Assignment 6

1.

```
MariaDB [university]> SELECT student.name AS student_name,
    ->                      student.dept_name,
    ->                      course.title AS course_title,
    ->                      instructor.name AS instructor_name
    -> FROM student INNER JOIN takes ON student.ID = takes.ID
    ->              INNER JOIN course ON takes.course_id = course.course_id
    ->              INNER JOIN teaches ON (takes.course_id = teaches.course_id AND
    ->                                     takes.sec_id = teaches.sec_id AND
    ->                                     takes.semester = teaches.semester AND
    ->                                     takes.year = teaches.year)
    ->              INNER JOIN instructor ON (teaches.ID = instructor.ID)
    -> ORDER BY student.name;
+--------------+------------+--------------------------+-----------------+
| student_name | dept_name  | course_title             | instructor_name |
+--------------+------------+--------------------------+-----------------+
| Aoi          | Elec. Eng. | Intro. to Digital Systems | Kim             |
| Bourikas     | Elec. Eng. | Robotics                 | Srinivasan      |
| Bourikas     | Elec. Eng. | Intro. to Computer Science | Srinivasan    |
| Brandt       | History    | World History            | El Said         |
| Brown        | Comp. Sci. | Intro. to Computer Science | Srinivasan    |
| Brown        | Comp. Sci. | Image Processing         | Brandt          |
| Chavez       | Finance    | Investment Banking       | Wu              |
| Levy         | Physics    | Image Processing         | Katz            |
| Levy         | Physics    | Intro. to Computer Science | Srinivasan    |
| Levy         | Physics    | Intro. to Computer Science | Katz          |
| Peltier      | Physics    | Physical Principles      | Einstein        |
| Sanchez      | Music      | Music Video Production   | Mozart          |
| Shankar      | Comp. Sci. | Robotics                 | Srinivasan      |
| Shankar      | Comp. Sci. | Game Design              | Brandt          |
| Shankar      | Comp. Sci. | Intro. to Computer Science | Srinivasan    |
| Shankar      | Comp. Sci. | Database System Concepts | Srinivasan      |
| Tanaka       | Biology    | Intro. to Biology        | Crick           |
| Tanaka       | Biology    | Genetics                 | Crick           |
| Williams     | Comp. Sci. | Intro. to Computer Science | Srinivasan    |
| Williams     | Comp. Sci. | Game Design              | Brandt          |
| Zhang        | Comp. Sci. | Intro. to Computer Science | Srinivasan    |
| Zhang        | Comp. Sci. | Database System Concepts | Srinivasan      |
+--------------+------------+--------------------------+-----------------+
22 rows in set (0.002 sec)
```

2.

a.

```
MariaDB [university]> SELECT student.name AS student_name,
    ->                       instructor.name AS instructor_name
    -> FROM student INNER JOIN advisor ON student.ID = advisor.s_ID
    ->              INNER JOIn instructor ON advisor.i_ID = instructor.ID;
+--------------+-----------------+
| student_name | instructor_name |
+--------------+-----------------+
| Shankar      | Srinivasan      |
| Peltier      | Einstein        |
| Levy         | Einstein        |
| Zhang        | Katz            |
| Brown        | Katz            |
| Chavez       | Singh           |
| Tanaka       | Crick           |
| Aoi          | Kim             |
| Bourikas     | Kim             |
+--------------+-----------------+
9 rows in set (0.001 sec)
```

b.

```
MariaDB [university]> CREATE VIEW student_advisor AS
    -> (SELECT student.name AS student_name,
    ->         instructor.name AS instructor_name
    -> FROM student INNER JOIN advisor ON student.ID = advisor.s_ID
    ->              INNER JOIN instructor ON advisor.i_ID = instructor.ID);
Query OK, 0 rows affected (0.019 sec)

MariaDB [university]> SELECT * FROM student_advisor;
+--------------+-----------------+
| student_name | instructor_name |
+--------------+-----------------+
| Shankar      | Srinivasan      |
| Peltier      | Einstein        |
| Levy         | Einstein        |
| Zhang        | Katz            |
| Brown        | Katz            |
| Chavez       | Singh           |
| Tanaka       | Crick           |
| Aoi          | Kim             |
| Bourikas     | Kim             |
+--------------+-----------------+
9 rows in set (0.002 sec)
```

c.

