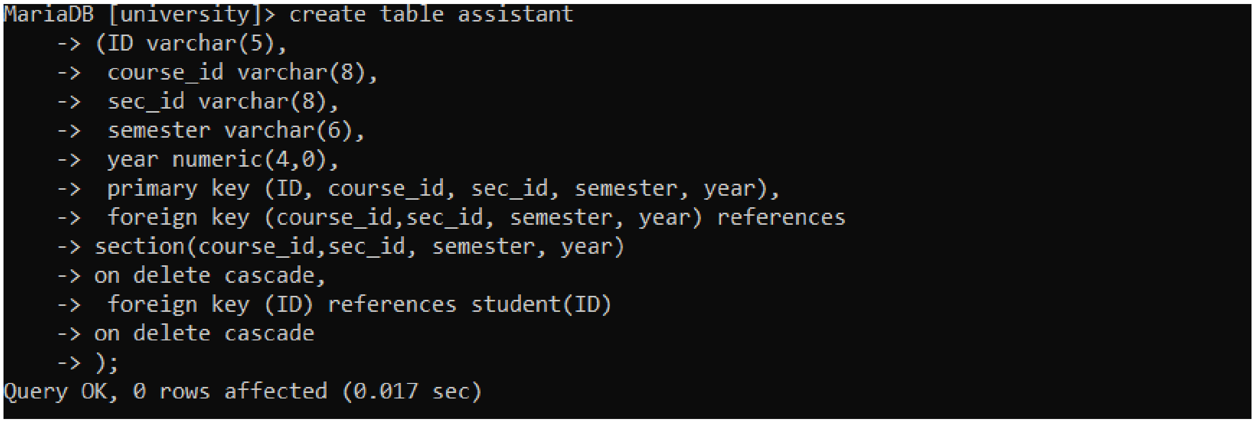
c . For all instructors who are advisors of at least 2 students, increase their salary by 50000.



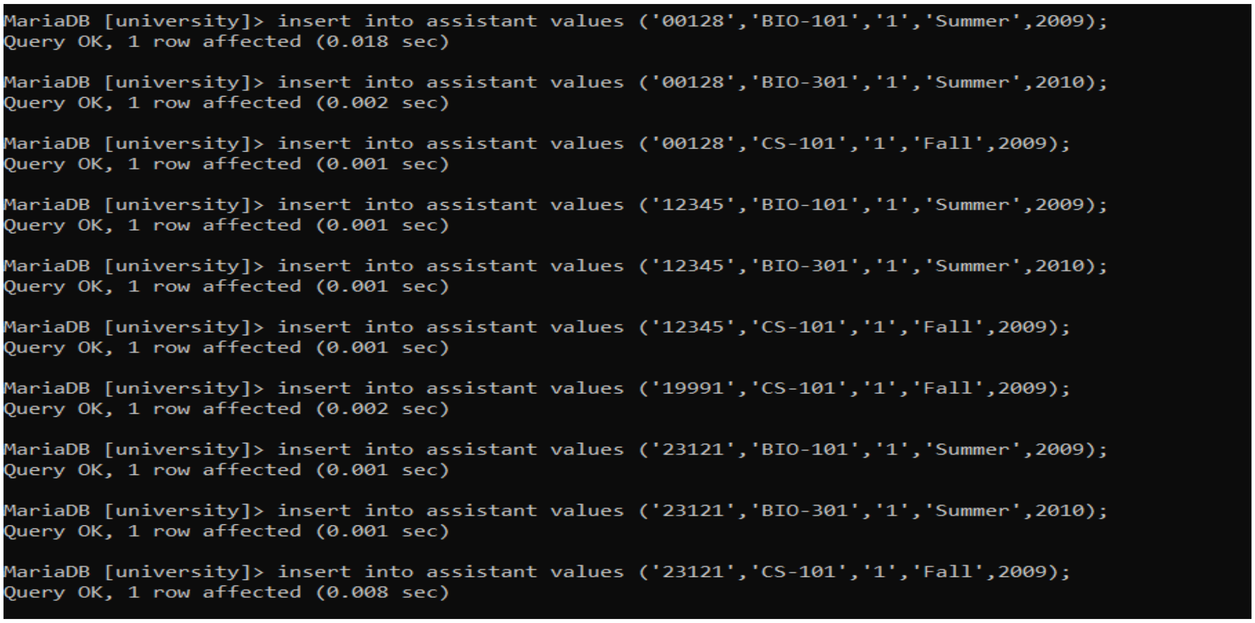
```
MariaDB [university]> update instructor
    -> set salary= salary+50000
    -> where instructor.id in (Select instructor.id from advisor,student where instructor.id = advisor.i_ID
    -> and advisor.s_ID=student.id having count(student.id>=2));
Query OK, 6 rows affected (0.010 sec)
Rows matched: 6  Changed: 6  Warnings: 0

MariaDB [university]> select name,salary from instructor;
+------------+-----------+
| name       | salary    |
+------------+-----------+
| Srinivasan | 121500.00 |
| Wu         |  99000.00 |
| Morgat     |  44000.00 |
| Einstein   | 145700.00 |
| El         |  66000.00 |
| Gold       |  95700.00 |
| Katz       | 132500.00 |
| Califiert  | 118200.00 |
| Singh      | 138000.00 |
| Brandt     | 101200.00 |
| Kim        | 138000.00 |
+------------+-----------+
11 rows in set (0.001 sec)
```

AIM : SQL DDL and updates

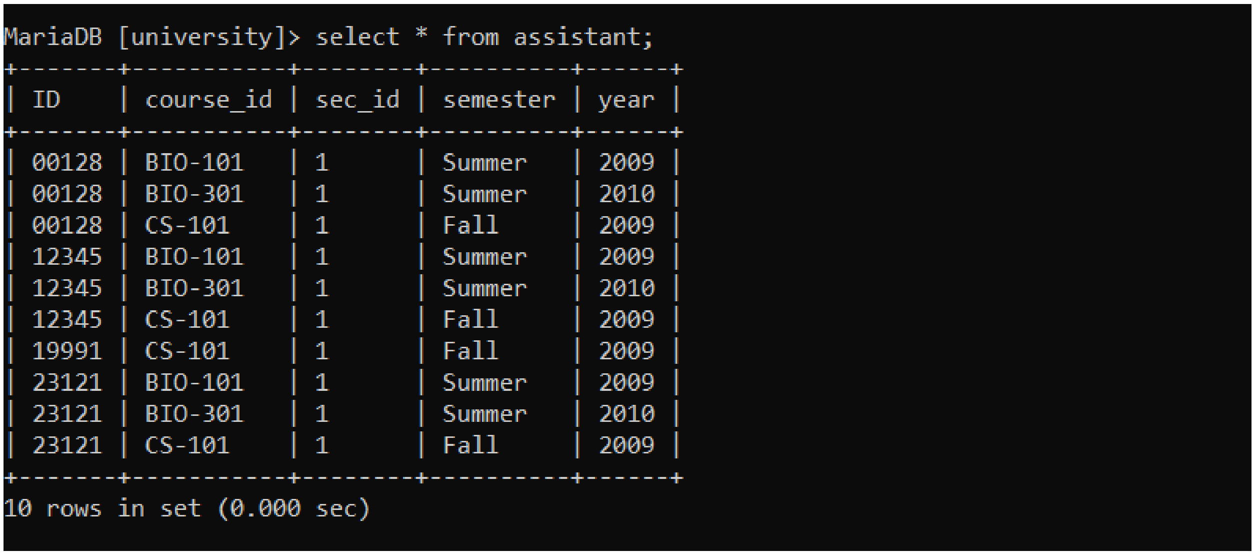
1. **Each offering of a course (i.e. a section) can have many Teaching assistants; each teaching assistant is a student. Extend the existing schema(Add/Alter tables) to accommodate this requirement.**



```
MariaDB [university]> create table assistant
    -> (ID varchar(5),
    ->  course_id varchar(8),
    ->  sec_id varchar(8),
    ->  semester varchar(6),
    ->  year numeric(4,0),
    ->  primary key (ID, course_id, sec_id, semester, year),
    ->  foreign key (course_id,sec_id, semester, year) references
    -> section(course_id,sec_id, semester, year)
    -> on delete cascade,
    ->  foreign key (ID) references student(ID)
    -> on delete cascade
    -> );
Query OK, 0 rows affected (0.017 sec)
```



