CS 432 - DATABASES

ASSIGNMENT -2

TEAM: DB11

HOSTEL MANAGEMENT

Assumptions :

- email_id length: varchar(320), the maximum email address length possible is 320 characters only.
- RESIDENT_ID: numeric(8), assuming resident_id is of length 8.
- all FIRST_NAME: varchar(15), the maximum length of first_name, middle_name, and last_name each are restricted to a maximum length of 15 characters.
- city_name: varchar(85), the maximum length of the name of a city can be of length 85 characters.
- payment_amount in the ALLOCATION table is of type int.
- Phone number data type is 10 digit numeric.

Responsibility of G1:

1. Populate the tables that you created in the previous assignment with random data with the following constraints. All tables must follow the ACID properties and the previous constraints mentioned in Assignment 1.

Populating the tables with random data by following the ACID properties and all the defined constraints(eg. Foreign key constraint).

ACID - Atomicity, Consistency, Isolation, Durability.

- Atomicity: Each transaction must be an indivisible unit of work. That is, everything happens or nothing happens. For example, if we are performing any transaction that involves multiple steps then if in between anything fails then the transaction rollbacks.

- Consistency: The database should remain valid even after the transaction.

- Isolation: Each transaction should happen independently. For example, if we are updating any tuple in a table then any other transaction should not access the same tuples.

- Durability: After a transaction is completed, the changes it made should be permanent. That is, the changes should be saved in disk so that the data could survive any failures such as crashes, etc,.

We took care to ensure that our tables follow ACID properties.
The queries to generate random data are written in population.sql and TableCreationSQL.sql.

Populating CARETAKER:

```
1 •  SELECT * FROM hostelmng.caretaker;
```

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

caretaker_id	first_name	middle_name	last_name	gender	office_no	email_id
10000001	caretakerfname1	caretakermname1	caretakerlname1	M	a181	caretakeremail1@iitgn.ac.in
10000002	caretakerfname2	caretakermname2	caretakerlname2	F	b199	caretakeremail2@iitgn.ac.in
10000003	caretakerfname3	caretakermname3	caretakerlname3	M	c160	caretakeremail3@iitgn.ac.in
10000004	caretakerfname4	caretakermname4	caretakerlname4	M	d146	caretakeremail4@iitgn.ac.in
10000005	caretakerfname5	caretakermname5	caretakerlname5	M	e135	caretakeremail5@iitgn.ac.in
10000006	caretakerfname6	caretakermname6	caretakerlname6	M	f157	caretakeremail6@iitgn.ac.in
10000007	caretakerfname7	caretakermname7	caretakerlname7	F	g175	caretakeremail7@iitgn.ac.in

Populating HOSTEL:

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

hostel_name	contact	total_rooms	total_students	energy_consumption	water_consumption	caretaker_id
a	1000000000	301	494	146.13	85.51	10000001
b	1000000001	301	499	689.18	478.47	10000002
c	1000000002	301	466	188.67	968.91	10000003
d	1000000003	301	463	486.02	594.43	10000004
e	1000000004	301	475	787.11	393.33	10000005
f	1000000005	301	480	846.66	417.28	10000006
g	1000000006	301	477	480.42	762.72	10000007
h	1000000007	301	468	573.64	751.12	10000001
i	1000000008	301	451	919.97	495.85	10000002
j	1000000009	301	485	109.14	387.71	10000003
k	1000000010	301	480	892.41	628.75	10000004
l	1000000011	301	473	446.28	831.87	10000005

Populating CARETAKER_PHONE:

Result Grid | Filter Rows: | Edit: | Expo

phone_no	caretaker_id
7000000007	10000002
7000000008	10000003
7000000009	10000003
7000000010	10000003
7000000011	10000004
7000000012	10000005
7000000013	10000005
7000000014	10000005
7000000015	10000006
7000000016	10000006
7000000017	10000007
7000000018	10000007

populating GUARD:

```
1 •    SELECT * FROM hostelmng.guard;
```

Result Grid | Filter Rows: | Edit: | Expor

security_id	first_name	middle_name	last_name
80000001	guardFName1	guardMName1	guardLName1
80000002	guardFName2	guardMName2	guardLName2
80000003	guardFName3	guardMName3	guardLName3
80000004	guardFName4	guardMName4	guardLName4
80000005	guardFName5	guardMName5	guardLName5
80000006	guardFName6	guardMName6	guardLName6
80000007	guardFName7	guardMName7	guardLName7
80000008	guardFName8	guardMName8	guardLName8
80000009	guardFName9	guardMName9	guardLName9
80000010	guardFName10	guardMNam...	guardLName10

populating GUARD_PHONE:

Result Grid | Filter Rows: | Edit: | Exp

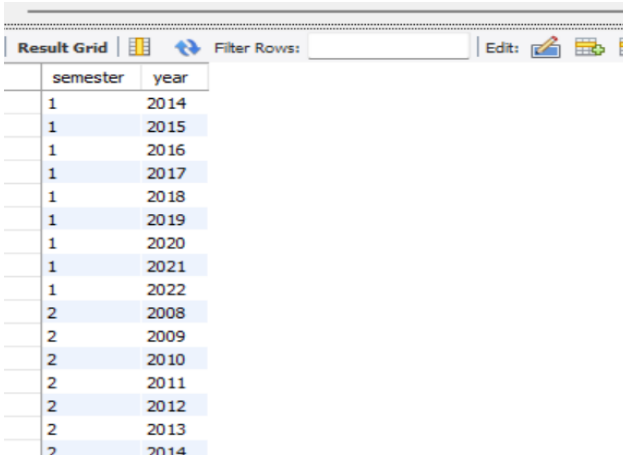
phone_no	security_id
7000000007	80000003
7000000008	80000004
7000000009	80000005
7000000010	80000005
7000000011	80000005
7000000012	80000006
7000000013	80000006
7000000014	80000007
7000000015	80000007
7000000016	80000008
7000000017	80000008
7000000018	80000009
7000000019	80000009
7000000020	80000009
7000000021	80000010

populating RESIDENT:

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

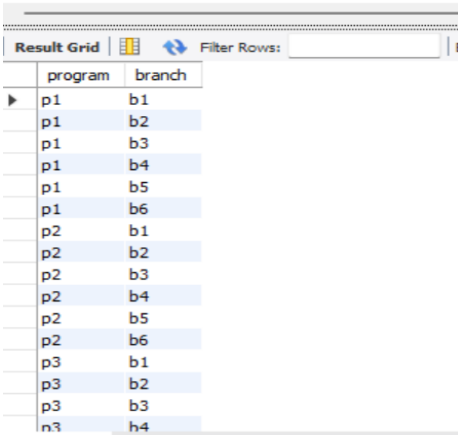
resident_id	first_name	middle_name	last_name	gender	blood_group	email_id	city	postal_code	home_contact	resident_type	on_campus
20000000	residentfn1	residentmn1	residentln1	M	b-	residentemail1@iitgn.ac.in	city1	100000	5000000000	faculty	1
20000001	residentfn2	residentmn2	residentln2	M	o+	residentemail2@iitgn.ac.in	city2	100001	5000000001	visitor	1
20000002	residentfn3	residentmn3	residentln3	F	a+	residentemail3@iitgn.ac.in	city3	100002	5000000002	faculty	1
20000003	residentfn4	residentmn4	residentln4	F	b+	residentemail4@iitgn.ac.in	city4	100003	5000000003	student	0
20000004	residentfn5	residentmn5	residentln5	F	o+	residentemail5@iitgn.ac.in	city5	100004	5000000004	visitor	0
20000005	residentfn6	residentmn6	residentln6	M	b+	residentemail6@iitgn.ac.in	city6	100005	5000000005	visitor	1
20000006	residentfn7	residentmn7	residentln7	M	o+	residentemail7@iitgn.ac.in	city7	100006	5000000006	visitor	0
20000007	residentfn8	residentmn8	residentln8	F	b-	residentemail8@iitgn.ac.in	city8	100007	5000000007	visitor	0
20000008	residentfn9	residentmn9	residentln9	F	b+	residentemail9@iitgn.ac.in	city9	100008	5000000008	faculty	1
20000009	residentfn10	residentmn10	residentln10	F	b+	residentemail10@iitgn.ac.in	city10	100009	5000000009	student	0
20000010	residentfn11	residentmn11	residentln11	F	o+	residentemail11@iitgn.ac.in	city11	100010	5000000010	faculty	1
20000011	residentfn12	residentmn12	residentln12	F	a+	residentemail12@iitgn.ac.in	city12	100011	5000000011	faculty	1
20000012	residentfn13	residentmn13	residentln13	F	b+	residentemail13@iitgn.ac.in	city13	100012	5000000012	student	0
20000013	residentfn14	residentmn14	residentln14	M	o-	residentemail14@iitgn.ac.in	city14	100013	5000000013	faculty	0

populating ACADEMIC_PERIOD:



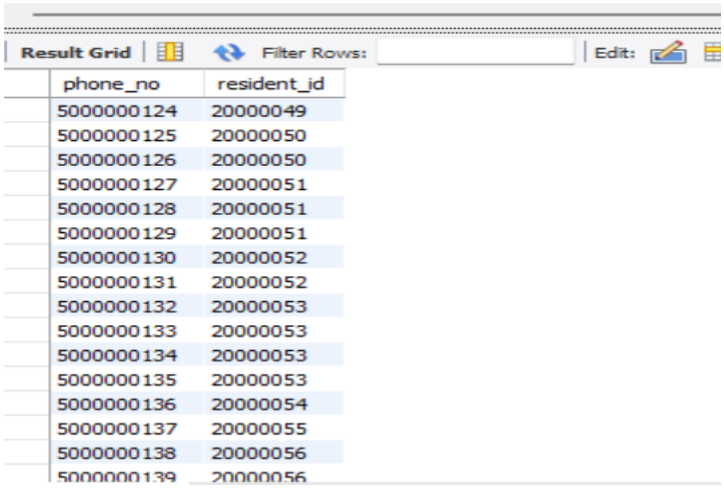
semester	year
1	2014
1	2015
1	2016
1	2017
1	2018
1	2019
1	2020
1	2021
1	2022
2	2008
2	2009
2	2010
2	2011
2	2012
2	2013
2	2014

populating DEGREE:



program	branch
p1	b1
p1	b2
p1	b3
p1	b4
p1	b5
p1	b6
p2	b1
p2	b2
p2	b3
p2	b4
p2	b5
p2	b6
p3	b1
p3	b2
p3	b3
p3	b4

populating RESIDENT_PHONE:



phone_no	resident_id
5000000124	20000049
5000000125	20000050
5000000126	20000050
5000000127	20000051
5000000128	20000051
5000000129	20000051
5000000130	20000052
5000000131	20000052
5000000132	20000053
5000000133	20000053
5000000134	20000053
5000000135	20000053
5000000136	20000054
5000000137	20000055
5000000138	20000056
5000000139	20000056

populating OUTLET:

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

outlet_name	open_time	close_time	contact	owner_first_name	owner_middle_name	owner_last_name	hostel_name
outlet1	12:00:00	01:00:00	4000000000	ownerfname1	ownermname1	ownerlname1	e
outlet2	12:00:00	02:00:00	4000000001	ownerfname2	ownermname2	ownerlname2	e
outlet3	05:00:00	01:00:00	4000000002	ownerfname3	ownermname3	ownerlname3	a
outlet4	10:00:00	00:00:00	4000000003	ownerfname4	ownermname4	ownerlname4	a
outlet5	09:00:00	01:00:00	4000000004	ownerfname5	ownermname5	ownerlname5	h
outlet6	06:00:00	00:00:00	4000000005	ownerfname6	ownermname6	ownerlname6	h

populating OUTLET_PHONE:

Result Grid | Filter Rows: | Edit:

phone_no	outlet_name
4100000002	outlet1
4100000003	outlet2
4100000004	outlet2
4100000005	outlet3
4100000006	outlet3
4100000007	outlet4
4100000008	outlet4
4100000009	outlet5
4100000010	outlet5
4100000011	outlet6
4100000012	outlet6

populating OUTLET_OWNER_PHONE:

Result Grid | Filter Rows: | Edit:

phone_no	outlet_name
4200000003	outlet2
4200000004	outlet2
4200000005	outlet3
4200000006	outlet3
4200000007	outlet4
4200000008	outlet4
4200000009	outlet5
4200000010	outlet5
4200000011	outlet6
4200000012	outlet6

populating ROOM:

