DBMS Lab Assignment - 5

1.

I.

```sql
CREATE TABLE referenced(
    `id` INT,
    `name` VARCHAR(20),
    `age` INT,
    `contact` VARCHAR(10),
    `address` VARCHAR(50),
    `email` VARCHAR(20),
    `date_of_birth` DATETIME,
    PRIMARY KEY (`id`, `name`)
);
```

```
MariaDB [university]> DESCRIBE referenced;
+---------------+-------------+------+-----+---------+-------+
| Field         | Type        | Null | Key | Default | Extra |
+---------------+-------------+------+-----+---------+-------+
| id            | int(11)     | NO   | PRI | NULL    |       |
| name          | varchar(20) | NO   | PRI | NULL    |       |
| age           | int(11)     | YES  |     | NULL    |       |
| contact       | varchar(10) | YES  |     | NULL    |       |
| address       | varchar(50) | YES  |     | NULL    |       |
| email         | varchar(20) | YES  |     | NULL    |       |
| date_of_birth | datetime    | YES  |     | NULL    |       |
+---------------+-------------+------+-----+---------+-------+
7 rows in set (0.007 sec)
```

```sql
CREATE TABLE referencing(
    `id` INT,
    `hobbies` VARCHAR(20),
    `height` FLOAT,
    `weight` FLOAT,
    `gender` VARCHAR(10),
    `major` BOOLEAN,
    FOREIGN KEY (`id`) REFERENCES `referenced` (`id`) ON DELETE CASCADE
)
```

```
MariaDB [university]> DESCRIBE referencing;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| id       | int(11)     | YES  | MUL | NULL    |       |
| hobbies  | varchar(20) | YES  |     | NULL    |       |
| height   | float       | YES  |     | NULL    |       |
| weight   | float       | YES  |     | NULL    |       |
| gender   | varchar(10) | YES  |     | NULL    |       |
| major    | tinyint(1)  | YES  |     | NULL    |       |
+----------+-------------+------+-----+---------+-------+
6 rows in set (0.005 sec)
```

II.

a. Domain Constraint

Inserting 'twenty' into the attribute age. Domain of age is int, but string is inserted.

```
MariaDB [university]> INSERT INTO referenced VALUES (1, 'Vipul', 'twenty', null, null, null, null);
ERROR 1366 (22007): Incorrect integer value: 'twenty' for column `university`.`referenced`.`age` at
row 1
```

Inserting '24-02-2001' into the attribute date_of_birth. Domain of date_of_birth

```
MariaDB [university]> INSERT INTO referenced VALUES (1, 'Vipul', 20, null, null, null, '24-02-2001');
ERROR 1292 (22007): Incorrect datetime value: '24-02-2001' for column `university`.`referenced`.`date_
of_birth` at row 1
```

b. Entity Integrity Constraint

Inserting null into the attribute name. name is a primary key.

```
MariaDB [university]> INSERT INTO referenced VALUES (1, null, 20, null, null, null, null);
ERROR 1048 (23000): Column 'name' cannot be null
```

Inserting null into the attribute id. id is a primary key.

```
MariaDB [university]> INSERT INTO referenced VALUES (null, 'Vipul', 20, null, null, null, null);
ERROR 1048 (23000): Column 'id' cannot be null
```

c. Referential Integrity Constraint

```
MariaDB [university]> INSERT INTO referenced VALUES (1, 'Vipul', 20, null, null, null, null);
Query OK, 1 row affected (0.003 sec)

MariaDB [university]> SELECT * FROM referenced;
+----+-------+-----+---------+---------+-------+---------------+
| id | name  | age | contact | address | email | date_of_birth |
+----+-------+-----+---------+---------+-------+---------------+
|  1 | Vipul |  20 | NULL    | NULL    | NULL  | NULL          |
+----+-------+-----+---------+---------+-------+---------------+
1 row in set (0.001 sec)

MariaDB [university]> INSERT INTO referencing VALUES (1, 'na', 170, 90, 'male', null);
Query OK, 1 row affected (0.003 sec)

MariaDB [university]> SELECT * FROM referencing;
+----+---------+--------+--------+--------+-------+
| id | hobbies | height | weight | gender | major |
+----+---------+--------+--------+--------+-------+
|  1 | na      |    170 |     90 | male   | NULL  |
+----+---------+--------+--------+--------+-------+
1 row in set (0.002 sec)
```