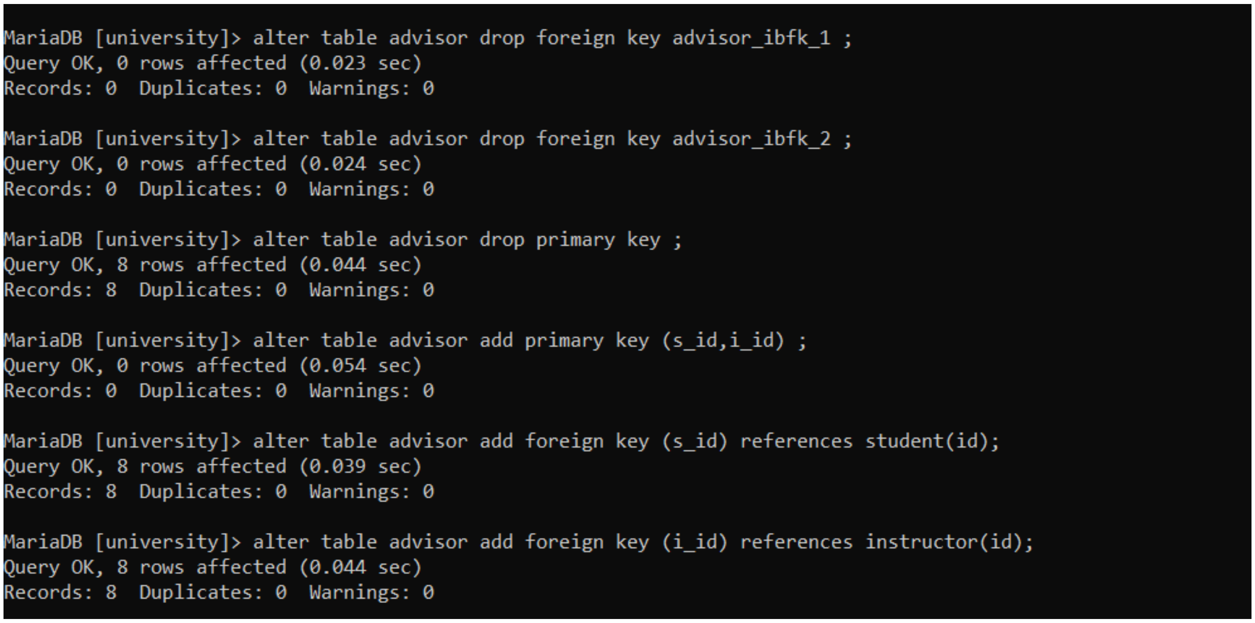
```
MariaDB [university]> insert into assistant values ('00128','BIO-101','1','Summer',2009);
Query OK, 1 row affected (0.018 sec)

MariaDB [university]> insert into assistant values ('00128','BIO-301','1','Summer',2010);
Query OK, 1 row affected (0.002 sec)

MariaDB [university]> insert into assistant values ('00128','CS-101','1','Fall',2009);
Query OK, 1 row affected (0.001 sec)

MariaDB [university]> insert into assistant values ('12345','BIO-101','1','Summer',2009);
Query OK, 1 row affected (0.001 sec)

MariaDB [university]> insert into assistant values ('12345','BIO-301','1','Summer',2010);
Query OK, 1 row affected (0.001 sec)

MariaDB [university]> insert into assistant values ('12345','CS-101','1','Fall',2009);
Query OK, 1 row affected (0.001 sec)

MariaDB [university]> insert into assistant values ('19991','CS-101','1','Fall',2009);
Query OK, 1 row affected (0.002 sec)

MariaDB [university]> insert into assistant values ('23121','BIO-101','1','Summer',2009);
Query OK, 1 row affected (0.001 sec)

MariaDB [university]> insert into assistant values ('23121','BIO-301','1','Summer',2010);
Query OK, 1 row affected (0.001 sec)

MariaDB [university]> insert into assistant values ('23121','CS-101','1','Fall',2009);
Query OK, 1 row affected (0.008 sec)
```



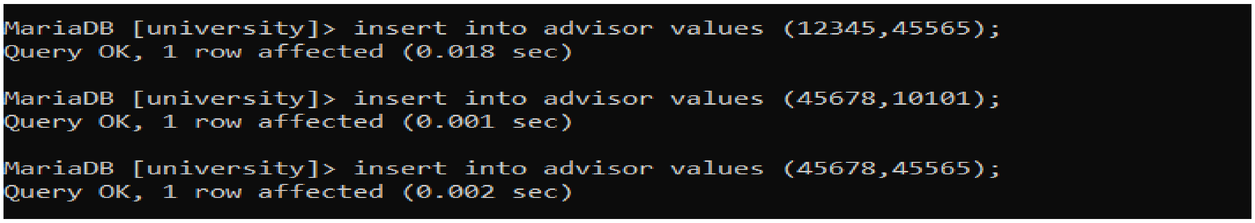
```
MariaDB [university]> select * from assistant;
+-------+-----------+--------+----------+------+
| ID    | course_id | sec_id | semester | year |
+-------+-----------+--------+----------+------+
| 00128 | BIO-101   | 1      | Summer   | 2009 |
| 00128 | BIO-301   | 1      | Summer   | 2010 |
| 00128 | CS-101    | 1      | Fall     | 2009 |
| 12345 | BIO-101   | 1      | Summer   | 2009 |
| 12345 | BIO-301   | 1      | Summer   | 2010 |
| 12345 | CS-101    | 1      | Fall     | 2009 |
| 19991 | CS-101    | 1      | Fall     | 2009 |
| 23121 | BIO-101   | 1      | Summer   | 2009 |
| 23121 | BIO-301   | 1      | Summer   | 2010 |
| 23121 | CS-101    | 1      | Fall     | 2009 |
+-------+-----------+--------+----------+------+
10 rows in set (0.000 sec)
```