Result Grid | Filter Rows: | Edit:

room_no	hostel_name	room_type	occupied
100	j	bathroom	0
100	k	bathroom	0
101	a	triple	0
101	b	triple	0
101	c	triple	0
101	d	triple	0
101	e	triple	0
101	f	triple	0
101	g	triple	0
101	h	triple	0
101	i	triple	0
101	j	triple	1
101	k	triple	0
102	a	single	0

populating ALLOCATION:

```
1 •  SELECT * FROM hostelmng.allocation;
```

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content: | Fetch rows:

semester	year	resident_id	room_no	hostel_name	entry_date	exit_date	payment_status	due_amount	due_status	payment_amount
2	2021	20000274	386	a	2021-01-02	2021-04-30	5000	0	0	5000
2	2021	20000285	397	j	2021-01-02	2021-04-30	5000	0	0	5000
2	2021	20000289	402	j	2021-01-02	2021-04-30	5000	0	0	5000
2	2021	20000290	403	a	2021-01-02	2021-04-30	5000	0	0	5000
2	2021	20000294	407	j	2021-01-02	2021-04-30	5000	0	0	5000
3	2020	20000003	104	a	2020-09-01	2020-11-30	5000	0	0	5000
3	2020	20000016	117	a	2020-09-01	2020-11-30	5000	0	0	5000
3	2020	20000017	118	a	2020-09-01	2020-11-30	5000	0	0	5000
3	2020	20000018	119	j	2020-09-01	2020-11-30	5000	0	0	5000
3	2020	20000019	120	j	2020-09-01	2020-11-30	5000	0	0	5000
3	2020	20000022	123	j	2020-09-01	2020-11-30	5000	0	0	5000
3	2020	20000024	126	a	2020-09-01	2020-11-30	5000	0	0	5000
3	2020	20000031	133	j	2020-09-01	2020-11-30	5000	0	0	5000
3	2020	20000032	134	a	2020-09-01	2020-11-30	5000	0	0	5000
3	2020	20000037	139	j	2020-09-01	2020-11-30	5000	0	0	5000

populating SECURITY:

```
1 •   SELECT * FROM hostelmng.security;
```

Result Grid | Filter Rows: | Edit:

security_id	hostel_name	start_time	end_time
80000002	j	05:00:00	19:00:00
80000003	e	16:00:00	07:00:00
80000003	h	16:00:00	07:00:00
80000004	a	04:00:00	21:00:00
80000004	l	04:00:00	21:00:00
80000005	b	05:00:00	18:00:00
80000005	f	05:00:00	18:00:00
80000006	d	03:00:00	17:00:00
80000006	e	03:00:00	17:00:00
80000007	g	12:00:00	02:00:00
80000007	l	12:00:00	02:00:00
80000008	g	17:00:00	00:00:00
80000008	k	17:00:00	00:00:00
80000009	f	17:00:00	05:00:00
80000009	l	17:00:00	05:00:00
80000010	e	23:00:00	01:00:00

populating FURNITURE:

```
1 •   SELECT * FROM hostelmng.furniture;
```

Result Grid | Filter Rows: | Edit:

furniture_id	status	room_no	hostel_name
furniture102b	1	102	b
furniture102c	1	102	c
furniture102d	1	102	d
furniture102e	1	102	e
furniture102f	1	102	f
furniture102g	1	102	g
furniture102h	1	102	h
furniture102i	1	102	i
furniture102j	1	102	j
furniture102k	1	102	k
furniture103a	1	103	a
furniture103b	1	103	b
furniture103c	1	103	c
furniture103d	1	103	d
furniture103e	1	103	e

Populating ENROLLED_IN:

```
1 •    SELECT * FROM hostelmng.enrolled_in;
```

Result Grid | Filter Rows: | Edit:

resident_id	program	branch
20000015	p1	b1
20000060	p1	b1
20000075	p1	b1
20000090	p1	b1
20000120	p1	b1
20000180	p1	b1
20000240	p1	b1
20000051	p1	b2
20000081	p1	b2
20000096	p1	b2
20000126	p1	b2
20000246	p1	b2
20000291	p1	b2
20000012	p1	b3
20000027	p1	b3

2. Please explain and implement the indexing over one of the columns (where the search needs to be optimized), user-defined data types, and table extensions.

In general, we chose the search key on the following basis:

1. Uniqueness: A search key should be unique for each record in the table so that it can be used to uniquely identify and retrieve a specific record.

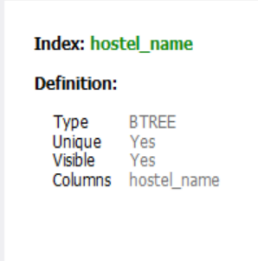
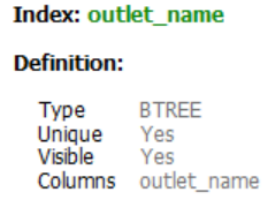
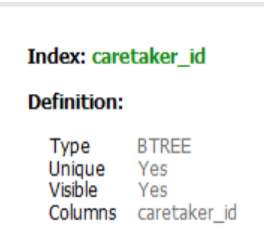
2. Stability: A search key should be stable over time and not frequently change to be used consistently to locate a record.

3. Minimality: A search key should be as small as possible to reduce storage requirements and search time.

4. Accessibility: A search key should be easily accessible and efficiently searchable to retrieve records quickly.

5. Relevance: To optimize performance, a search key should be relevant to the queries and operations commonly performed on the table.

NOTE: Wherever we are using the primary key as the search key, the reason is **Efficiency:** Since the primary key is typically indexed automatically by the database management system, searches using the primary key as the search key can be performed efficiently and quickly, without requiring a full table scan.

Sr no	Schema name	Search Key (Indexing)	Reason	SQL Implementation
1.	Hostel	hostel_name	Since a hostel is uniquely identified by and mostly used by its name, selecting hostel_name would be the most suitable choice.	
2.	Outlet	outlet_name	Since an outlet is most commonly called by its name.	
3.	Caretaker	caretaker_id	The caretaker_id attribute satisfies the properties of a good search key, as it is unique for each record in the table, stable, minimal, accessible, and relevant to the queries that are commonly performed on the table.	

4.	Room	room_no	For easy accessibility, more frequently addressed and is unique to a particular room.	**Index:** room_no **Definition:** Type BTREE Unique No Visible Yes Columns room_no
5.	degree	program	Since the program(ex: Btech) covers a wide range of data(students) involved rather than a specific degree (ex, CSE).	**Index:** program **Definition:** Type BTREE Unique No Visible Yes Columns program
6.	furniture	hostel_name	We would be checking furniture hostel-wise. It would be convenient to use it.	**Index:** hostel_name **Definition:** Type BTREE Unique No Visible Yes Columns hostel_name room_no
7.	Allocation	room_no	Since the room allocation would be done based on the room no, all associated information(like allocated to whom) can be accessed by knowing the room_no.	**Index:** room_no **Definition:** Type BTREE Unique No Visible Yes Columns room_no
8.	academic_period	year	A acad period can be accessed by the year since a year contains only 2 semesters, but semesters would repeat each and every year.	**Index:** year **Definition:** Type BTREE Unique No Visible Yes Columns year

9.	resident	resident_id	As there are more residents, we use mostly resident_id's rather than names to recognize them easily based on the need.	**Index: resident_id** **Definition:** Type BTREE Unique Yes Visible Yes Columns resident_id
10.	resident_phone	resident_id	In the database, we go to the resident's phone through his resident_id.	**Index: resident_id** **Definition:** Type BTREE Unique No Visible Yes Columns resident_id
11.	guard	security_id	We recognize a guard with his security_id.	**Index: security_id** **Definition:** Type BTREE Unique Yes Visible Yes Columns security_id
12.	caretaker_phone	caretaker_id	In a database, we go through the resident's phone through caretaker_ id.	**Index: caretaker_id** **Definition:** Type BTREE Unique No Visible Yes Columns caretaker_id
13.	security	hostel_name	If we query the data primarily based on the guards assigned to each hostel, then the hostel_name attribute is a more preferred search key.	**Index: hostel_name** **Definition:** Type BTREE Unique No Visible Yes Columns hostel_name
14.	enrolled_in	program	We'll search for the program and then look up who is enrolled in a particular program.	**Index: program** **Definition:** Type BTREE Unique No Visible Yes Columns program branch

15.	guard_phone	security_id	In the database, we go through the guard's phone through his security_id.	**Index: security_id** **Definition:** Type BTREE Unique No Visible Yes Columns security_id
16.	outlet_owner_phone	outlet_name	In the database, we go through the outlet's owner's phone through the outlet_name.	**Index: outlet_name** **Definition:** Type BTREE Unique No Visible Yes Columns outlet_name
17.	outlet_phone	outlet_name	In the database, we go through the outlet's phone through oulet_name.	**Index: outlet_name** **Definition:** Type BTREE Unique No Visible Yes Columns outlet_name

User Defined Datatypes:

MySQL does not support creating type statements to execute user defined datatype queries, but we use JSON to implement user defined data types.

We define user defined datatypes on email_id's.

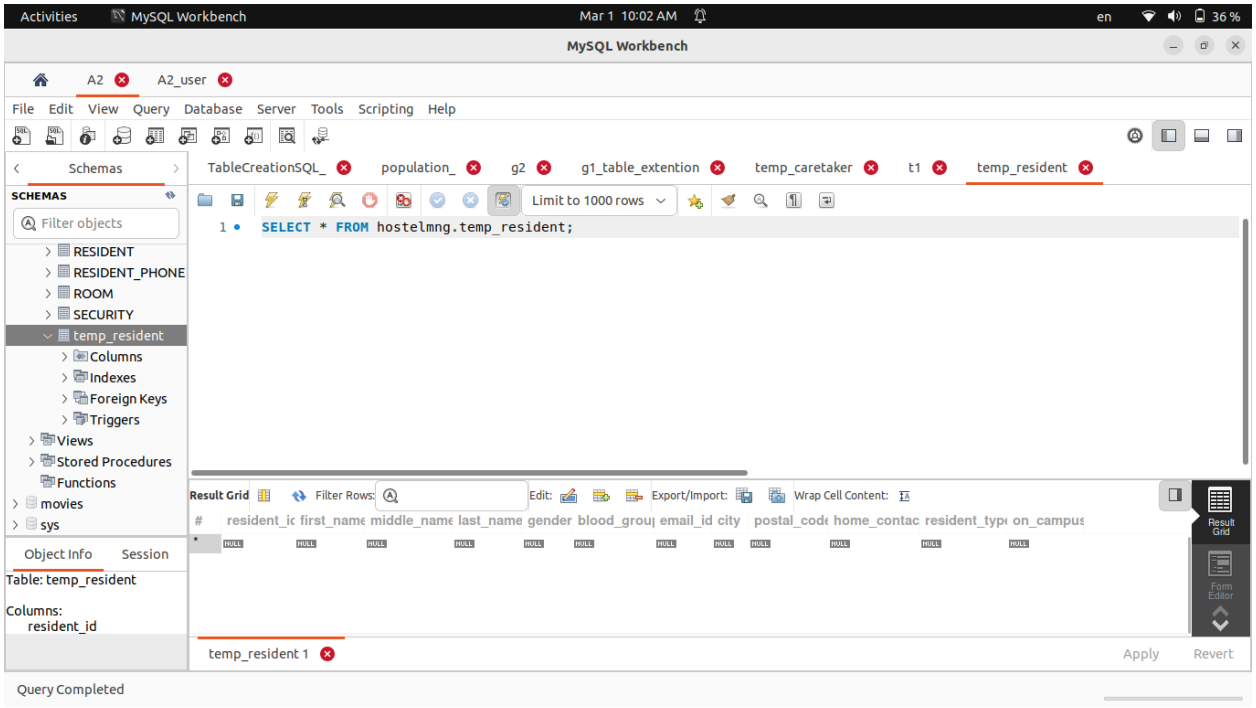
```
WHILE (counter <= 300) DO -- change 10 to the desired number of tuples to insertw

    SET resident_id = resident_id ; -- generates random hostel name
    SET first_name = concat("residentfn" , CAST(counter as char)) ;
    SET middle_name = concat("residentmn" , CAST(counter as char)) ;
    SET last_name = concat("residentln" , CAST(counter as char)) ;
    SET gender = CASE WHEN ROUND(RAND()*10,0) % 2 =0 THEN 'M' ELSE 'F' END;
    SET blood_group = concat(elt(floor(1 + rand() * 3), "o", "a", "b"), elt(floor(1 + rand() * 2), "+", "-"));
    SET email_id = JSON_OBJECT("name", concat("residentemail", cast(counter as CHAR)), "domain", "@iitgn.ac.in");
    SET city = concat("city", CAST(counter as char)) ;
    SET postal_code = postal_code ;
    SET home_contact = home_contact ;
```

```sql
create table RESIDENT(
    resident_id numeric(8) PRIMARY KEY NOT NULL UNIQUE,
    first_name varchar(15) NOT NULL,
    middle_name varchar(15),
    last_name varchar(15) NOT NULL,
    gender char(1) NOT NULL,
    blood_group char(3) NOT NULL,
    email_id JSON NOT NULL UNIQUE,
    city varchar(85) NOT NULL,
    postal_code numeric(6, 0) NOT NULL,
    home_contact numeric(10, 0) NOT NULL UNIQUE,
    resident_type varchar(15) NOT NULL,
    on_campus bool NOT NULL
);
```

Table Extensions:

