Assignment10

A. Do following tasks using University Database

a. Check if the event scheduler is ON. If not on, then set it ON.

```
MariaDB [university]> SHOW VARIABLES WHERE VARIABLE_NAME = 'event_scheduler';
+-----------------+-------+
| Variable_name   | Value |
+-----------------+-------+
| event_scheduler | OFF   |
+-----------------+-------+
1 row in set (0.010 sec)

MariaDB [university]>
```

```
MariaDB [university]> SET GLOBAL event_scheduler=ON;
Query OK, 0 rows affected (0.005 sec)

MariaDB [university]> SHOW VARIABLES WHERE VARIABLE_NAME = 'event_scheduler';
+-----------------+-------+
| Variable_name   | Value |
+-----------------+-------+
| event_scheduler | ON    |
+-----------------+-------+
1 row in set (0.002 sec)
```

Justification: Events can be used to do some activity in the schema based on time information. To create events in mariadb, the event scheduler should be turned on.

b. Create an event to increment the budget of all departments by 5% after 1 minute.

```
MariaDB [university]> CREATE EVENT incr_budg
    ->                ON SCHEDULE AT CURRENT_TIMESTAMP + INTERVAL 1 MINUTE
    ->                DO
    ->                    UPDATE department SET budget = 1.05 * budget;
Query OK, 0 rows affected (0.017 sec)
```

Justification: Events can be scheduled at a particular time. Using time helper functions. The above event will take place exactly after one minute form the time of execution.

c. Show the details of the events in an easy to read format.

```
MariaDB [university]> SHOW EVENTS\G
*************************** 1. row ***************************
                  Db: university
                Name: incr_budg
             Definer: root@localhost
           Time zone: SYSTEM
                Type: ONE TIME
          Execute at: 2021-05-01 19:21:37
      Interval value: NULL
      Interval field: NULL
              Starts: NULL
                Ends: NULL
              Status: ENABLED
          Originator: 1
character_set_client: utf8
collation_connection: utf8_general_ci
  Database Collation: utf8mb4_general_ci
1 row in set (0.005 sec)
```

Justification: To show the details of events in easy to read format there is inbuilt command in mariadb.

d. Modify the above event so that it will increment the budget of all departments by 100 in every minute for the next 5 minutes.

```
MariaDB [university]> ALTER EVENT incr_budg
    ->                ON SCHEDULE
    ->                    EVERY 1 MINUTE
    ->                    STARTS CURRENT_TIMESTAMP
    ->                    ENDS CURRENT_TIMESTAMP + INTERVAL 5 MINUTE
    ->                DO
    ->                    UPDATE department SET budget = budget + 100;
Query OK, 0 rows affected (0.015 sec)

MariaDB [university]> SHOW EVENTS\G
*************************** 1. row ***************************
                  Db: university
                Name: incr_budg
             Definer: root@localhost
           Time zone: SYSTEM
                Type: RECURRING
          Execute at: NULL
      Interval value: 1
      Interval field: MINUTE
              Starts: 2021-05-01 19:21:24
                Ends: 2021-05-01 19:26:24
              Status: ENABLED
          Originator: 1
character_set_client: utf8
collation_connection: utf8_general_ci
  Database Collation: utf8mb4_general_ci
1 row in set (0.006 sec)
```

Final state of department table after the event

```
MariaDB [university]> select * from department;
+------------+----------+-----------+
| dept_name  | building | budget    |
+------------+----------+-----------+
| Biology    | Watson   |  90600.00 |
| Comp. Sci. | Taylor   | 100600.00 |
| Elec. Eng. | Taylor   |  85600.00 |
| Finance    | Painter  | 120600.00 |
| History    | Painter  |  50600.00 |
| Music      | Packard  |  80600.00 |
| Physics    | Watson   |  70600.00 |
+------------+----------+-----------+
7 rows in set (0.001 sec)
```

Justification: To alter an event, ALTER EVENT command can be used. To alter the event created in A.b, the alteration should be done within 1 minute, because the event in A.b lasted only 1 minute. The altered event runs for 5 min, updating the department table each minute starting from the time of execution. That is why the final value of the budgets after 5 min is 600 more than original.