2. According to the existing schema, one student can have only one advisor.

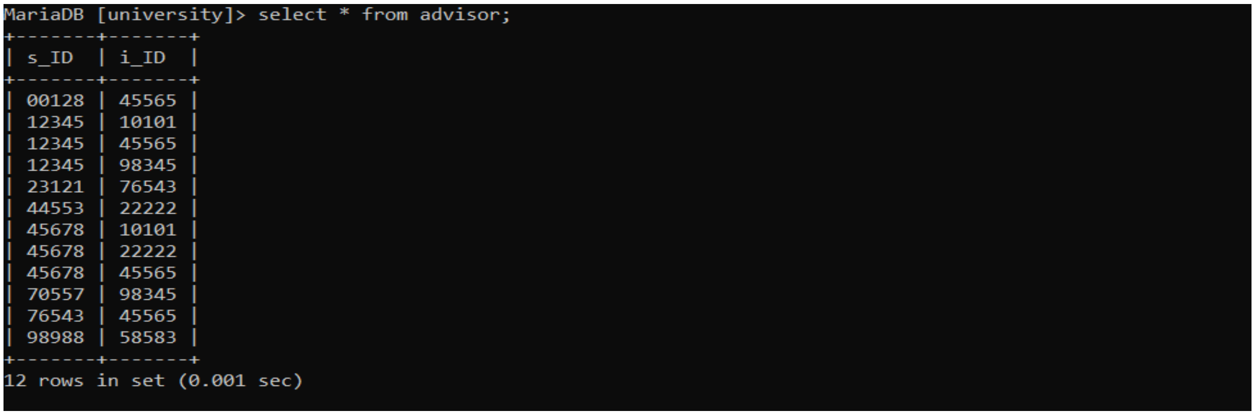
a. **Alter the schema to allow a student to have multiple advisors and make sure that you are able to insert multiple advisors for a student.**



```
MariaDB [university]> alter table advisor drop foreign key advisor_ibfk_1 ;
Query OK, 0 rows affected (0.023 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor drop foreign key advisor_ibfk_2 ;
Query OK, 0 rows affected (0.024 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor drop primary key ;
Query OK, 8 rows affected (0.044 sec)
Records: 8  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor add primary key (s_id,i_id) ;
Query OK, 0 rows affected (0.054 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor add foreign key (s_id) references student(id);
Query OK, 8 rows affected (0.039 sec)
Records: 8  Duplicates: 0  Warnings: 0

MariaDB [university]> alter table advisor add foreign key (i_id) references instructor(id);
Query OK, 8 rows affected (0.044 sec)
Records: 8  Duplicates: 0  Warnings: 0
```



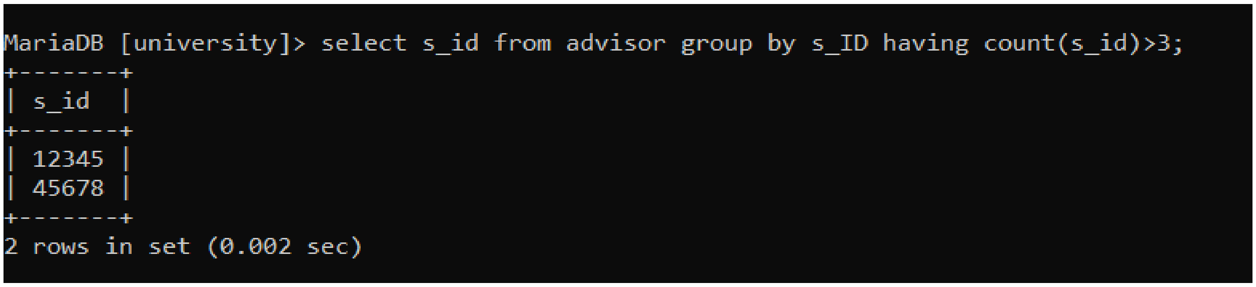
```
MariaDB [university]> insert into advisor values (12345,45565);
Query OK, 1 row affected (0.018 sec)

MariaDB [university]> insert into advisor values (45678,10101);
Query OK, 1 row affected (0.001 sec)

MariaDB [university]> insert into advisor values (45678,45565);
Query OK, 1 row affected (0.002 sec)
```



```
MariaDB [university]> select * from advisor;
+-------+-------+
| s_ID  | i_ID  |
+-------+-------+
| 00128 | 45565 |
| 12345 | 10101 |
| 12345 | 45565 |
| 12345 | 98345 |
| 23121 | 76543 |
| 44553 | 22222 |
| 45678 | 10101 |
| 45678 | 22222 |
| 45678 | 45565 |
| 70557 | 98345 |
| 76543 | 45565 |
| 98988 | 58583 |
+-------+-------+
12 rows in set (0.001 sec)
```

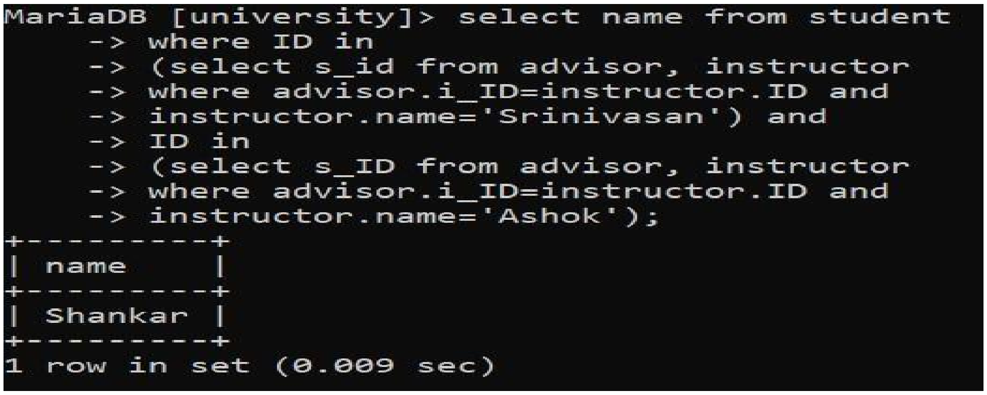
1. **Write SQL queries on the modified schema. You will need to insert data to ensure the query results are not empty.**

a. **Find all students who have more than 3 advisors.**



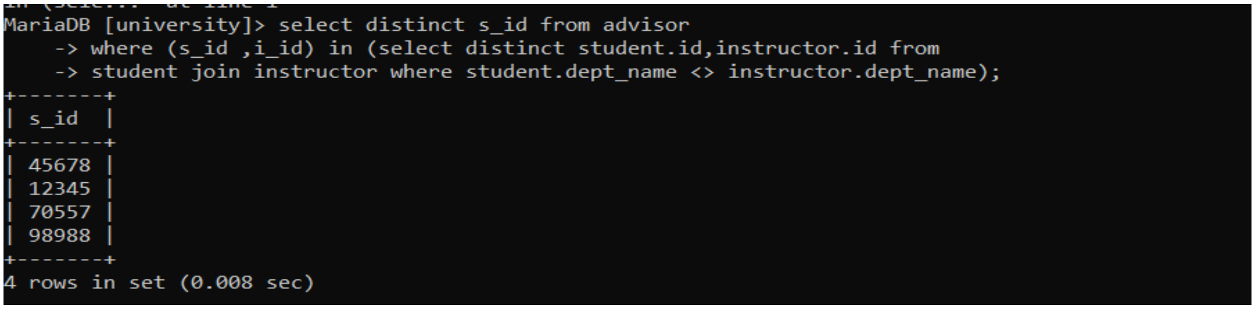
```
MariaDB [university]> select s_id from advisor group by s_ID having count(s_id)>3;
+-------+
| s_id  |
+-------+
| 12345 |
| 45678 |
+-------+
2 rows in set (0.002 sec)
```

2. Find all students who are co-advised by Prof. Srinivas and Prof. Ashok.



```
MariaDB [university]> select name from student
    -> where ID in
    -> (select s_id from advisor, instructor
    -> where advisor.i_ID=instructor.ID and
    -> instructor.name='Srinivasan') and
    -> ID in
    -> (select s_ID from advisor, instructor
    -> where advisor.i_ID=instructor.ID and
    -> instructor.name='Ashok');
+---------+
| name    |
+---------+
| Shankar |
+---------+
1 row in set (0.009 sec)
```