Advisor table before updation of view(student_advisor)

```
MariaDB [university]> SELECT * FROM advisor;
+-------+-------+
| s_ID  | i_ID  |
+-------+-------+
| 12345 | 10101 |
| 44553 | 22222 |
| 45678 | 22222 |
| 00128 | 45565 |
| 76543 | 45565 |
| 23121 | 76543 |
| 98988 | 76766 |
| 76653 | 98345 |
| 98765 | 98345 |
+-------+-------+
9 rows in set (0.000 sec)
```

Updation of view(student_advisor)

```
MariaDB [university]> UPDATE student_advisor
    -> SET student_name = 'Vipul'
    -> WHERE instructor_name = 'Singh';
Query OK, 1 row affected (0.009 sec)
Rows matched: 1  Changed: 1  Warnings: 0

MariaDB [university]> SELECT * FROM student_advisor;
+--------------+-----------------+
| student_name | instructor_name |
+--------------+-----------------+
| Shankar      | Srinivasan      |
| Peltier      | Einstein        |
| Levy         | Einstein        |
| Zhang        | Katz            |
| Brown        | Katz            |
| Vipul        | Singh           |
| Tanaka       | Crick           |
| Aoi          | Kim             |
| Bourikas     | Kim             |
+--------------+-----------------+
9 rows in set (0.001 sec)
```

Advisor table after updation of view(student_advisor)

```
MariaDB [university]> SELECT * FROM advisor;
+-------+-------+
| s_ID  | i_ID  |
+-------+-------+
| 12345 | 10101 |
| 44553 | 22222 |
| 45678 | 22222 |
| 00128 | 45565 |
| 76543 | 45565 |
| 23121 | 76543 |
| 98988 | 76766 |
| 76653 | 98345 |
| 98765 | 98345 |
+-------+-------+
9 rows in set (0.000 sec)
```

The view gets changed but the advisor table remains unchanged due to the change in view.

Noticeable Change: In the students table the earlier name was replaced with new updated name (‘Chavez’ was replaced with ‘Vipul’)

d.

```
MariaDB [university]> DELETE FROM student_advisor WHERE student_name = 'Vipul';
ERROR 1395 (HY000): Can not delete from join view 'university.student_advisor'
```

The view cannot be deleted as the view is created from the join of two tables and deleting from view should result in deletion from both the tables which is not allowed by any sql implementation(even mysql).

e.

```
MariaDB [university]> INSERT INTO student_advisor(student_name, instructor_name) VALUES ('Vipul', 'Advisor1');
ERROR 1393 (HY000): Can not modify more than one base table through a join view 'university.student_advisor'
```

The view cannot be modified, as the view is created from the join of two tables and modification from view should result in modification of both the tables which is not allowed by any sql implementation(even mysql).

3.

```
MariaDB [university]> SELECT student.name AS student_name,
    ->                        student.ID AS student_id,
    ->                        instructor.name AS advisor_name,
    ->                        advisor.i_ID AS advisor_id
    -> FROM student LEFT OUTER JOIN advisor ON student.ID = advisor.s_ID
    ->              LEFT OUTER JOIN instructor ON advisor.i_ID = instructor.ID;
+--------------+------------+--------------+------------+
| student_name | student_id | advisor_name | advisor_id |
+--------------+------------+--------------+------------+
| Zhang        | 00128      | Katz         | 45565      |
| Shankar      | 12345      | Srinivasan   | 10101      |
| Brandt       | 19991      | NULL         | NULL       |
| Vipul        | 23121      | Singh        | 76543      |
| Peltier      | 44553      | Einstein     | 22222      |
| Levy         | 45678      | Einstein     | 22222      |
| Williams     | 54321      | NULL         | NULL       |
| Sanchez      | 55739      | NULL         | NULL       |
| Snow         | 70557      | NULL         | NULL       |
| Brown        | 76543      | Katz         | 45565      |
| Aoi          | 76653      | Kim          | 98345      |
| Bourikas     | 98765      | Kim          | 98345      |
| Tanaka       | 98988      | Crick        | 76766      |
+--------------+------------+--------------+------------+
13 rows in set (0.001 sec)
```

4.