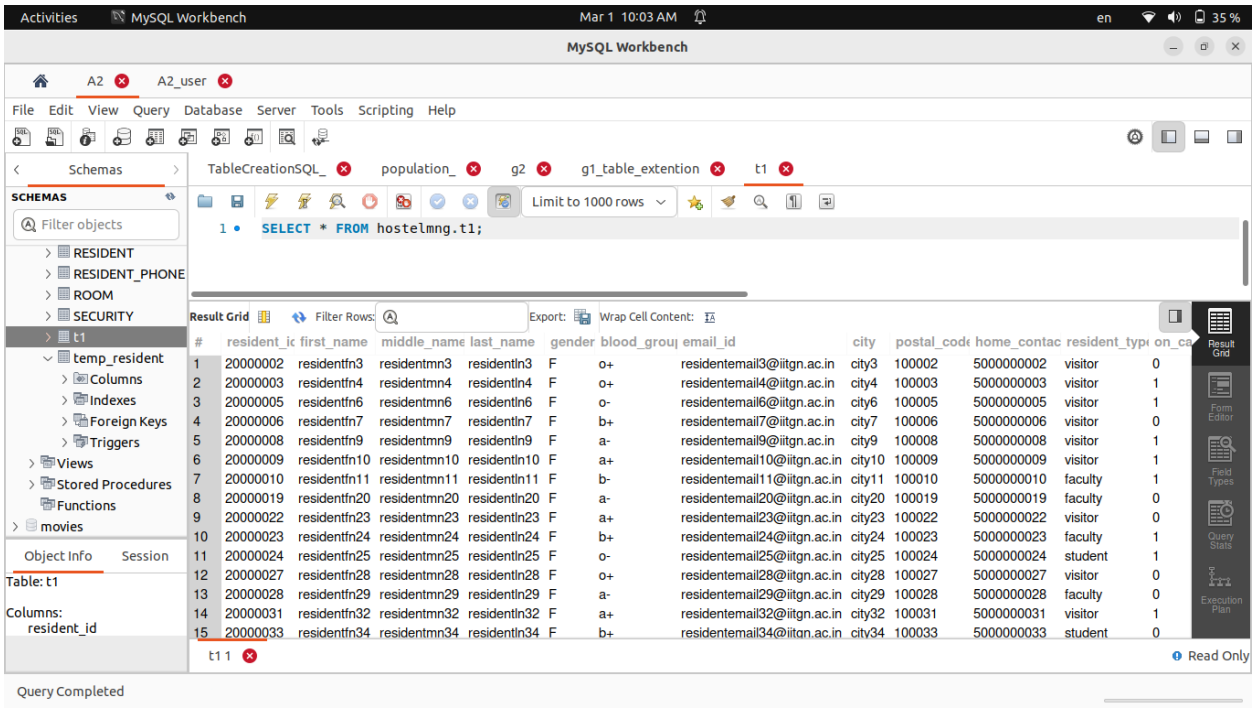
The query for creating table temp_resident which has the same schema as resident.

```sql
create table temp_resident like RESIDENT;
```



The query for creating and populating table t1 which has same schema as resident and gender female.

```
create table t1 as
( select * from RESIDENT where gender = 'F') ;
```



3.2 Responsibility of G2:

1. **Create a user named "user1" with the password "password1".**

   Created a user named “user1” with password Lunch@4u. According to the question we should set the password as “password1” but it is rejected by mySQL as it is trivial.

```
CREATE USER 'user1'@'localhost' IDENTIFIED BY 'Lunch@4u';
```

2. **Create Views on any of the two tables formed by G1 as view1 and view2. And make sure that views contain columns from at least two tables and one additional column with the user-defined data type.**

   View1:

   Creating view1 on the tables RESIDENT and ENROLLED_IN, the columns that we select from RESIDENT are resident_id, first_name, email_id, the columns that we select from ENROLLED_IN are program, branch. The additional column with user defined data type is resident email_id.

```
CREATE VIEW view1 AS
SELECT r.resident_id, r.first_name, r.email_id, ei.program, ei.branch
FROM RESIDENT as r
INNER JOIN ENROLLED_IN as ei
ON ei.resident_id = r.resident_id;
```

   View2:

   Creating view2 on the tables CARETAKER and HOSTEL, the columns that we select from CARETAKER are caretaker_id, first_name, email_id, the columns that we select from HOSTEL are hostel_name, contact. The additional column with user defined data type is caretaker email_id.

```
CREATE VIEW view2 AS
SELECT c.caretaker_id, c.first_name, c.email_id, h.hostel_name, h.contact
FROM CARETAKER as c
INNER JOIN HOSTEL as h
ON c.caretaker_id = h.caretaker_id;
```

3. **Grant "user1" the following permissions on "table1":**
   - **SELECT**
   - **UPDATE**
   - **DELETE**

   Granting user1 SELECT, UPDATE, DELETE permissions on table RESIDENT.

We use the RESIDENT table as “table1”.

```
# Q3 granting permissions on table
GRANT SELECT, UPDATE, DELETE ON RESIDENT TO "user1"@'localhost';
```

4. **Grant "user1" the following permissions on "view1":**
   - **SELECT**

   Granting user1 SELECT permission on view1.

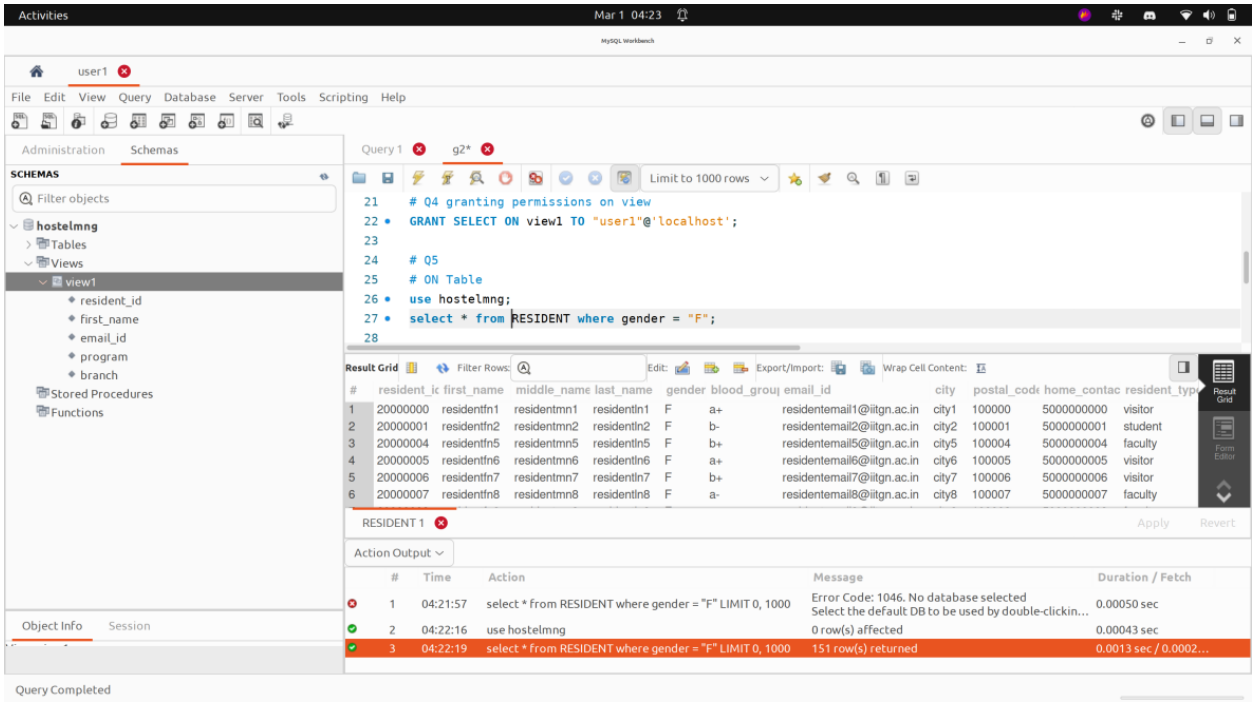
```
# Q4 granting permissions on view
GRANT SELECT ON view1 TO "user1"@'localhost';
```

5. **Try to perform SELECT, UPDATE, and DELETE operations on "table1" and "view1" as "user1" and report your findings.**

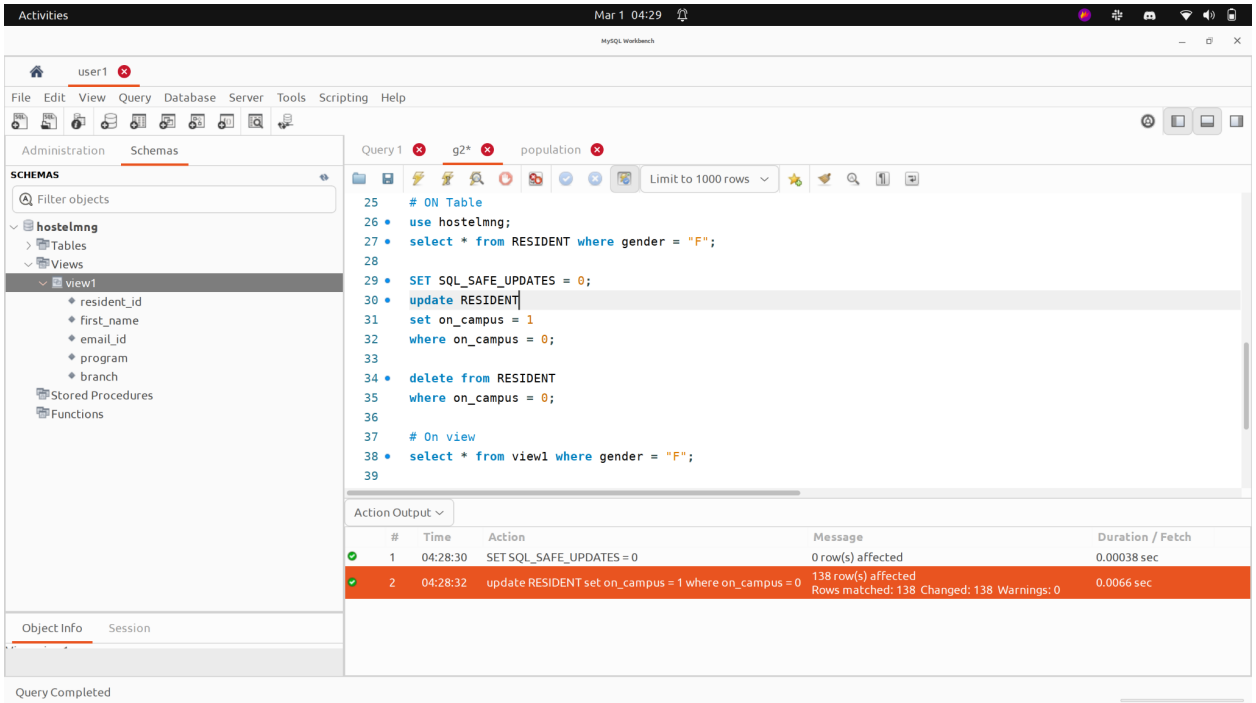
   <u>On RESIDENT(table1):</u>

   Since the user1 has been given permissions to SELECT, UPDATE, and DELETE on RESIDENT, when we execute the query, we should get no error.

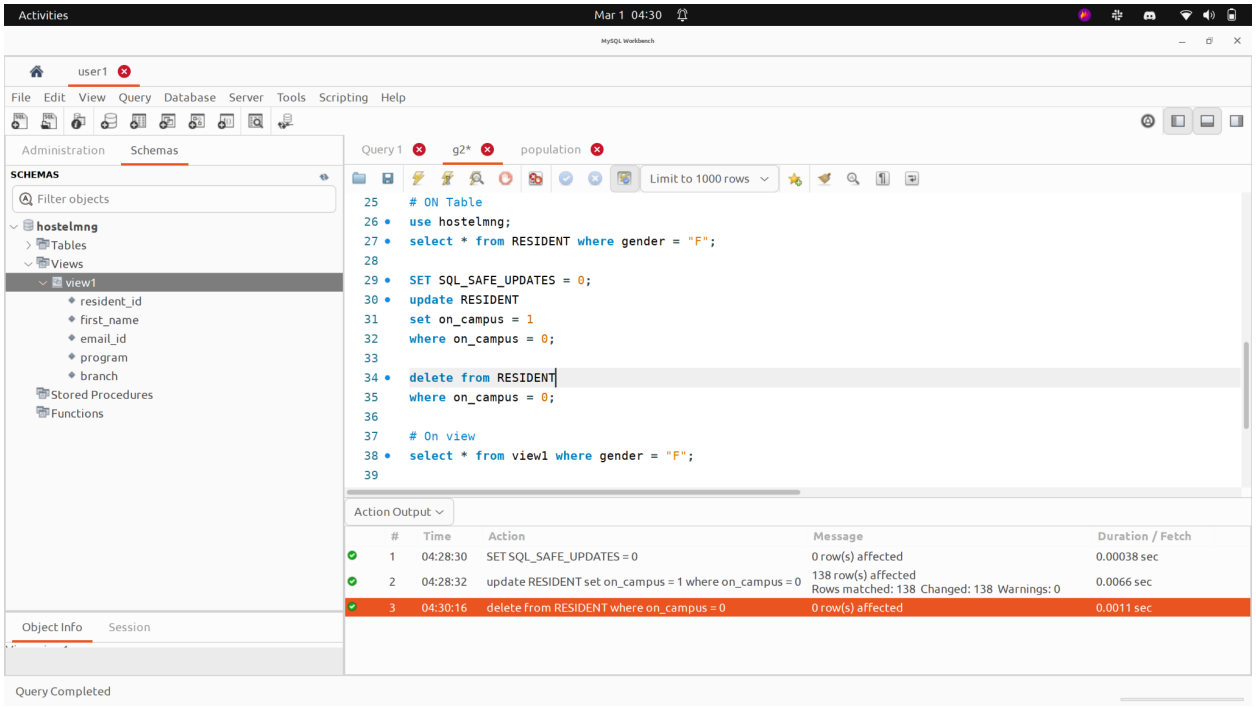
   SELECT operation:



UPDATE operation:



DELETE operation:

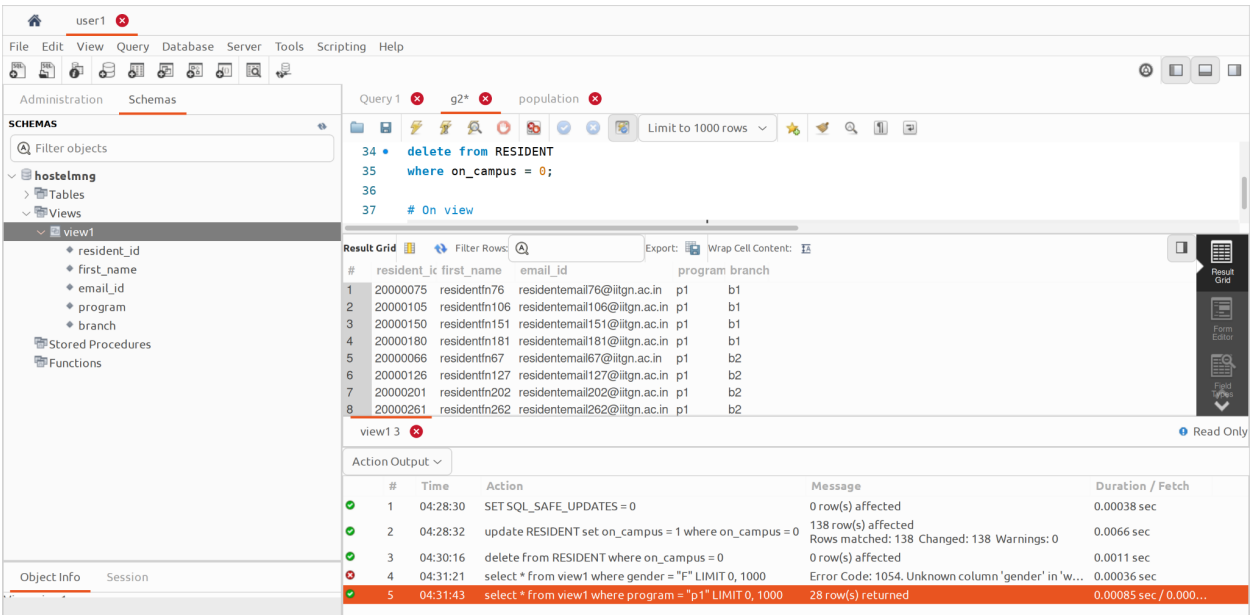


As predicted, the observations correlated with our expectations.

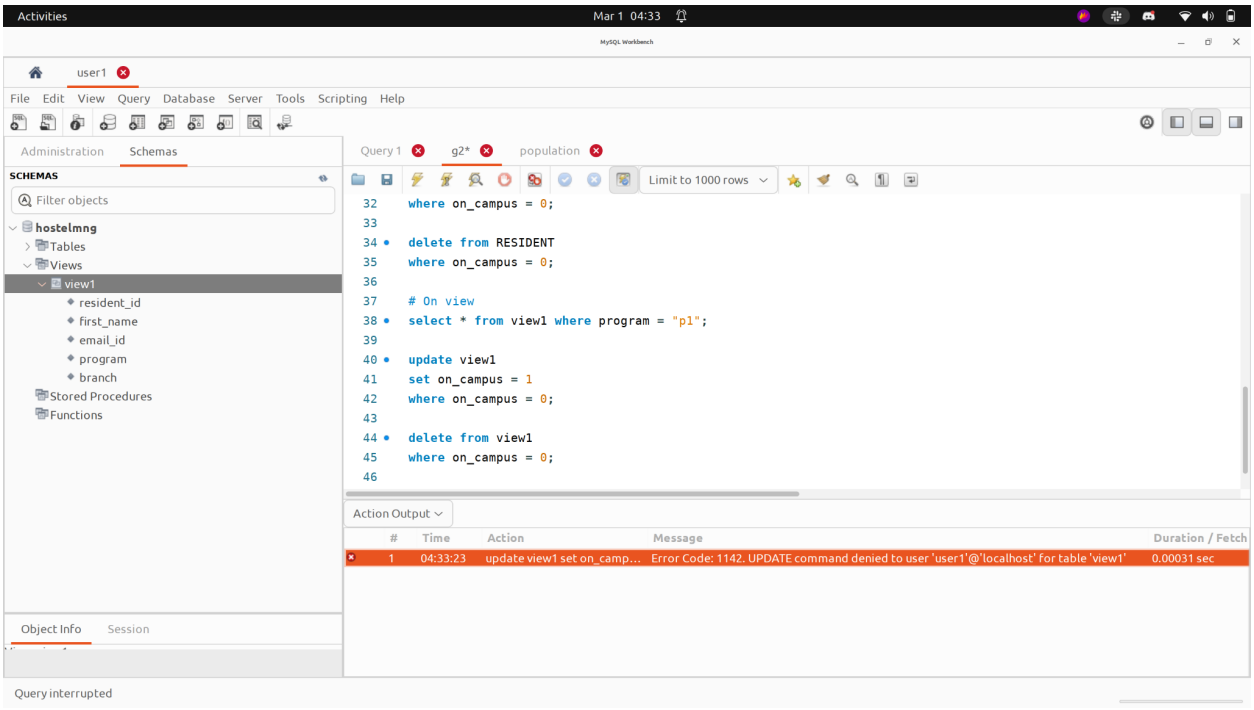
On VIEW1:

Since the user1 has been given permissions to only SELECT on view1, when we execute the query, we should get no error for this, but for update and delete operation, we should get an error.

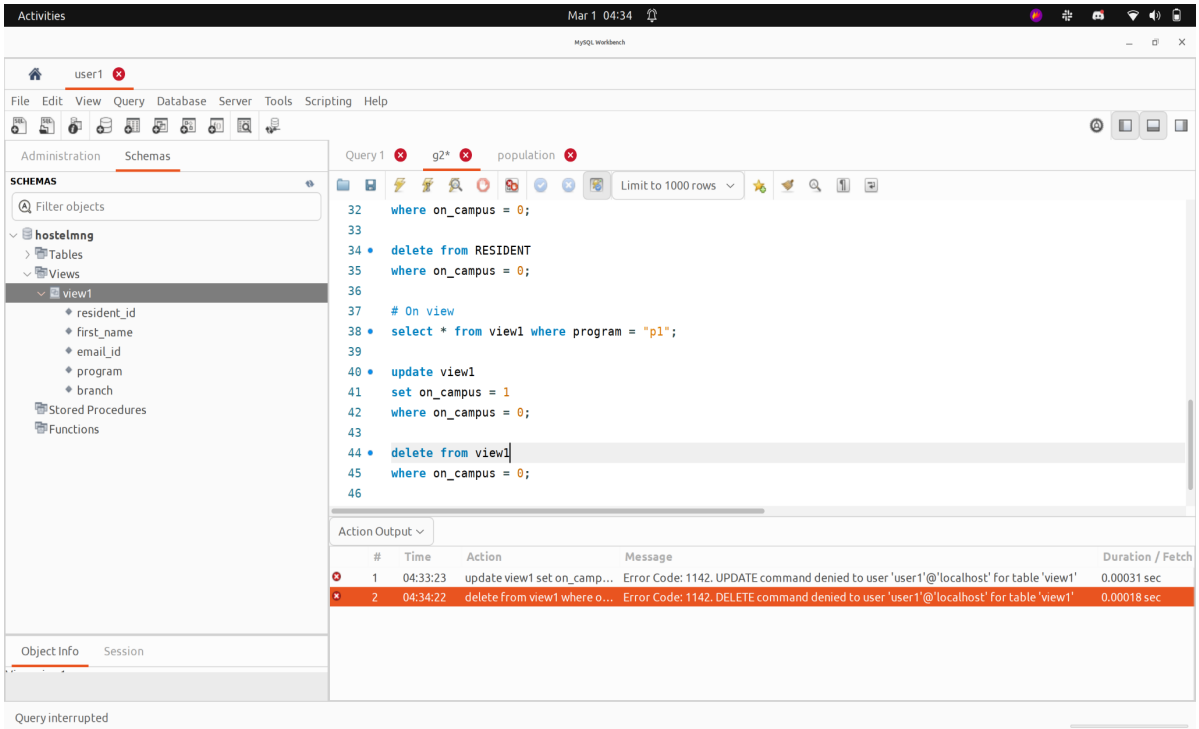
SELECT operation:



UPDATE operation:



DELETE operation:

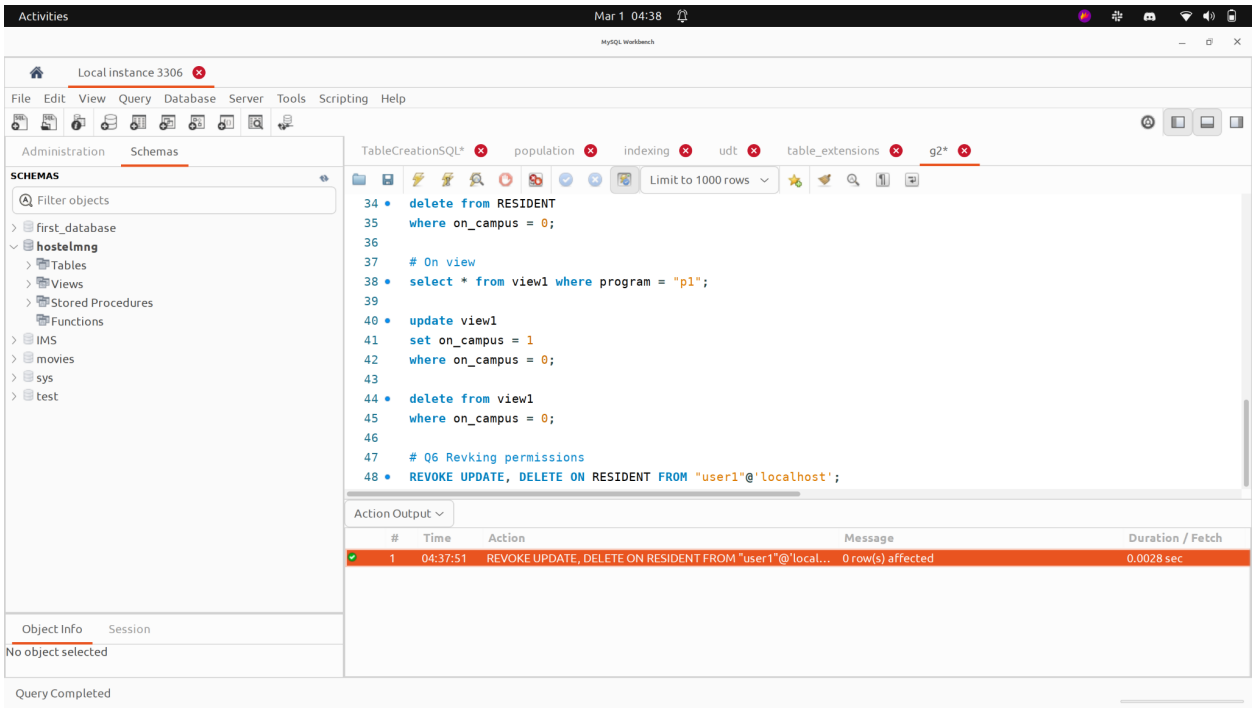


As predicted, the observations match with our expectations.

6. **Revoke the UPDATE and DELETE permissions on "table1" for "user1" and report your findings.**

   Revoking the UPDATE and DELETE permissions on RESIDENT for user1.