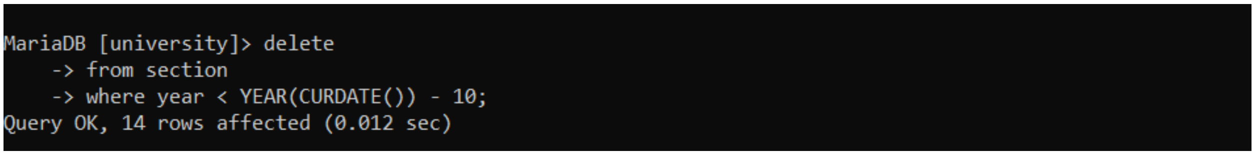
3. Find students advised by instructors from different departments. Etc.



```
in (sele...  at line 1
MariaDB [university]> select distinct s_id from advisor
    -> where (s_id ,i_id) in (select distinct student.id,instructor.id from
    -> student join instructor where student.dept_name <> instructor.dept_name);
+-------+
| s_id  |
+-------+
| 45678 |
| 12345 |
| 70557 |
| 98988 |
+-------+
4 rows in set (0.008 sec)
```

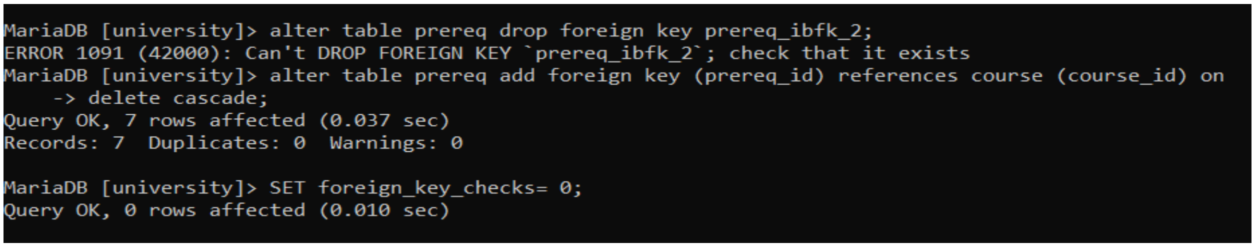
3. Write SQL queries for the following:

a. **Delete all information in the database which is more than 10 years old. Add data as necessary to verify your query.**

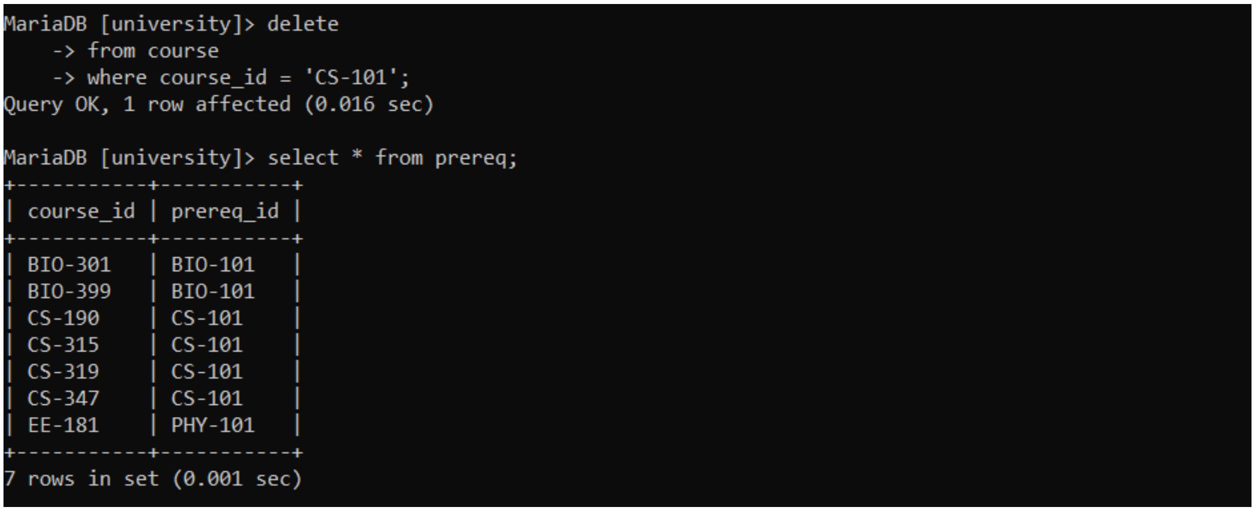


```
MariaDB [university]> delete
    -> from section
    -> where year < YEAR(CURDATE()) - 10;
Query OK, 14 rows affected (0.012 sec)
```

b. Delete the course CS 101. Any course which has CS 101 as a prereq should remove CS 101 from its prereq set. Create a cascade constraint to enforce the above rule, and verify that it is working.



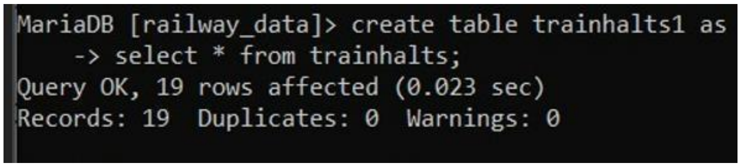
```
MariaDB [university]> alter table prereq drop foreign key prereq_ibfk_2;
ERROR 1091 (42000): Can't DROP FOREIGN KEY `prereq_ibfk_2`; check that it exists
MariaDB [university]> alter table prereq add foreign key (prereq_id) references course (course_id) on
    -> delete cascade;
Query OK, 7 rows affected (0.037 sec)
Records: 7  Duplicates: 0  Warnings: 0

MariaDB [university]> SET foreign_key_checks= 0;
Query OK, 0 rows affected (0.010 sec)
```



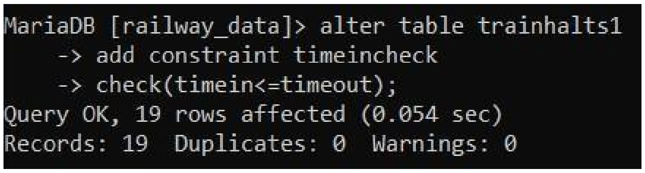
```
MariaDB [university]> delete
    -> from course
    -> where course_id = 'CS-101';
Query OK, 1 row affected (0.016 sec)

MariaDB [university]> select * from prereq;
+-----------+-----------+
| course_id | prereq_id |
+-----------+-----------+
| BIO-301   | BIO-101   |
| BIO-399   | BIO-101   |
| CS-190    | CS-101    |
| CS-315    | CS-101    |
| CS-319    | CS-101    |
| CS-347    | CS-101    |
| EE-181    | PHY-101   |
+-----------+-----------+
7 rows in set (0.001 sec)
```

AIM : Schema creation and constraints

1. **Modify the trains schema, to create constraints to check the following:**
    1. **The value of timein is always less than or equal to timeout**

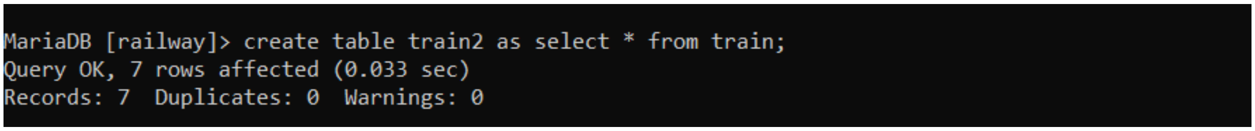


```
MariaDB [railway_data]> create table trainhalts1 as
    -> select * from trainhalts;
Query OK, 19 rows affected (0.023 sec)
Records: 19  Duplicates: 0  Warnings: 0
```