a.

```
MariaDB [university]> CREATE VIEW advisor_dept_budg AS
    -> (SELECT DISTINCT(ID), name, dept_name, salary
    ->  FROM instructor INNER JOIN advisor ON instructor.ID = advisor.i_ID
    ->  WHERE instructor.dept_name IN (SELECT dept_name
    ->                                 FROM instructor
    ->                                 GROUP BY dept_name
    ->                                 HAVING SUM(salary) > 100000));
Query OK, 0 rows affected (0.018 sec)

MariaDB [university]> SELECT * FROM advisor_dept_budg;
+-------+-----------+------------+----------+
| ID    | name      | dept_name  | salary   |
+-------+-----------+------------+----------+
| 10101 | Srinivasan | Comp. Sci. | 65000.00 |
| 22222 | Einstein  | Physics    | 95000.00 |
| 45565 | Katz      | Comp. Sci. | 75000.00 |
| 76543 | Singh     | Finance    | 80000.00 |
+-------+-----------+------------+----------+
4 rows in set (0.001 sec)
```

b.

Increasing the salaries of instructors by 10%

```
MariaDB [university]> UPDATE instructor
    -> SET salary = salary * 1.10;
Query OK, 12 rows affected (0.007 sec)
Rows matched: 12  Changed: 12  Warnings: 0

MariaDB [university]> select * from instructor;
+-------+------------+------------+-----------+
| ID    | name       | dept_name  | salary    |
+-------+------------+------------+-----------+
| 10101 | Srinivasan | Comp. Sci. |  71500.00 |
| 12121 | Wu         | Finance    |  99000.00 |
| 15151 | Mozart     | Music      |  44000.00 |
| 22222 | Einstein   | Physics    | 104500.00 |
| 32343 | El Said    | History    |  66000.00 |
| 33456 | Gold       | Physics    |  95700.00 |
| 45565 | Katz       | Comp. Sci. |  82500.00 |
| 58583 | Califieri  | History    |  68200.00 |
| 76543 | Singh      | Finance    |  88000.00 |
| 76766 | Crick      | Biology    |  79200.00 |
| 83821 | Brandt     | Comp. Sci. | 101200.00 |
| 98345 | Kim        | Elec. Eng. |  88000.00 |
+-------+------------+------------+-----------+
12 rows in set (0.000 sec)
```

View after the update of salaries in instructor table

```
MariaDB [university]> SELECT * FROM advisor_dept_budg;
+-------+------------+------------+-----------+
| ID    | name       | dept_name  | salary    |
+-------+------------+------------+-----------+
| 10101 | Srinivasan | Comp. Sci. |  71500.00 |
| 22222 | Einstein   | Physics    | 104500.00 |
| 45565 | Katz       | Comp. Sci. |  82500.00 |
| 76543 | Singh      | Finance    |  88000.00 |
+-------+------------+------------+-----------+
4 rows in set (0.001 sec)
```

The values in the view get changed after the table is modified. This is because view is just a virtual relation which resides as a query in the database. Whenever a view is invoked it returns the result of the query which is stored against the view. The results of the query will be dynamic, any change to the database will reflect in the results of the query.

5.

```
MariaDB [university]> SELECT instructor.ID AS instructor_ID,
    ->                      instructor.name AS instructor_name,
    ->                      teaches.course_id,
    ->                      teaches.sec_id,
    ->                      teaches.semester,
    ->                      section.building,
    ->                      section.room_number
    -> FROM teaches INNER JOIN instructor ON teaches.ID = instructor.ID
    ->              INNER JOIN section ON (teaches.course_id = section.course_id AND
    ->                                     teaches.sec_id = section.sec_id AND
    ->                                     teaches.semester = section.semester)
    -> WHERE teaches.year = 2009;
+--------------+-----------------+-----------+--------+----------+----------+-------------+
| instructor_ID | instructor_name | course_id | sec_id | semester | building | room_number |
+--------------+-----------------+-----------+--------+----------+----------+-------------+
| 10101        | Srinivasan      | CS-101    | 1      | Fall     | Packard  | 101         |
| 10101        | Srinivasan      | CS-347    | 1      | Fall     | Taylor   | 3128        |
| 22222        | Einstein        | PHY-101   | 1      | Fall     | Watson   | 100         |
| 76766        | Crick           | BIO-101   | 1      | Summer   | Painter  | 514         |
| 83821        | Brandt          | CS-190    | 1      | Spring   | Taylor   | 3128        |
| 83821        | Brandt          | CS-190    | 2      | Spring   | Taylor   | 3128        |
| 98345        | Kim             | EE-181    | 1      | Spring   | Taylor   | 3128        |
+--------------+-----------------+-----------+--------+----------+----------+-------------+
7 rows in set (0.001 sec)
```