Inserting entry with id 2 into the referencing table. Attribute id of the referencing table is a foreign key which references the id of the referenced table. Referenced table has no entry with id 2, so the referencing table also cannot have the entry.

```
MariaDB [university]> INSERT INTO referencing VALUES (2, 'na', null, null, null, null);
ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint fails (`university`.`re
ferencing`, CONSTRAINT `referencing_ibfk_1` FOREIGN KEY (`id`) REFERENCES `referenced` (`id`) ON DELET
E CASCADE)
```

Modifying the entry with id 1 in the referencing table, to 3. Referenced table has no entry with id 3, so modifying the id of referencing table to 3 raises error

```
MariaDB [university]> UPDATE referencing SET id = 3 WHERE hobbies = 'na';
ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint fails (`university`.`re
ferencing`, CONSTRAINT `referencing_ibfk_1` FOREIGN KEY (`id`) REFERENCES `referenced` (`id`) ON DELET
E CASCADE)
```

      d. Key Constraint

```
MariaDB [university]> INSERT INTO referenced VALUES (2, 'Mohan', 20, null, null, null, null);
Query OK, 1 row affected (0.003 sec)

MariaDB [university]> SELECT * FROM referenced;
+----+-------+-----+---------+---------+-------+---------------+
| id | name  | age | contact | address | email | date_of_birth |
+----+-------+-----+---------+---------+-------+---------------+
|  1 | Vipul |  20 | NULL    | NULL    | NULL  | NULL          |
|  2 | Mohan |  20 | NULL    | NULL    | NULL  | NULL          |
+----+-------+-----+---------+---------+-------+---------------+
2 rows in set (0.000 sec)
```

Inserting an entry with id 1 and name 'Vipul' into the referenced table. Attribute id and name are the primary key of the referencing table. So, there can't exist multiple entries with the same primary key.

```
MariaDB [university]> INSERT INTO referenced VALUES (1, 'Vipul', null, null, null, null, null);
ERROR 1062 (23000): Duplicate entry '1-Vipul' for key 'PRIMARY'
```

Inserting an entry with id 2 and name 'Mohan' into the referenced table.

```
MariaDB [university]> INSERT INTO referenced VALUES (2, 'Mohan', null, null, null, null, null);
ERROR 1062 (23000): Duplicate entry '2-Mohan' for key 'PRIMARY'
```

III.

```
MariaDB [university]> SELECT * FROM referenced;
+------+--------+------+---------+---------+-------+---------------+
| id   | name   | age  | contact | address | email | date_of_birth |
+------+--------+------+---------+---------+-------+---------------+
|  1   | Vipul  |  20  | NULL    | NULL    | NULL  | NULL          |
|  2   | Mohan  |  20  | NULL    | NULL    | NULL  | NULL          |
+------+--------+------+---------+---------+-------+---------------+
2 rows in set (0.001 sec)
```

```
MariaDB [university]> INSERT INTO referencing VALUES (1, 'na', 170, 90, 'male', null);
Query OK, 1 row affected (0.003 sec)

MariaDB [university]> INSERT INTO referencing VALUES (2, 'reading books', 170, 90, 'female', null);
Query OK, 1 row affected (0.002 sec)

MariaDB [university]> SELECT * FROM referencing;
+------+---------------+--------+--------+--------+-------+
| id   | hobbies       | height | weight | gender | major |
+------+---------------+--------+--------+--------+-------+
|  1   | na            |  170   |  90    | male   | NULL  |
|  2   | reading books |  170   |  90    | female | NULL  |
+------+---------------+--------+--------+--------+-------+
2 rows in set (0.001 sec)
```

```
MariaDB [university]> DELETE FROM referenced WHERE id = 1;
Query OK, 1 row affected (0.002 sec)

MariaDB [university]> SELECT * FROM referenced;
+------+--------+------+---------+---------+-------+---------------+
| id   | name   | age  | contact | address | email | date_of_birth |
+------+--------+------+---------+---------+-------+---------------+
|  2   | Mohan  |  20  | NULL    | NULL    | NULL  | NULL          |
+------+--------+------+---------+---------+-------+---------------+
1 row in set (0.000 sec)

MariaDB [university]> SELECT * FROM referencing;
+------+---------------+--------+--------+--------+-------+
| id   | hobbies       | height | weight | gender | major |
+------+---------------+--------+--------+--------+-------+
|  2   | reading books |  170   |  90    | female | NULL  |
+------+---------------+--------+--------+--------+-------+
1 row in set (0.000 sec)
```

```
MariaDB [university]> SELECT * FROM referencing;
+------+---------------+--------+--------+--------+-------+
| id   | hobbies       | height | weight | gender | major |
+------+---------------+--------+--------+--------+-------+
|    2 | reading books |    170 |     90 | female | NULL  |
+------+---------------+--------+--------+--------+-------+
1 row in set (0.000 sec)

MariaDB [university]> DELETE FROM referenced WHERE id = 2;
Query OK, 1 row affected (0.002 sec)

MariaDB [university]> SELECT * FROM referenced;
Empty set (0.000 sec)

MariaDB [university]> SELECT * FROM referencing;
Empty set (0.000 sec)
```