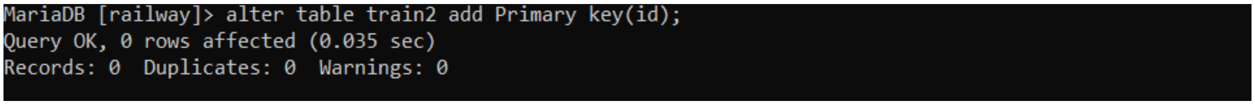


```
MariaDB [railway_data]> alter table trainhalts1
    -> add constraint timeincheck
    -> check(timein<=timeout);
Query OK, 19 rows affected (0.054 sec)
Records: 19  Duplicates: 0  Warnings: 0
```

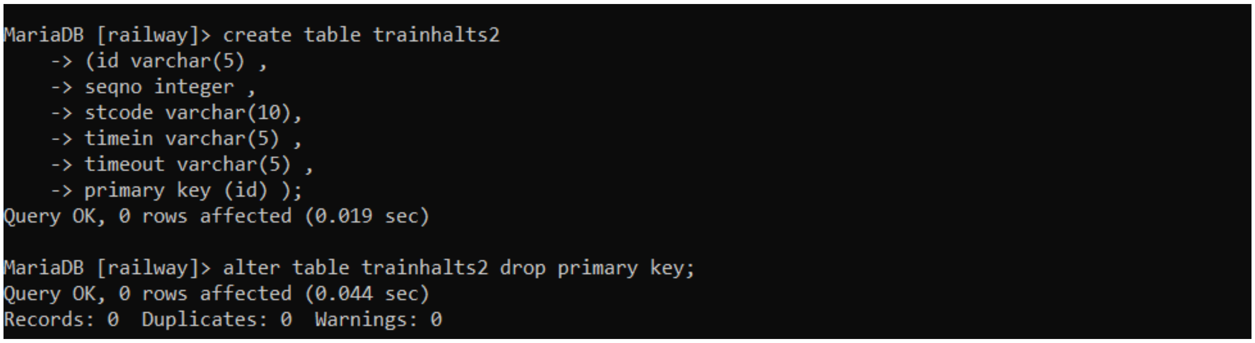
2. When a train is removed from service, all its halts should be deleted.



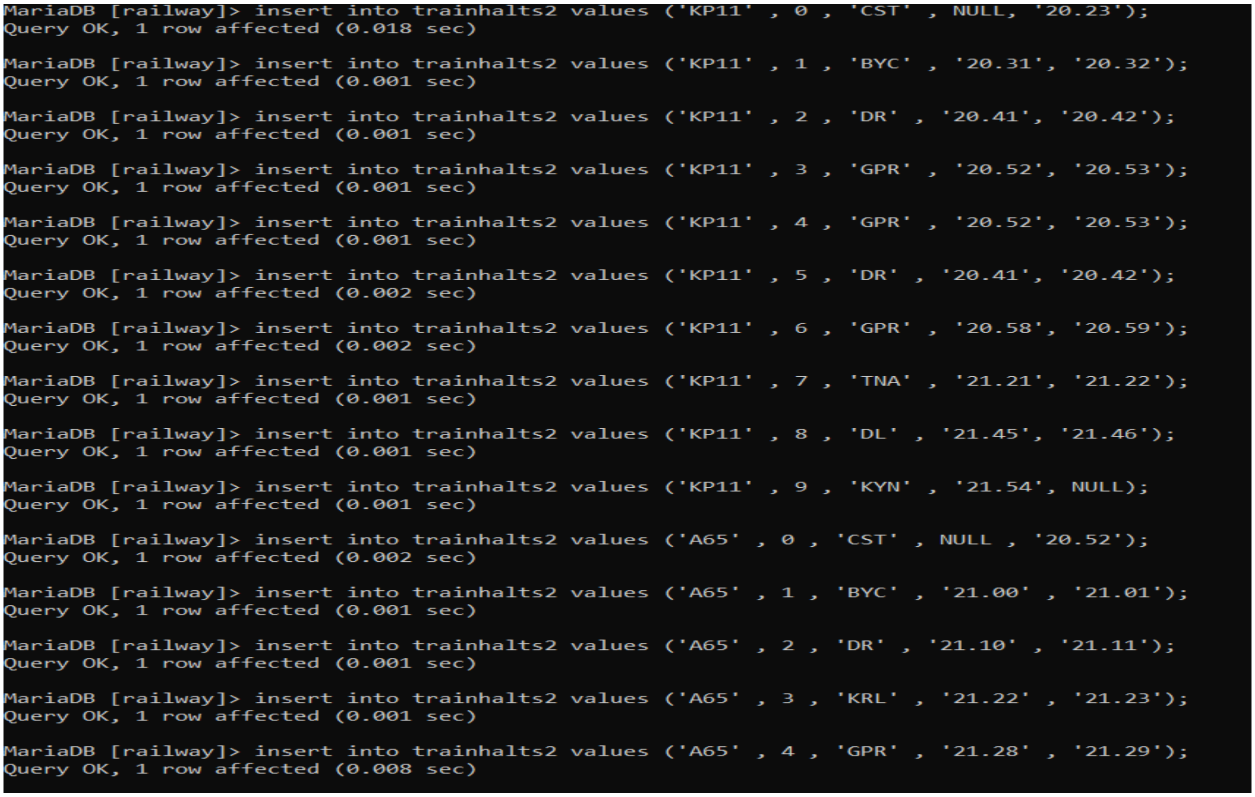
```
MariaDB [railway]> create table train2 as select * from train;
Query OK, 7 rows affected (0.033 sec)
Records: 7  Duplicates: 0  Warnings: 0
```



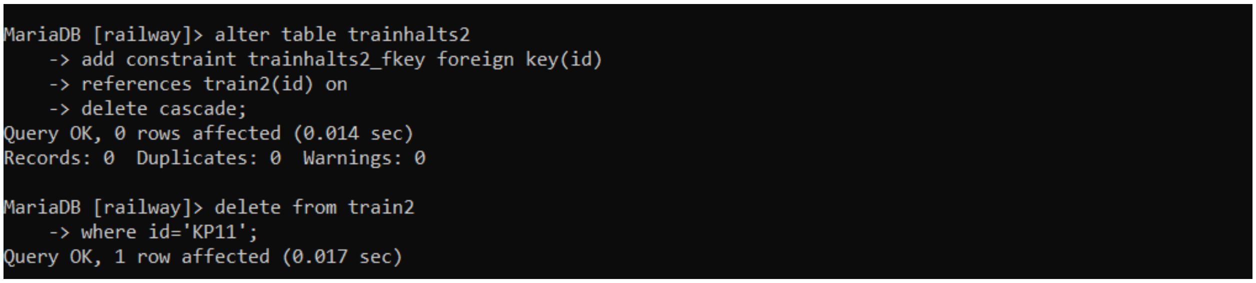
```
MariaDB [railway]> alter table train2 add Primary key(id);
Query OK, 0 rows affected (0.035 sec)
Records: 0  Duplicates: 0  Warnings: 0
```