B. Do Following Tasks

a. Set profiling ON

```
MariaDB [university]> SELECT @profiling;
+------------+
| @profiling |
+------------+
| NULL       |
+------------+
1 row in set (0.000 sec)

MariaDB [university]> SHOW PROFILES;
Empty set (0.000 sec)

MariaDB [university]> SET profiling = ON;
Query OK, 0 rows affected (0.000 sec)

MariaDB [university]> SHOW PROFILES;
Empty set (0.000 sec)

MariaDB [university]> SELECT @profiling;
+------------+
| @profiling |
+------------+
| NULL       |
+------------+
1 row in set (0.001 sec)

MariaDB [university]> SHOW PROFILES;
+----------+------------+-------------------+
| Query_ID | Duration   | Query             |
+----------+------------+-------------------+
|        1 | 0.00020300 | SELECT @profiling |
+----------+------------+-------------------+
1 row in set (0.001 sec)
```

Justification: Profiling keeps track of all the queries executed from the time profiling is turned on.

b. Show list of processes running in your DB.

```
MariaDB [university]> SHOW PROCESSLIST;
+----+-----------------+-----------+------------+---------+------+------------------------+------------------+----------+
| Id | User            | Host      | db         | Command | Time | State                  | Info             | Progress |
+----+-----------------+-----------+------------+---------+------+------------------------+------------------+----------+
|  5 | event_scheduler | localhost | NULL       | Daemon  | 1746 | Waiting on empty queue | NULL             |    0.000 |
| 12 | root            | localhost | university | Query   |    0 | starting               | SHOW PROCESSLIST |    0.000 |
+----+-----------------+-----------+------------+---------+------+------------------------+------------------+----------+
2 rows in set (0.002 sec)
```

Justification: SHOW PROCESSLIST command shows the list of running processes in DB.

c. Import database from “largeRelationsInsertFile.sql” and execute following queries and point out the bottlenecks (most costly task in terms of space and time).

i. select all departments having budgets greater than 50000.

```
MariaDB [university]> select dept_name, budget from department WHERE budget>50000;
+-------------+-----------+
| dept_name   | budget    |
+-------------+-----------+
| Accounting  | 441840.92 |
| Astronomy   | 617253.94 |
| Athletics   | 734550.70 |
| Biology     | 647610.55 |
| Civil Eng.  | 255041.46 |
| Comp. Sci.  | 106378.69 |
| Cybernetics | 794541.46 |
| Elec. Eng.  | 276527.61 |
| English     | 611042.66 |
| Finance     | 866831.75 |
| Geology     | 406557.93 |
| History     | 699140.86 |
| Languages   | 601283.60 |
| Marketing   | 210627.58 |
| Math        | 777605.11 |
| Mech. Eng.  | 520350.65 |
| Physics     | 942162.76 |
| Pol. Sci.   | 573745.09 |
| Psychology  | 848175.04 |
| Statistics  | 395051.74 |
+-------------+-----------+
20 rows in set (0.001 sec)
```

ii. fetch details of students from the student table whose name is ‘wood’.

```
MariaDB [university]> select * from student where name='wood';
+-------+------+------------+----------+
| ID    | name | dept_name  | tot_cred |
+-------+------+------------+----------+
| 33791 | Wood | Civil Eng. |       92 |
| 39876 | Wood | Accounting |       14 |
| 62054 | Wood | Mech. Eng. |       13 |
| 96085 | Wood | Accounting |       70 |
+-------+------+------------+----------+
4 rows in set (0.002 sec)
```

```
MariaDB [university]> SHOW PROFILES;
+----------+------------+-----------------------------------------------------------------+
| Query_ID | Duration   | Query                                                           |
+----------+------------+-----------------------------------------------------------------+
|        1 | 0.00067400 | select dept_name, budget from department WHERE budget>50000 |
|        2 | 0.00326700 | select * from student where name LIKE 'wood'                    |
+----------+------------+-----------------------------------------------------------------+
2 rows in set (0.000 sec)
```

Justification: After loading the largeRelationsInsertFile into the university schema, all the data is replaced by very large rows of values. The execution times of the queries that are made on the new university schema are given above.

Bottlenecks: In the first query, projection is followed by selection operation will take significantly lot time compared to selection followed by projection

In the second query, as there are many number of rows in the table, here also projection followed by selection operation will take huge time compared to selection followed by projection

C. Create a trigger that will not allow you to enter any record into the takes table with a grade that is not used before in any record in the takes table.

```
MariaDB [university]> DELIMITER //
MariaDB [university]> CREATE TRIGGER grade_inhibit
    ->                BEFORE INSERT ON takes FOR EACH ROW
    ->                BEGIN
    ->                  IF NEW.grade NOT IN (SELECT grade FROM takes WHERE grade IS NOT NULL) THEN
    ->                    SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Invalid value in grade field';
    ->                  END IF;
    ->                END //
Query OK, 0 rows affected (0.034 sec)

MariaDB [university]> INSERT INTO takes VALUES ('00000', 'CS-101', 1, 'Fall', 2021, 'Z')//
ERROR 1644 (45000): Invalid value in grade field
MariaDB [university]>
```

Justification: Triggers are decision based action events. They execute according to some conditions. Here the condition of execution is before inserting into the takes table. If any value is tried to enter in the table, then the event will be executed before the insertion. The trigger then decides to raise an error or proceed with the insertion based on the value of grade which is entered.