IV.

```
MariaDB [university]> DROP TABLE referencing;
Query OK, 0 rows affected (0.008 sec)

MariaDB [university]> DROP TABLE referenced;
Query OK, 0 rows affected (0.005 sec)
```

2.

I.

```
 ~/Doc/coding/dbms/labs/lab5 > ls                                            base  02:33:14
fk.sql
 ~/Doc/coding/dbms/labs/lab5 > sudo mysqldump -u root -p --no-data university > structure_without_data.sql
Password:
Enter password:
 ~/Doc/cod/dbms/labs/lab5 > ls                                         6s  base  02:34:04
fk.sql                    structure_without_data.sql
 ~/Doc/coding/dbms/labs/lab5 > sudo mysqldump -u root -p university > structure_with_data.sql
Enter password:
 ~/Doc/cod/dbms/labs/lab5 > ls                                         4s  base  02:34:30
fk.sql                    structure_with_data.sql    structure_without_data.sql
 ~/Doc/coding/dbms/labs/lab5 >                                             base  02:34:31
```

II.

```
MariaDB [(none)]> show databases;
+--------------------+
| Database           |
+--------------------+
| hospital           |
| information_schema |
| mysql              |
| performance_schema |
| restaurant         |
| test               |
| university         |
+--------------------+
7 rows in set (0.001 sec)

MariaDB [(none)]> create database without_data;
Query OK, 1 row affected (0.004 sec)

MariaDB [(none)]> create database with_data;
Query OK, 1 row affected (0.001 sec)
```

```
 ~/Doc/coding/dbms/labs/lab5 > sudo mysql -u root -p without_data < structure_without_data.sql
Enter password:
 ~/Doc/cod/dbms/labs/lab5 > sudo mysql -u root -p with_data < structure_without_data.sql
Enter password:
 ~/Doc/cod/dbms/labs/lab5 > sudo mysql -u root -p with_data < structure_with_data.sql  5s  base  02:41:10
Enter password:
 ~/Doc/cod/dbms/labs/lab5 >                                                             6s  base  02:41:20
```

```
MariaDB [(none)]> use without_data;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MariaDB [without_data]> SHOW TABLES;
+-----------------------+
| Tables_in_without_data |
+-----------------------+
| advisor               |
| classroom             |
| course                |
| department            |
| instructor            |
| prereq                |
| section               |
| student               |
| takes                 |
| teaches               |
| time_slot             |
+-----------------------+
11 rows in set (0.001 sec)

MariaDB [without_data]> SELECT * FROM student;
Empty set (0.001 sec)
```

```
MariaDB [without_data]> USE with_data;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MariaDB [with_data]> SHOW TABLES;
+------------------------+
| Tables_in_with_data    |
+------------------------+
| advisor                |
| classroom              |
| course                 |
| department             |
| instructor             |
| prereq                 |
| section                |
| student                |
| takes                  |
| teaches                |
| time_slot              |
+------------------------+
11 rows in set (0.001 sec)

MariaDB [with_data]> SELECT * FROM student;
+--------+----------+------------+----------+
| ID     | name     | dept_name  | tot_cred |
+--------+----------+------------+----------+
| 00128  | Zhang    | Comp. Sci. |      102 |
| 12345  | Shankar  | Comp. Sci. |       42 |
| 19991  | Brandt   | History    |       80 |
| 23121  | Chavez   | Finance    |      110 |
| 44553  | Peltier  | Physics    |       56 |
| 45678  | Levy     | Physics    |       46 |
| 54321  | Williams | Comp. Sci. |       64 |
| 55739  | Sanchez  | Music      |       38 |
| 70557  | Snow     | Physics    |        0 |
| 76543  | Brown    | Comp. Sci. |       68 |
| 76653  | Aoi      | Elec. Eng. |       60 |
| 98765  | Bourikas | Elec. Eng. |       98 |
| 98988  | Tanaka   | Biology    |      120 |
+--------+----------+------------+----------+
13 rows in set (0.005 sec)
```