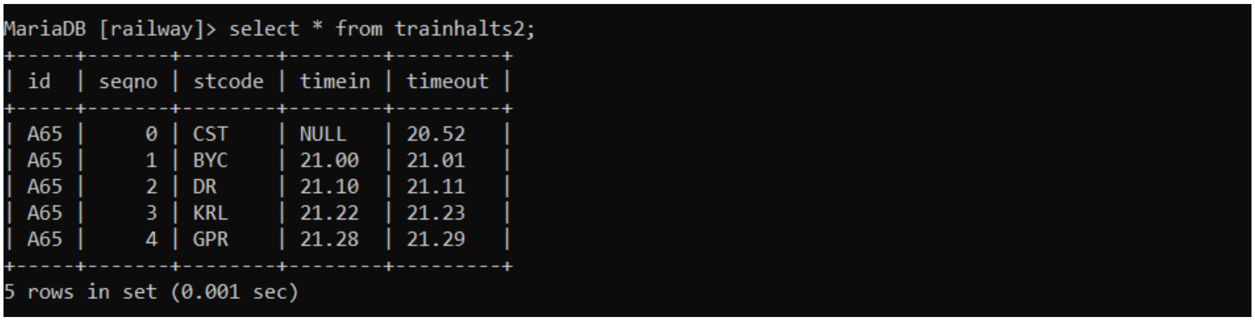
```
MariaDB [railway]> create table trainhalts2
    -> (id varchar(5) ,
    -> seqno integer ,
    -> stcode varchar(10),
    -> timein varchar(5) ,
    -> timeout varchar(5) ,
    -> primary key (id) );
Query OK, 0 rows affected (0.019 sec)

MariaDB [railway]> alter table trainhalts2 drop primary key;
Query OK, 0 rows affected (0.044 sec)
Records: 0  Duplicates: 0  Warnings: 0
```



```
MariaDB [railway]> insert into trainhalts2 values ('KP11' , 0 , 'CST' , NULL, '20.23');
Query OK, 1 row affected (0.018 sec)

MariaDB [railway]> insert into trainhalts2 values ('KP11' , 1 , 'BYC' , '20.31', '20.32');
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('KP11' , 2 , 'DR' , '20.41', '20.42');
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('KP11' , 3 , 'GPR' , '20.52', '20.53');
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('KP11' , 4 , 'GPR' , '20.52', '20.53');
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('KP11' , 5 , 'DR' , '20.41', '20.42');
Query OK, 1 row affected (0.002 sec)

MariaDB [railway]> insert into trainhalts2 values ('KP11' , 6 , 'GPR' , '20.58', '20.59');
Query OK, 1 row affected (0.002 sec)

MariaDB [railway]> insert into trainhalts2 values ('KP11' , 7 , 'TNA' , '21.21', '21.22');
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('KP11' , 8 , 'DL' , '21.45', '21.46');
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('KP11' , 9 , 'KYN' , '21.54', NULL);
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('A65' , 0 , 'CST' , NULL , '20.52');
Query OK, 1 row affected (0.002 sec)

MariaDB [railway]> insert into trainhalts2 values ('A65' , 1 , 'BYC' , '21.00' , '21.01');
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('A65' , 2 , 'DR' , '21.10' , '21.11');
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('A65' , 3 , 'KRL' , '21.22' , '21.23');
Query OK, 1 row affected (0.001 sec)

MariaDB [railway]> insert into trainhalts2 values ('A65' , 4 , 'GPR' , '21.28' , '21.29');
Query OK, 1 row affected (0.008 sec)
```

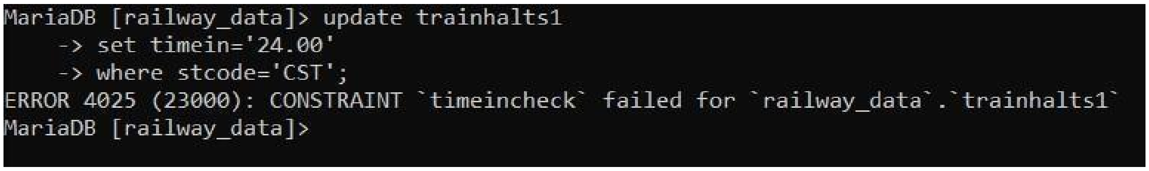


```
MariaDB [railway]> alter table trainhalts2
    -> add constraint trainhalts2_fkey foreign key(id)
    -> references train2(id) on
    -> delete cascade;
Query OK, 0 rows affected (0.014 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [railway]> delete from train2
    -> where id='KP11';
Query OK, 1 row affected (0.017 sec)
```

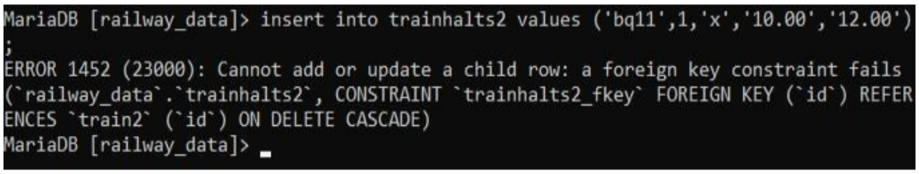


```
MariaDB [railway]> select * from trainhalts2;
+-----+-------+--------+--------+---------+
| id  | seqno | stcode | timein | timeout |
+-----+-------+--------+--------+---------+
| A65 |     0 | CST    | NULL   | 20.52   |
| A65 |     1 | BYC    | 21.00  | 21.01   |
| A65 |     2 | DR     | 21.10  | 21.11   |
| A65 |     3 | KRL    | 21.22  | 21.23   |
| A65 |     4 | GPR    | 21.28  | 21.29   |
+-----+-------+--------+--------+---------+
5 rows in set (0.001 sec)
```

2. Insert inconsistent data and verify the constraints.



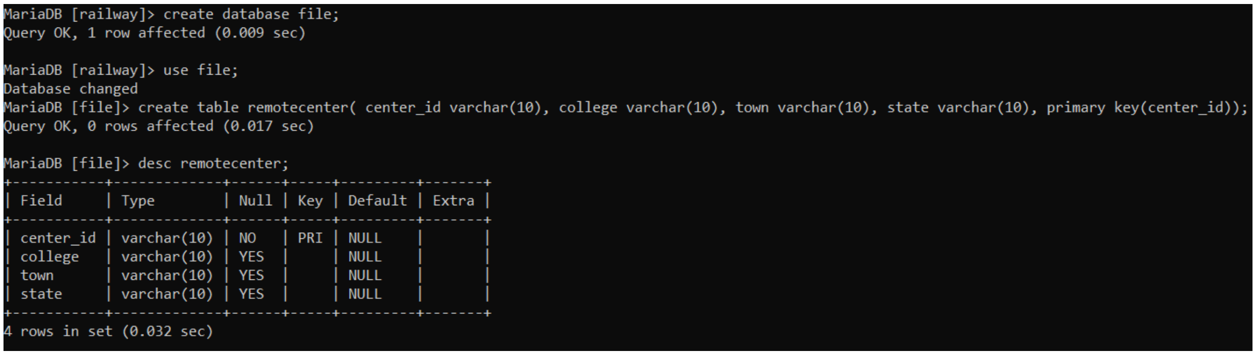
```
MariaDB [railway_data]> update trainhalts1
    -> set timein='24.00'
    -> where stcode='CST';
ERROR 4025 (23000): CONSTRAINT `timeincheck` failed for `railway_data`.`trainhalts1`
MariaDB [railway_data]>
```



```
MariaDB [railway_data]> insert into trainhalts2 values ('bq11',1,'x','10.00','12.00')
;
ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint fails
(`railway_data`.`trainhalts2`, CONSTRAINT `trainhalts2_fkey` FOREIGN KEY (`id`) REFER
ENCES `train2` (`id`) ON DELETE CASCADE)
MariaDB [railway_data]> _
```