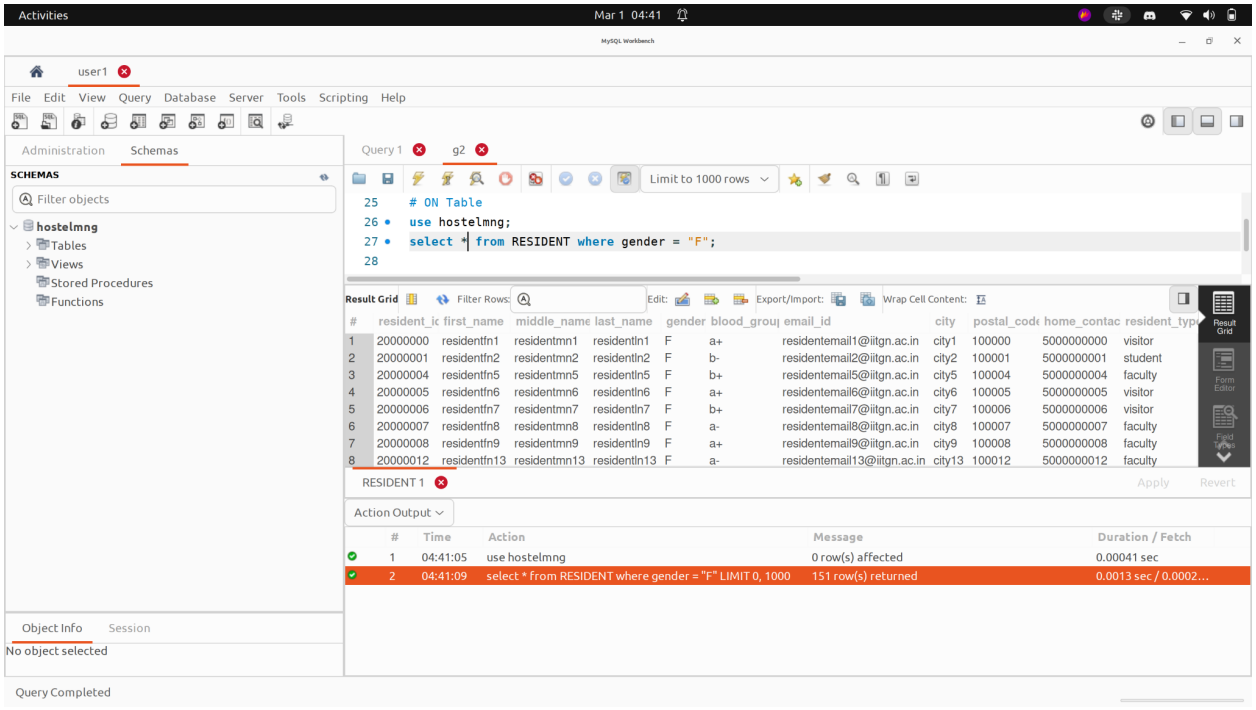
```
REVOKE UPDATE, DELETE ON RESIDENT FROM "user1"@'localhost';
```



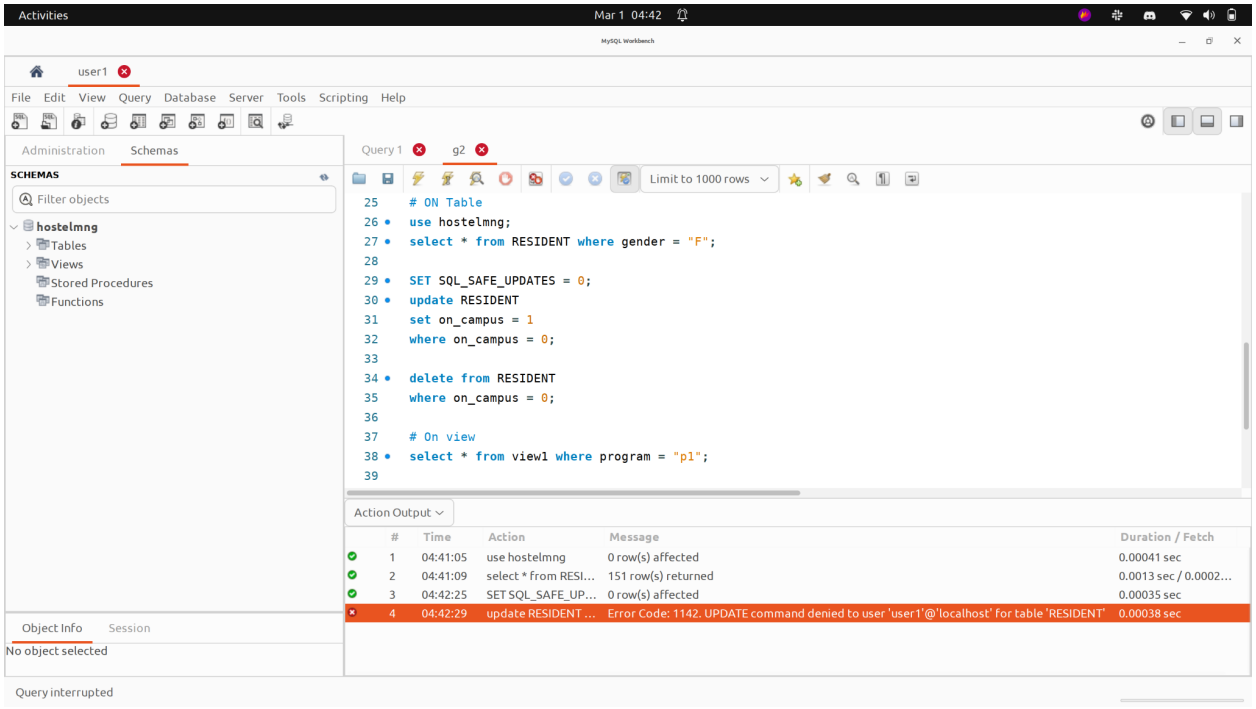
7. **Try to perform SELECT, UPDATE, and DELETE operations on "table1" and "view1" as "user1" again.**

   <u>On RESIDENT(table1)</u>:

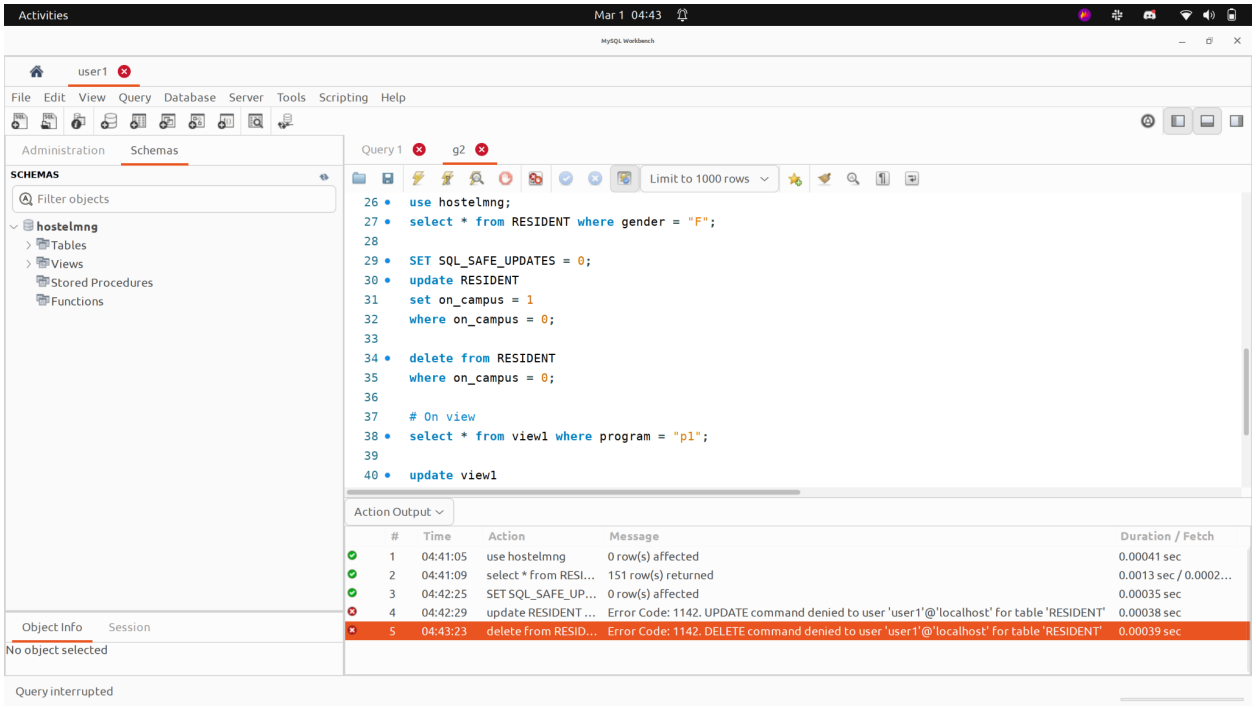
   Now that we removed the UPDATE and DELETE permissions on the RESIDENT table for user1, the executions should give errors for UPDATE and DELETE operations. SELECT operation should give no error.
   SELECT operation:



UPDATE operation:



DELETE operation:

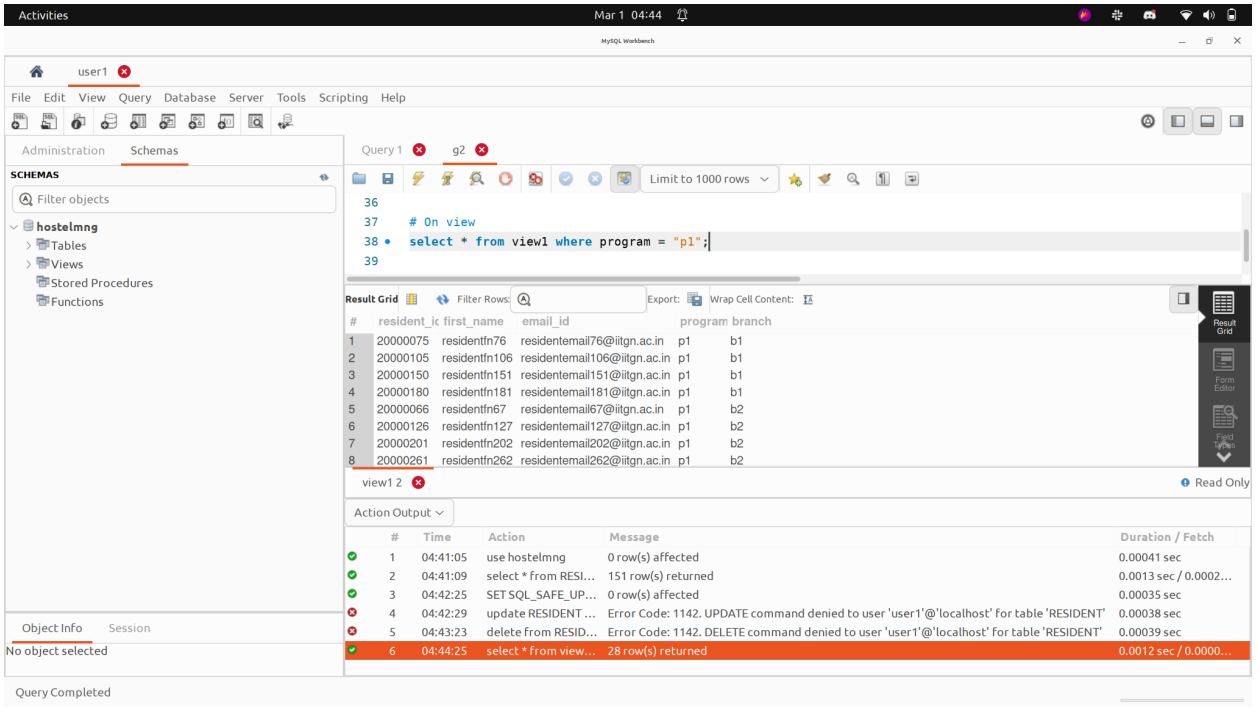


As predicted, the observations correlated with our expectations.

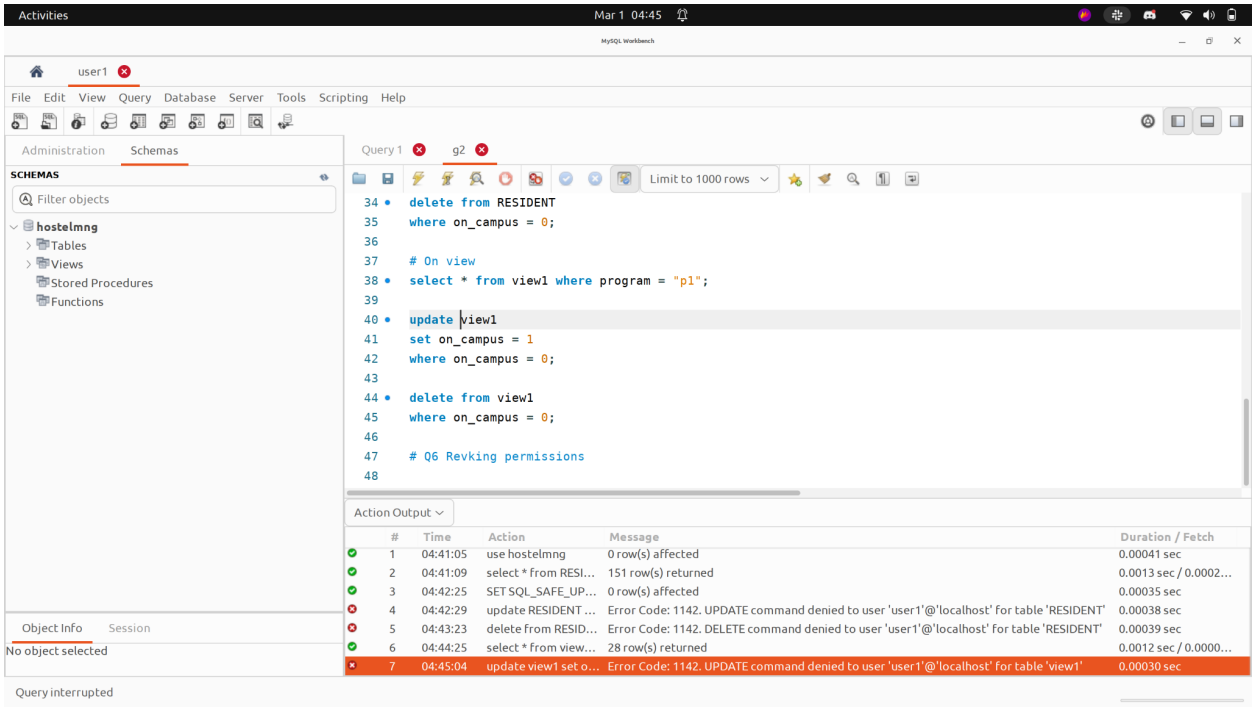
<u>On view1</u>:

We haven't made any changes to view1 permissions. So, they should work the same as they were in question 5.