III.

```
MariaDB [with_data]> drop database without_data;
Query OK, 11 rows affected (0.030 sec)

MariaDB [with_data]> drop database with_data;
Query OK, 11 rows affected (0.030 sec)
```

3.

```
MariaDB [university]> SELECT COUNT(DISTINCT takes.ID)
    -> FROM takes
    -> WHERE takes.course_id in (SELECT course_id FROM teaches WHERE teaches.ID = 10101);
+--------------------------+
| COUNT(DISTINCT takes.ID) |
+--------------------------+
|                        6 |
+--------------------------+
1 row in set (0.001 sec)
```

4.

```
MariaDB [university]> SELECT name
    -> FROM instructor
    -> WHERE salary > SOME (SELECT salary FROM instructor WHERE dept_name='Biology');
+----------+
| name     |
+----------+
| Wu       |
| Einstein |
| Gold     |
| Katz     |
| Singh    |
| Brandt   |
| Kim      |
+----------+
7 rows in set (0.002 sec)
```

5.

```
MariaDB [university]> SELECT DISTINCT T.dept_name, (SELECT COUNT(S.ID) FROM instructor AS S WHERE S.dept_name = T.dept_name) AS instructor_count
    -> FROM instructor AS T;
+-----------+------------------+
| dept_name | instructor_count |
+-----------+------------------+
| Biology   |                1 |
| Comp. Sci.|                3 |
| Elec. Eng.|                1 |
| Finance   |                2 |
| History   |                2 |
| Music     |                1 |
| Physics   |                2 |
+-----------+------------------+
7 rows in set (0.003 sec)
```

6.

```
MariaDB [university]> SELECT T.name
    -> FROM instructor AS T
    -> WHERE T.salary > ALL (SELECT S.salary FROM instructor AS S WHERE S.name <> T.name AND
    ->                       S.name <> (SELECT name FROM instructor WHERE salary IN (SELECT MAX(salary) FROM instructor)))
    ->       AND T.salary < (SELECT MAX(salary) FROM instructor);
+--------+
| name   |
+--------+
| Brandt |
+--------+
1 row in set (0.003 sec)
```

7.

```
MariaDB [university]> SELECT S.name, S.dept_name, S.tot_cred
    -> FROM student AS S
    -> WHERE S.tot_cred > ALL(SELECT T.tot_cred FROM student AS T WHERE T.dept_name = S.dept_name AND T.ID <> S.ID)
    ->       AND (SELECT COUNT(L.ID) FROM student AS L WHERE L.dept_name = S.dept_name) > 1;
+----------+------------+----------+
| name     | dept_name  | tot_cred |
+----------+------------+----------+
| Zhang    | Comp. Sci. |      102 |
| Peltier  | Physics    |       56 |
| Bourikas | Elec. Eng. |       98 |
+----------+------------+----------+
3 rows in set (0.014 sec)
```