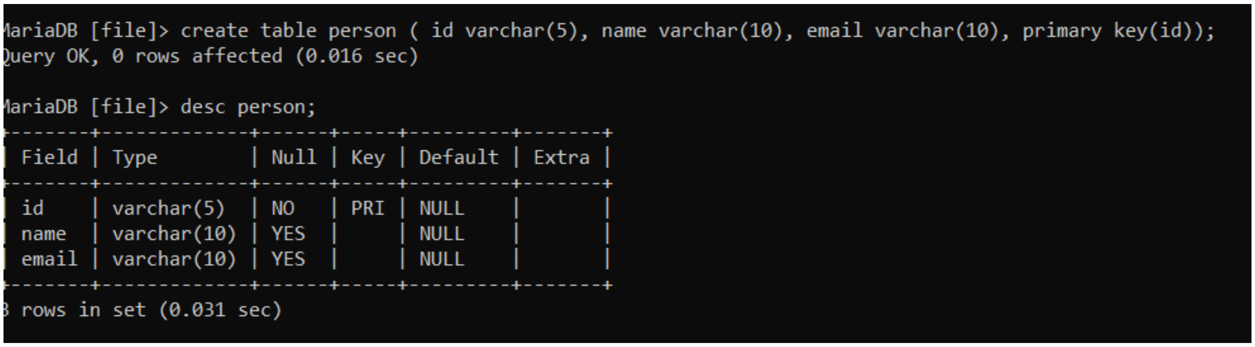
3. Write SQL Create table statements to create the following schema. Include all appropriate primary and foreign key declarations. Choose appropriate types for each attribute.

1. **remotecentre(centreId, college, town, state)**



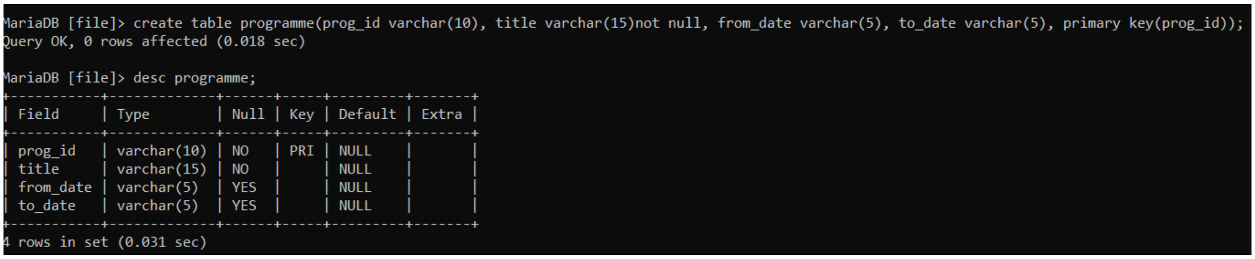
```
MariaDB [railway]> create database file;
Query OK, 1 row affected (0.009 sec)

MariaDB [railway]> use file;
Database changed
MariaDB [file]> create table remotecenter( center_id varchar(10), college varchar(10), town varchar(10), state varchar(10), primary key(center_id));
Query OK, 0 rows affected (0.017 sec)

MariaDB [file]> desc remotecenter;
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| center_id | varchar(10) | NO   | PRI | NULL    |       |
| college   | varchar(10) | YES  |     | NULL    |       |
| town      | varchar(10) | YES  |     | NULL    |       |
| state     | varchar(10) | YES  |     | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
4 rows in set (0.032 sec)
```

2. **person(ID, name, email)**



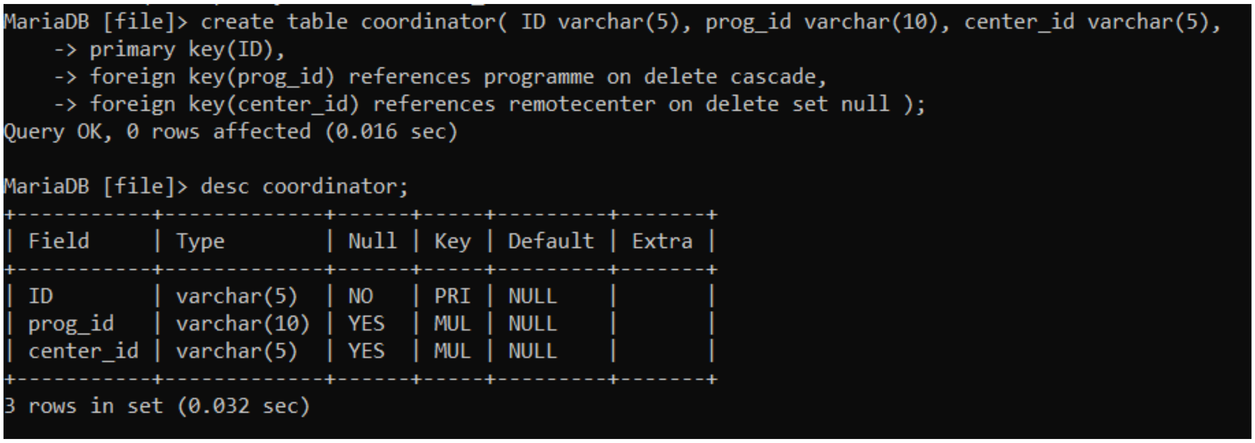
```
lariaDB [file]> create table person ( id varchar(5), name varchar(10), email varchar(10), primary key(id));
Query OK, 0 rows affected (0.016 sec)

lariaDB [file]> desc person;
+-------+-------------+------+-----+---------+-------+
| Field | Type        | Null | Key | Default | Extra |
+-------+-------------+------+-----+---------+-------+
| id    | varchar(5)  | NO   | PRI | NULL    |       |
| name  | varchar(10) | YES  |     | NULL    |       |
| email | varchar(10) | YES  |     | NULL    |       |
+-------+-------------+------+-----+---------+-------+
3 rows in set (0.031 sec)
```

3. programme(progId, title, fromdate, todate)



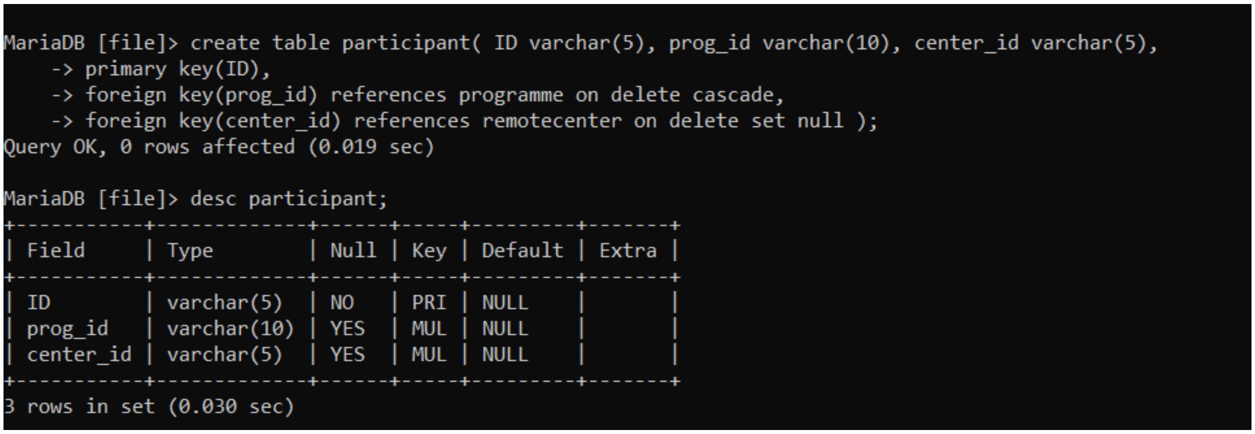
```
MariaDB [file]> create table programme(prog_id varchar(10), title varchar(15)not null, from_date varchar(5), to_date varchar(5), primary key(prog_id));
Query OK, 0 rows affected (0.018 sec)

MariaDB [file]> desc programme;
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| prog_id   | varchar(10) | NO   | PRI | NULL    |       |
| title     | varchar(15) | NO   |     | NULL    |       |
| from_date | varchar(5)  | YES  |     | NULL    |       |
| to_date   | varchar(5)  | YES  |     | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
4 rows in set (0.031 sec)
```