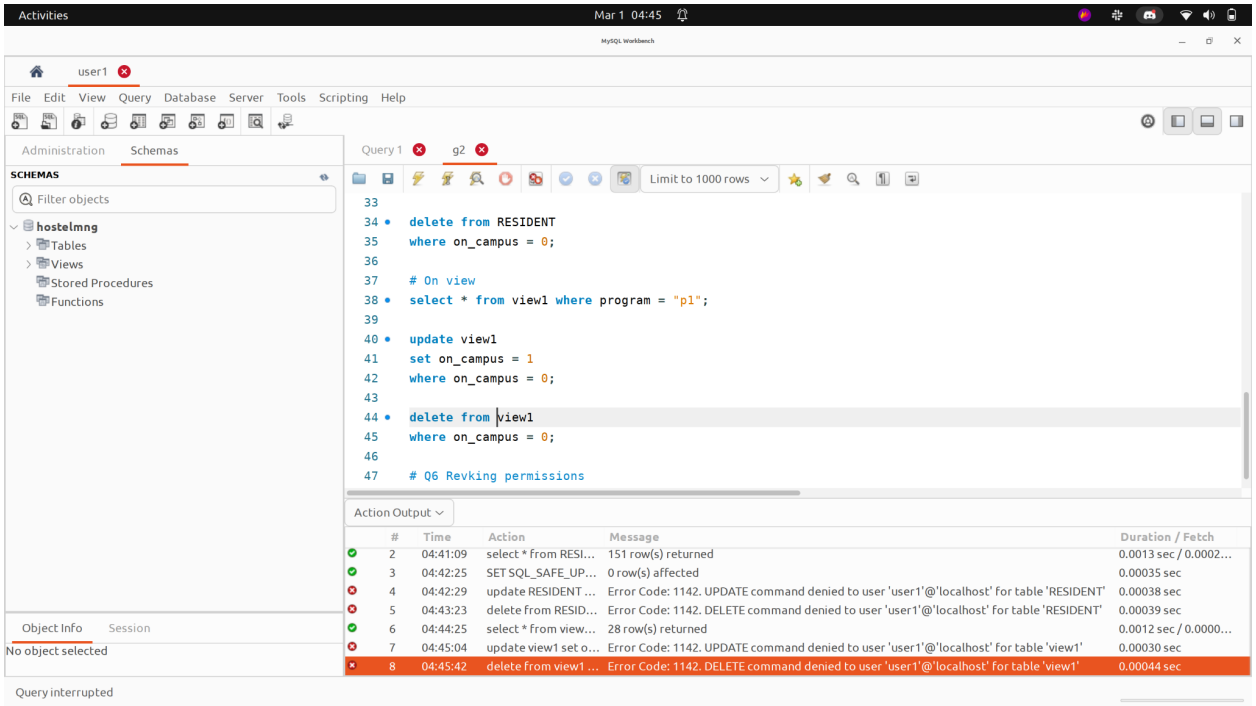
SELECT operation:



UPDATE operation:



DELETE operation:



As predicted, our expectations meet our observations.

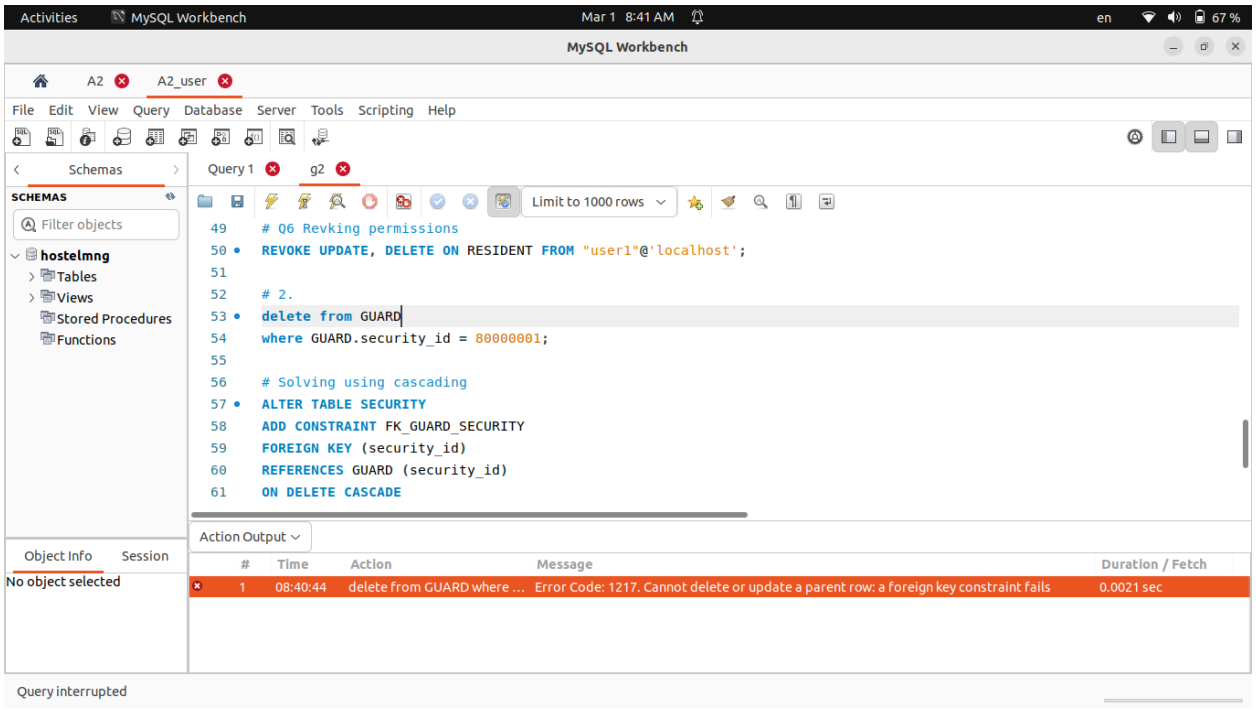
2. Mention the situation that violates the referential integrity, show the updates in the table, and how we can solve such problems.

If a GUARD record is deleted, there may be GUARD_PHONE records that reference the deleted GUARD record through their security_id foreign key. This can result in orphaned records that do not have a corresponding GUARD record.

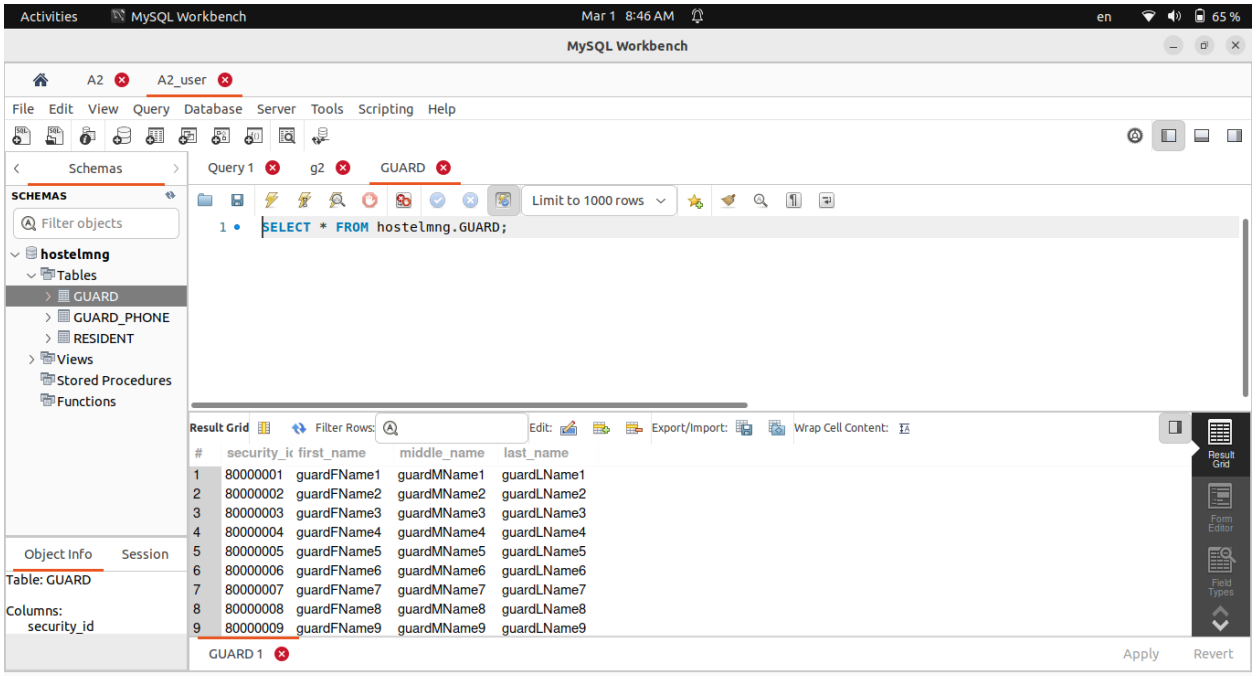
Here's an example code to add cascading delete and update actions to the foreign key constraints:

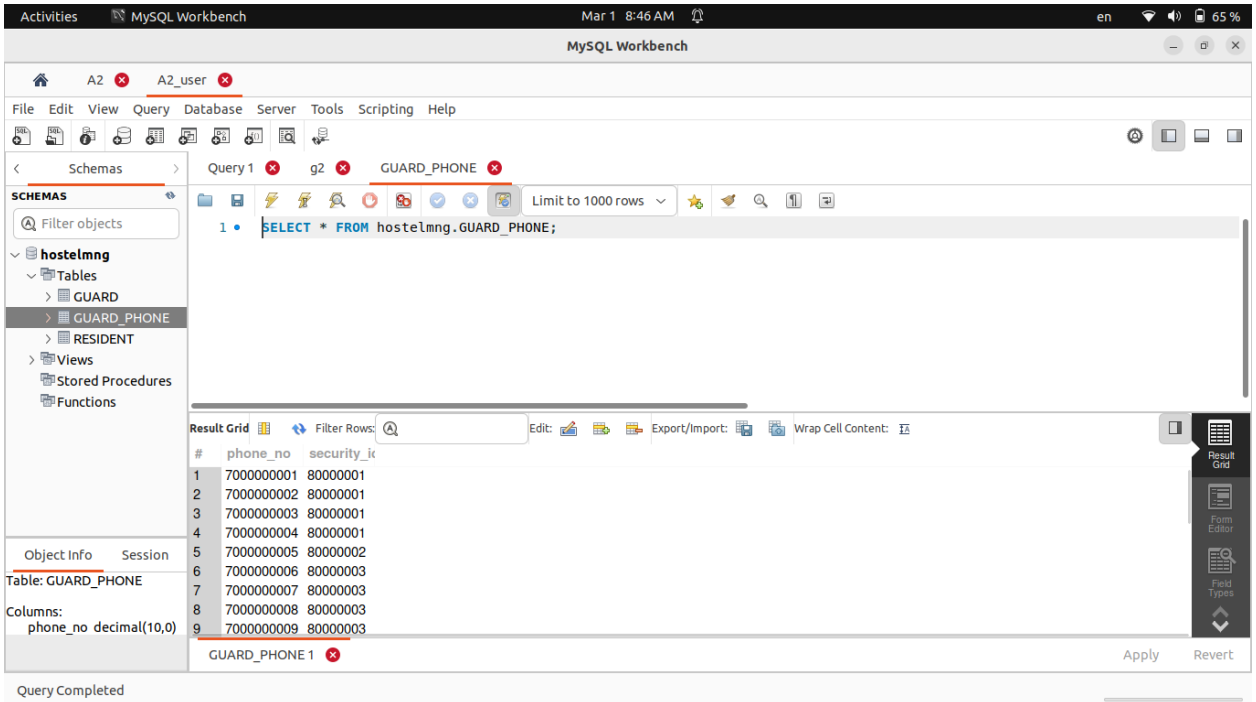
```
delete from GUARD where GUARD.security_id = 80000001;
```

Let's say we want to delete a guard record whose security_id is 80000001, but if we execute it, we get the following error message.



This means the record whose security_id is 80000001 will not be deleted, and can be viewed below.