6.

```
MariaDB [university]> SELECT S.ID, S.name, S.dept_name
    -> FROM student AS S LEFT JOIN takes AS T ON S.ID = T.ID
    -> WHERE T.course_id IS NULL;
+-------+------+------------+
| ID    | name | dept_name  |
+-------+------+------------+
| 70557 | Snow | Physics    |
+-------+------+------------+
1 row in set (0.000 sec)
```

7.

```
MariaDB [university]> SELECT student.ID AS student_id,
    ->                       student.name AS student_name,
    ->                       student.dept_name,
    ->                       takes.course_id
    -> FROM student INNER JOIN takes ON student.ID = takes.ID
    -> WHERE takes.year = 2009 AND takes.grade = 'A';
+------------+--------------+------------+-----------+
| student_id | student_name | dept_name  | course_id |
+------------+--------------+------------+-----------+
| 00128      | Zhang        | Comp. Sci. | CS-101    |
| 12345      | Shankar      | Comp. Sci. | CS-190    |
| 12345      | Shankar      | Comp. Sci. | CS-347    |
| 76543      | Brown        | Comp. Sci. | CS-101    |
| 98988      | Tanaka       | Biology    | BIO-101   |
+------------+--------------+------------+-----------+
5 rows in set (0.002 sec)
```

8.

```
MariaDB [university]> SELECT DISTINCT(instructor.ID) AS instructor_id,
    ->                       instructor.name AS instructor_name
    -> FROM instructor INNER JOIn teaches ON instructor.ID = teaches.ID
    -> WHERE instructor.ID IN (SELECT teaches.ID
    ->                         FROM teaches
    ->                         GROUP BY teaches.ID
    ->                         HAVING COUNT(teaches.course_id) >= 2);
+---------------+-----------------+
| instructor_id | instructor_name |
+---------------+-----------------+
| 10101         | Srinivasan      |
| 45565         | Katz            |
| 76766         | Crick           |
| 83821         | Brandt          |
+---------------+-----------------+
4 rows in set (0.001 sec)
```

9.

```
MariaDB [university]> SELECT instructor.ID AS instructor_id,
    ->                        instructor.name AS instructor_name
    -> FROM instructor LEFT JOIN teaches ON instructor.ID = teaches.ID
    -> WHERE teaches.ID NOT IN (SELECT teaches.ID FROM teaches WHERE teaches.year = 2010)
    ->    OR teaches.ID IS NULL;
+---------------+-----------------+
| instructor_id | instructor_name |
+---------------+-----------------+
| 22222         | Einstein        |
| 33456         | Gold            |
| 58583         | Califieri       |
| 76543         | Singh           |
| 98345         | Kim             |
+---------------+-----------------+
5 rows in set (0.002 sec)
```

10.

```
MariaDB [university]> WITH department_greater_than_1(building) AS (SELECT building
    ->                                                              FROM department
    ->                                                              GROUP BY building
    ->                                                              HAVING COUNT(dept_name)> 1)
    -> SELECT department.dept_name, department.building
    -> FROM department INNER JOIN department_greater_than_1 ON
    ->   department.building = department_greater_than_1.building;
+------------+----------+
| dept_name  | building |
+------------+----------+
| Biology    | Watson   |
| Comp. Sci. | Taylor   |
| Elec. Eng. | Taylor   |
| Finance    | Painter  |
| History    | Painter  |
| Physics    | Watson   |
+------------+----------+
6 rows in set (0.001 sec)
```

11.

```
MariaDB [university]> SELECT student.name AS student_name,
    ->                        instructor.name AS advisor_name
    -> FROM advisor INNER JOIN student ON advisor.s_ID = student.ID
    ->              INNER JOIN instructor ON advisor.i_ID = instructor.ID
    -> WHERE student.ID IN (SELECT takes.ID FROM takes WHERE takes.year = 2010) AND
    ->       instructor.ID IN (SELECT teaches.ID FROM teaches WHERE teaches.year = 2010);
+--------------+--------------+
| student_name | advisor_name |
+--------------+--------------+
| Shankar      | Srinivasan   |
| Brown        | Katz         |
| Tanaka       | Crick        |
+--------------+--------------+
3 rows in set (0.006 sec)
```