4. coordinator(ID, progId, centreId)



```
MariaDB [file]> create table coordinator( ID varchar(5), prog_id varchar(10), center_id varchar(5),
    -> primary key(ID),
    -> foreign key(prog_id) references programme on delete cascade,
    -> foreign key(center_id) references remotecenter on delete set null );
Query OK, 0 rows affected (0.016 sec)

MariaDB [file]> desc coordinator;
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| ID        | varchar(5)  | NO   | PRI | NULL    |       |
| prog_id   | varchar(10) | YES  | MUL | NULL    |       |
| center_id | varchar(5)  | YES  | MUL | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
3 rows in set (0.032 sec)
```

5. participant(ID, progId, centreId)



```
MariaDB [file]> create table participant( ID varchar(5), prog_id varchar(10), center_id varchar(5),
    -> primary key(ID),
    -> foreign key(prog_id) references programme on delete cascade,
    -> foreign key(center_id) references remotecenter on delete set null );
Query OK, 0 rows affected (0.019 sec)

MariaDB [file]> desc participant;
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| ID        | varchar(5)  | NO   | PRI | NULL    |       |
| prog_id   | varchar(10) | YES  | MUL | NULL    |       |
| center_id | varchar(5)  | YES  | MUL | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
3 rows in set (0.030 sec)
```

AIM : Create an ER diagram for each of the following enterprises

1. A railway system, which needs to model the following:

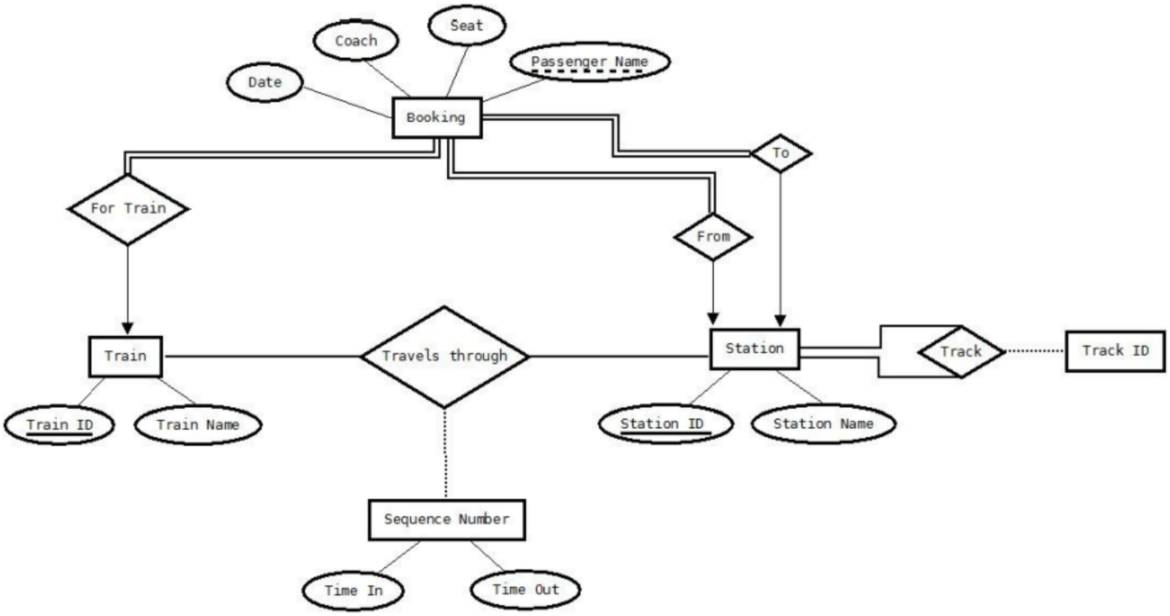
    1. Stations

    2. Tracks, connecting stations. You can assume for simplicity that only one track exists between any two stations. All the tracks put together form a graph.

    3. Trains, with an ID and a name

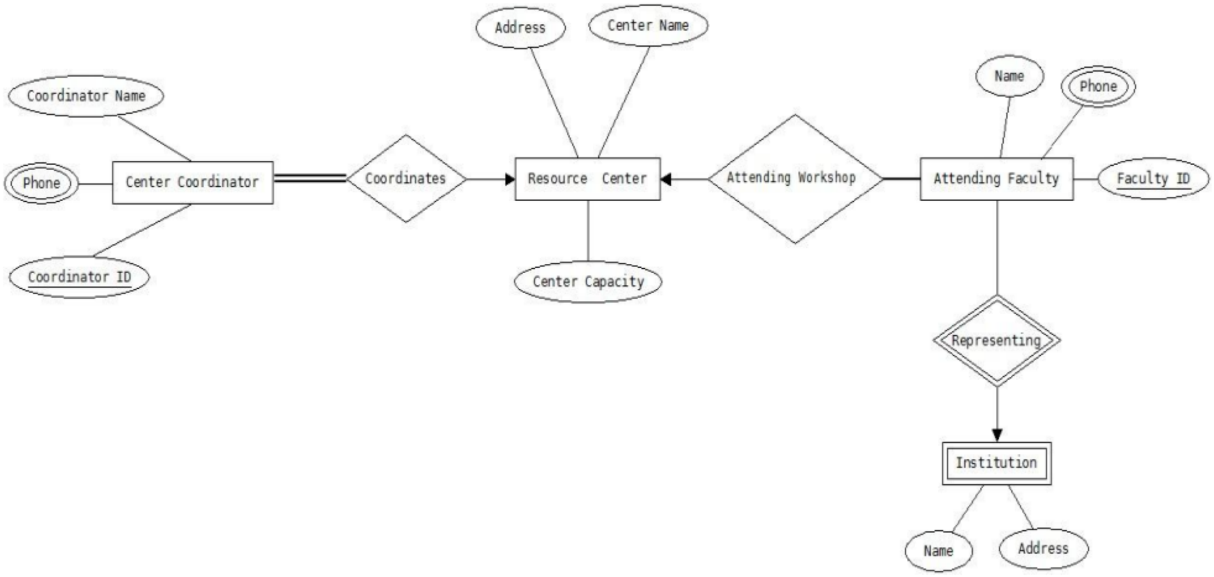
    4. Train schedules recording what time a train passes through each station on its route. You can assume for simplicity that each train reaches its destination on the same day, and that every train runs every day. Also for simplicity, assume that for each train, for each station on its route, you store (a) time in, (b) time out (same as time in if it does not stop), and (c) a sequence number so the stations in the route of a train can be ordered by sequence number.

    5. Passenger booking consisting of train, date, from-station, to-station, coach, seat and passenger name; for simplicity, don't bother to model passengers as entities.



<u>ER Diagram for Railway</u>

2. An ER diagram for this program, modeling resource centers, center coordinators from resource centers, capacity of each center, and (for the main ISTE workshop) the faculty who will be attending at each resource center, and their associated institutions.



ER Diagram