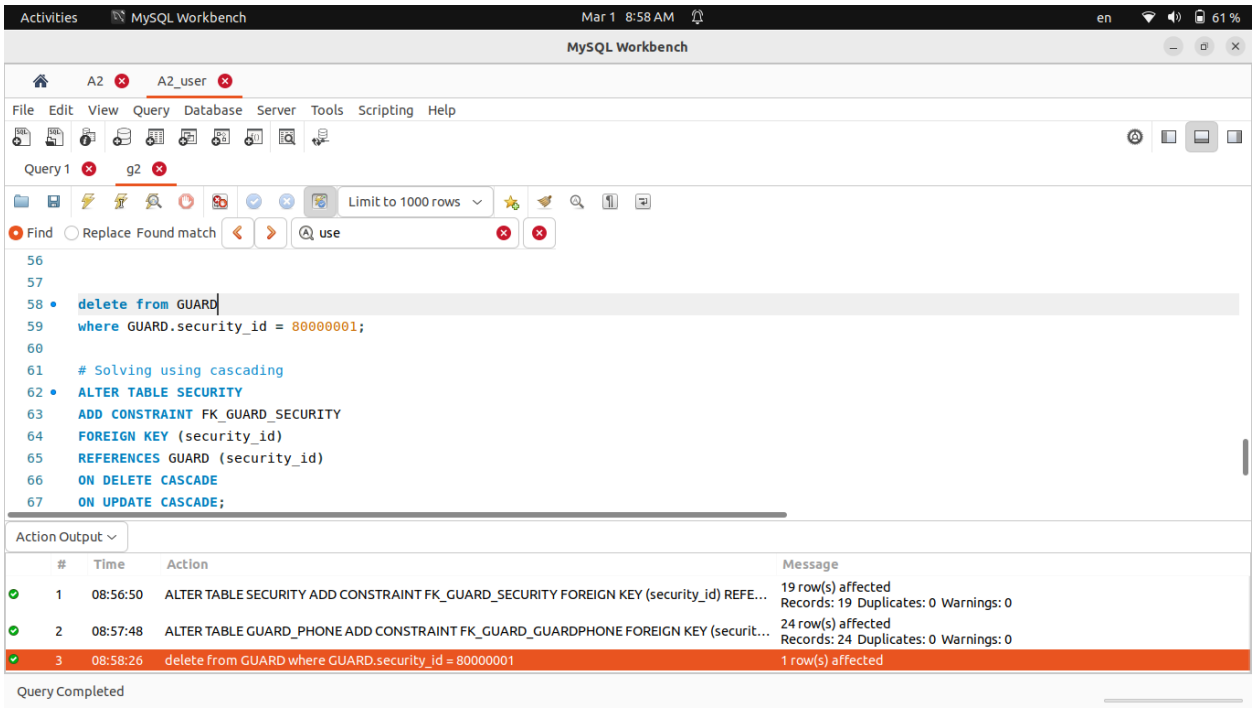


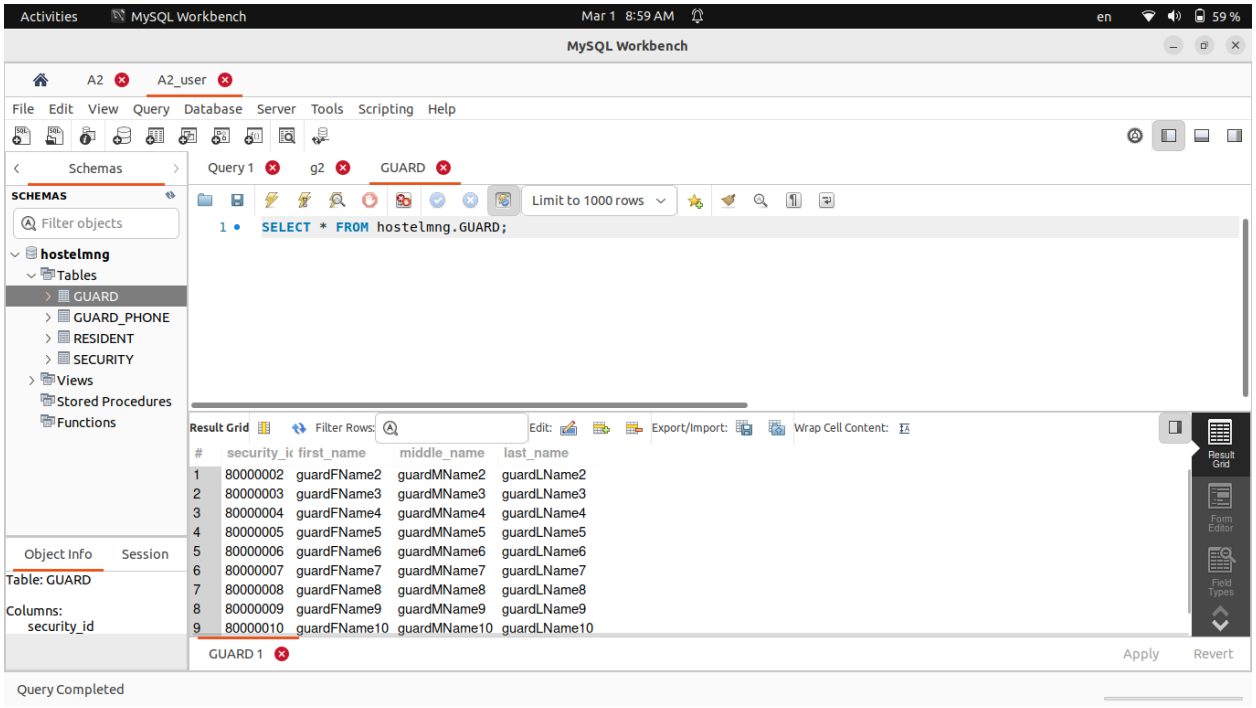


To avoid these referential integrity issues, we can set up the foreign key constraints with cascading delete and update actions. This means that when a parent record is deleted or updated, the corresponding child records will also be deleted or updated automatically to maintain referential integrity.

```sql
# Solving using cascading
ALTER TABLE SECURITY
ADD CONSTRAINT FK_GUARD_SECURITY
FOREIGN KEY (security_id)
REFERENCES GUARD (security_id)
ON DELETE CASCADE
ON UPDATE CASCADE;

ALTER TABLE GUARD_PHONE
ADD CONSTRAINT FK_GUARD_GUARDPHONE
FOREIGN KEY (security_id)
REFERENCES GUARD (security_id)
ON DELETE CASCADE
ON UPDATE CASCADE;
```

Now, after executing the above two queries, and executes the delete GUARD record, we get the following message.




Activities
MySQL Workbench
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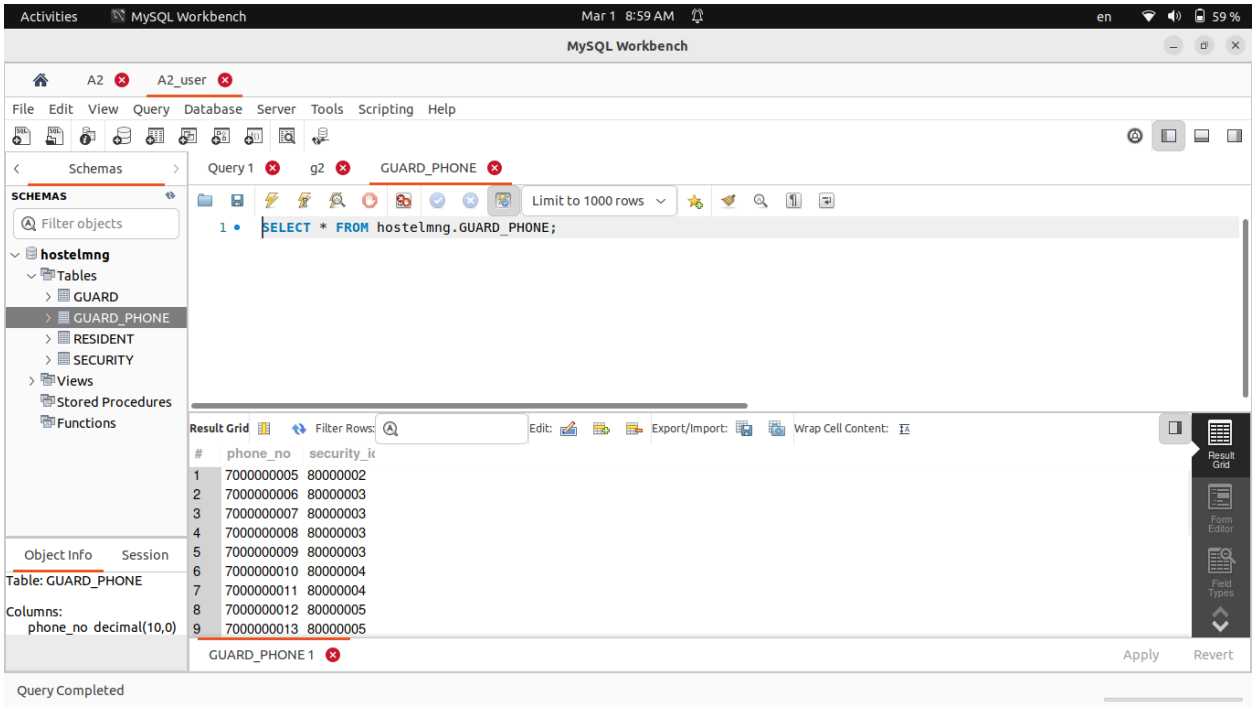
en
59 %
MySQL Workbench
A2
A2_user
File Edit View Query Database Server Tools Scripting Help
Schemas
Query 1
g2
GUARD
SCHEMAS
Filter objects
hostelmng
Tables
GUARD
GUARD_PHONE
RESIDENT
SECURITY
Views
Stored Procedures
Functions
Limit to 1000 rows
1 • SELECT * FROM hostelmng.GUARD;
Result Grid
Filter Rows:
Edit:
Export/Import:
Wrap Cell Content:
security_id first_name middle_name last_name
1 80000002 guardFName2 guardMName2 guardLName2
2 80000003 guardFName3 guardMName3 guardLName3
3 80000004 guardFName4 guardMName4 guardLName4
4 80000005 guardFName5 guardMName5 guardLName5
5 80000006 guardFName6 guardMName6 guardLName6
6 80000007 guardFName7 guardMName7 guardLName7
7 80000008 guardFName8 guardMName8 guardLName8
8 80000009 guardFName9 guardMName9 guardLName9
9 80000010 guardFName10 guardMName10 guardLName10
Object Info
Session
Table: GUARD
Columns:
security_id
GUARD 1
Apply
Revert
Query Completed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Schemas
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GUARD_PHONE
SCHEMAS
Filter objects
hostelmng
Tables
GUARD
GUARD_PHONE
RESIDENT
SECURITY
Views
Stored Procedures
Functions
Limit to 1000 rows
1 • SELECT * FROM hostelmng.GUARD_PHONE;
Result Grid
Filter Rows:
Edit:
Export/Import:
Wrap Cell Content:
phone_no security_id
1 7000000005 80000002
2 7000000006 80000003
3 7000000007 80000003
4 7000000008 80000003
5 7000000009 80000003
6 7000000010 80000004
7 7000000011 80000004
8 7000000012 80000005
9 7000000013 80000005
Object Info
Session
Table: GUARD_PHONE
Columns:
phone_no decimal(10,0)
GUARD_PHONE 1
Apply
Revert
Query Completed

As you can see from the above screenshots, the GUARD record whose security_id is 80000001 is deleted in GUARD and GUARD_PHONE.

3.3 Responsibility of G1 & G2:

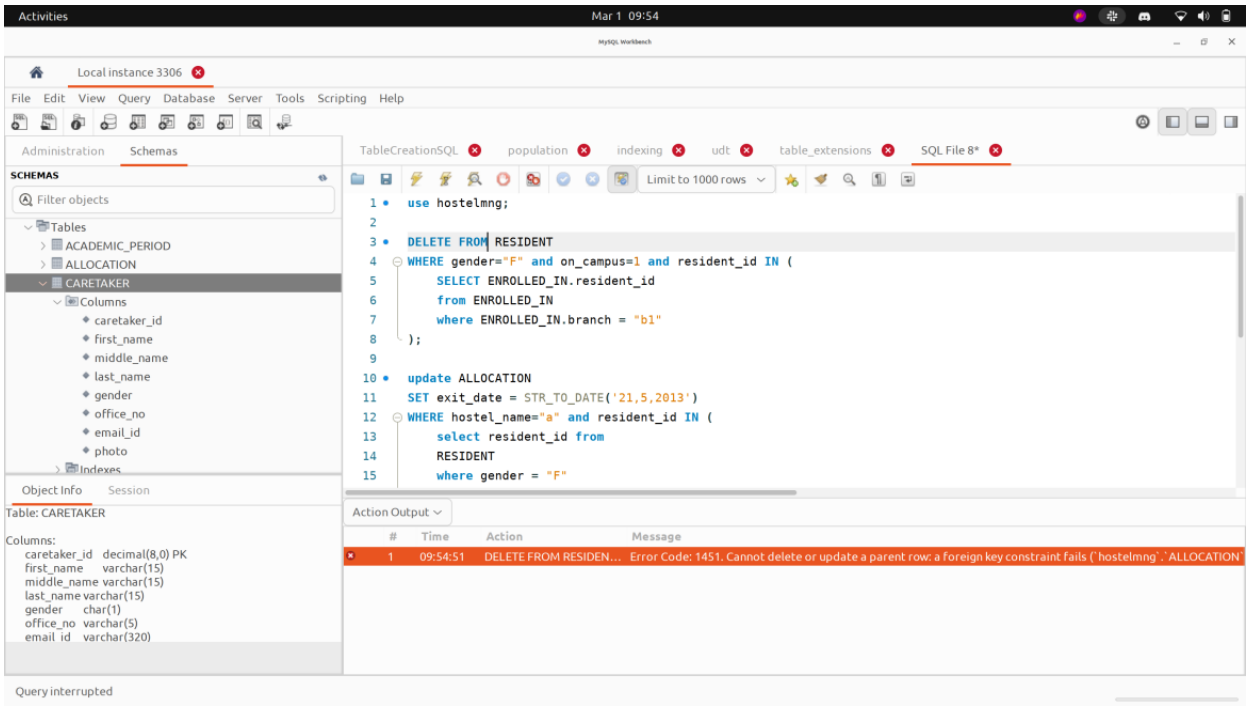
The five nested sql queries f1,f2,f3,f4 and f5 are described below.

1. **Two queries must throw an error due to a violation of constraints specified by G1.**
   - f1 and f2 are the two operations that satisfy these conditions.

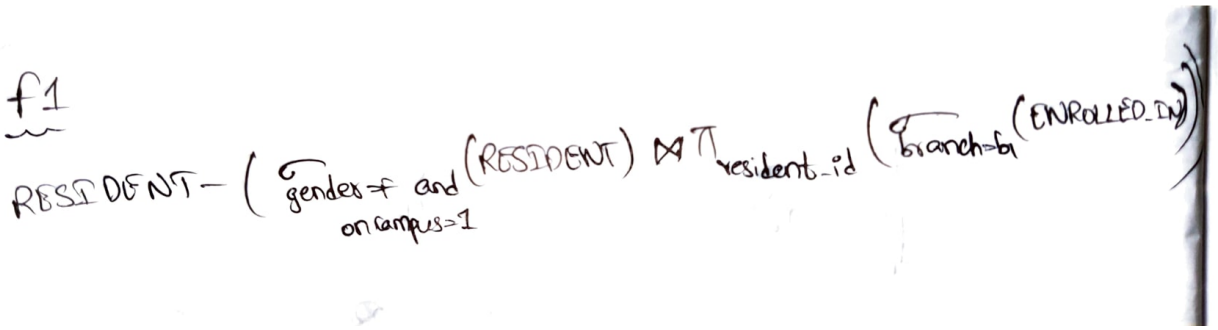
   - **f1**:

```
DELETE FROM RESIDENT
WHERE gender="F" and on_campus=1 and resident_id IN (
SELECT ENROLLED_IN.resident_id from ENROLLED_IN where
ENROLLED_IN.branch = "b1" );
```

   In the below figure, the delete query, (where the cursor is placed) throws an error due to the violation of the foreign key constraint specified by G1.



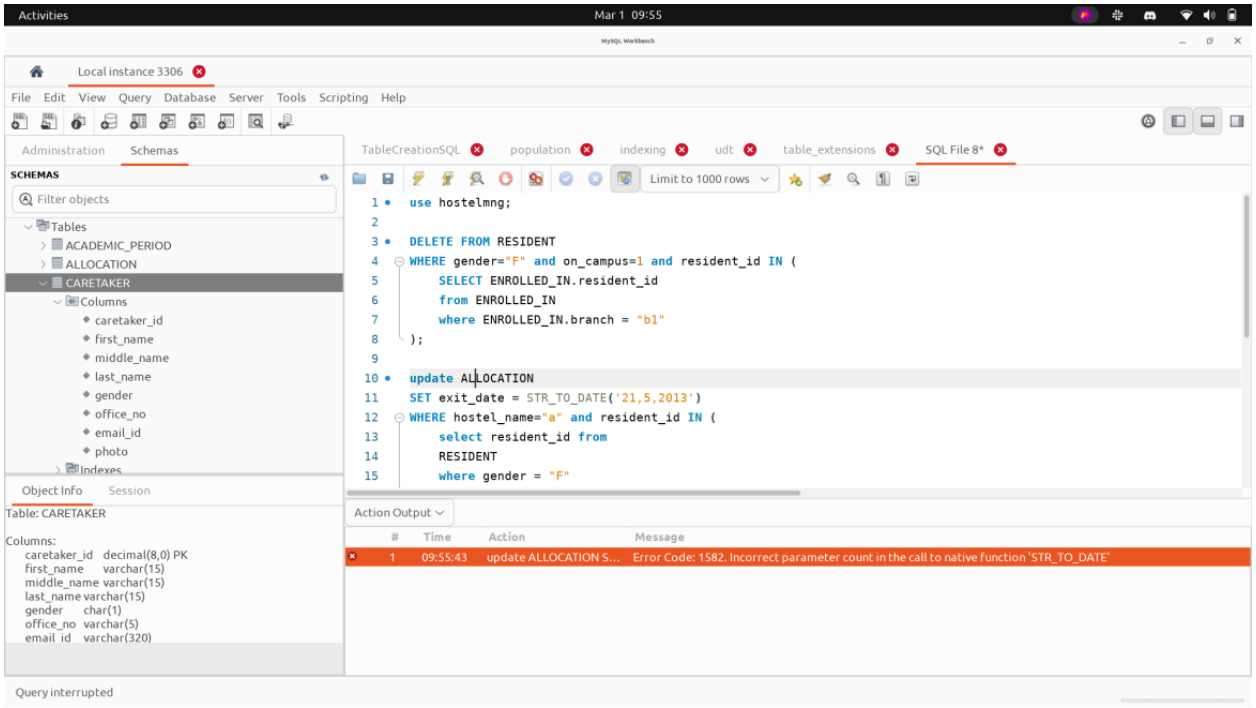
Relational algebra:



- **f2** :

```
update ALLOCATION
SET exit_date = STR_TO_DATE('21,5,2013')
WHERE hostel_name="a" and resident_id IN (
     select resident_id from
     RESIDENT
     where gender = "F"
);
```

In the below figure, the update query, (where the cursor is placed) throws an error due to the violation of the foreign key constraint on the exit-date attributes given by G1.

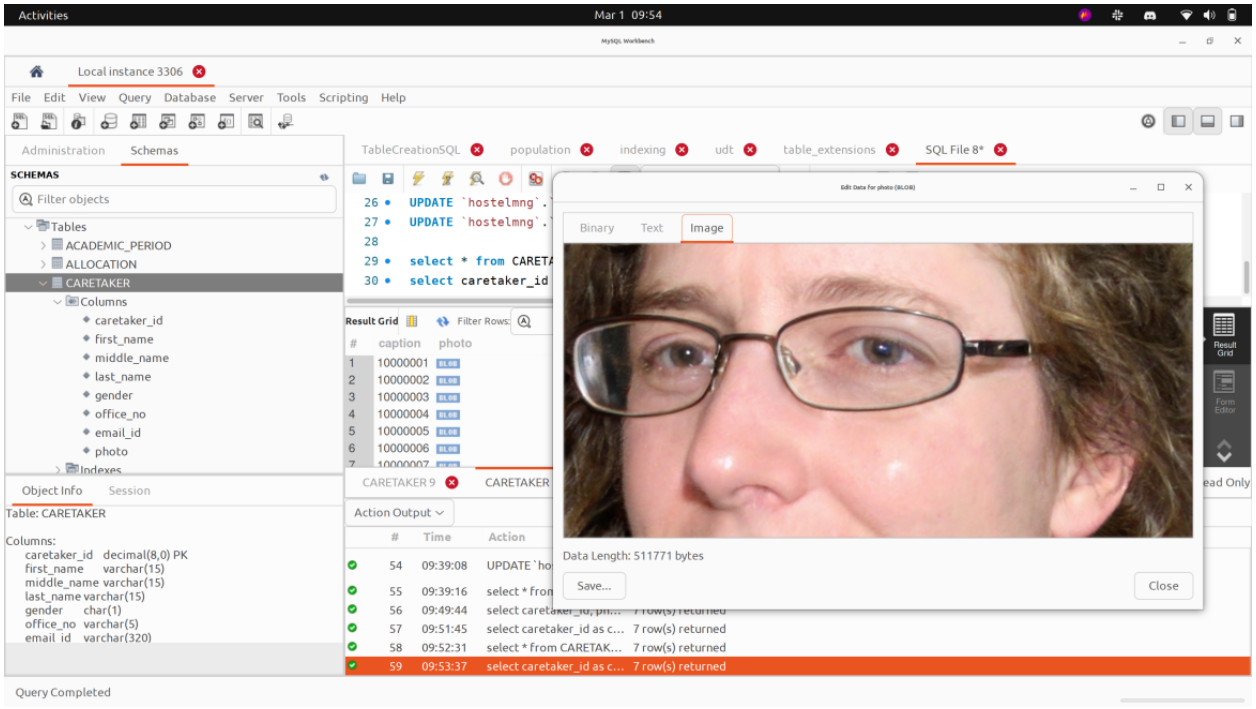


2. **One function should involve storing an image and a caption in the database.**
   - **f3** :

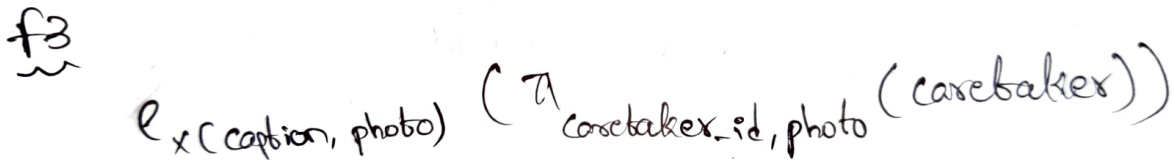
```
# Adding the image to CARETAKER ALTER table CARETAKER ADD COLUMN photo LONGBLOB;

UPDATE hostelmng.CARETAKER SET photo = LOAD_FILE("images/1.jpg") WHERE (caretaker_id = '10000001');
UPDATE hostelmng.CARETAKER SET photo = LOAD_FILE("images/2.jpg") WHERE (caretaker_id = '10000002');
UPDATE hostelmng.CARETAKER SET photo = LOAD_FILE("images/3.jpg") WHERE (caretaker_id = '10000003');
UPDATE hostelmng.CARETAKER SET photo = LOAD_FILE("images/4.jpg") WHERE (caretaker_id = '10000004');
UPDATE hostelmng.CARETAKER SET photo = LOAD_FILE("images/5.jpg") WHERE (caretaker_id = '10000005');
UPDATE hostelmng.CARETAKER SET photo = LOAD_FILE("images/6.jpg") WHERE (caretaker_id = '10000006');
UPDATE hostelmng.CARETAKER SET photo = LOAD_FILE("images/7.jpg") WHERE (caretaker_id = '10000007');
```

In this query, we are storing an image ‘photo’ in the caretaker entity. We are also using one of the attributes as its caption. The query and the output is shown in the below figure.



Relational algebra:

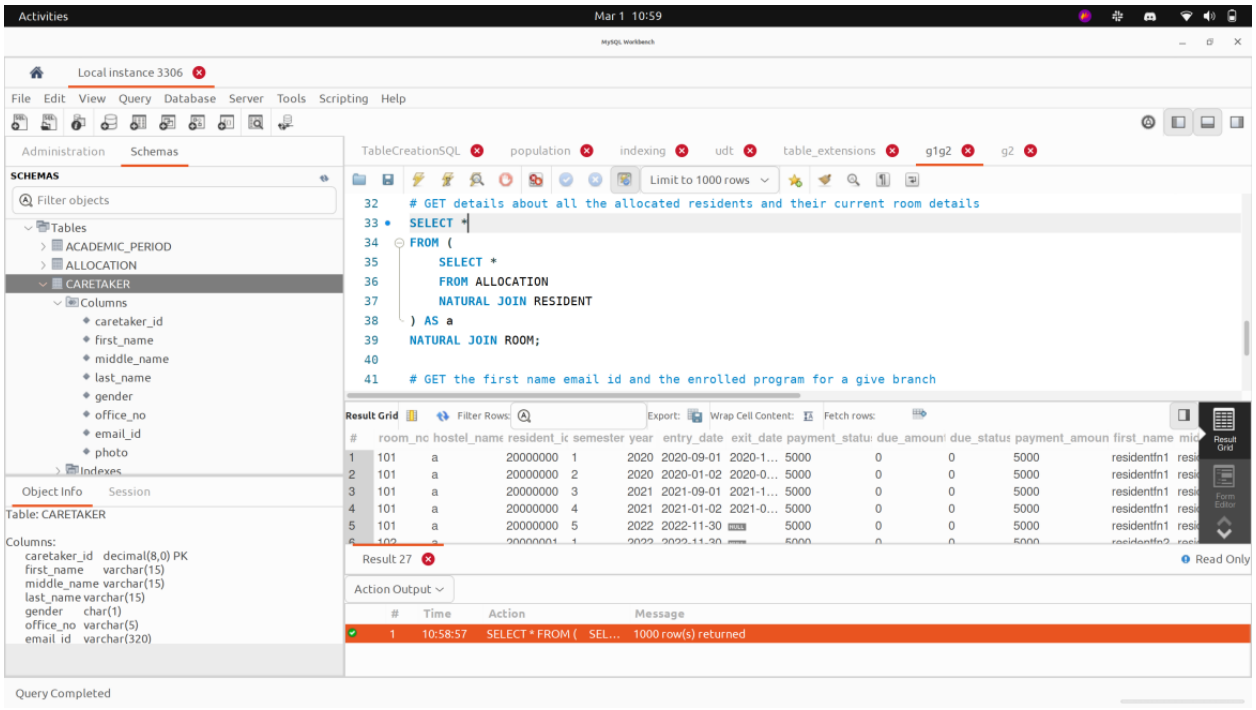


3. **Include cases of natural join, outer join, renaming, two or more different kinds of aggregate functions, and case statements in one or more queries.**

- **f4 :**

```
# GET details about all the allocated residents and their
current room details

SELECT *
FROM (
      SELECT *
      FROM ALLOCATION
      NATURAL JOIN RESIDENT
 ) AS a
NATURAL JOIN ROOM;
```



Relational algebra:

f4

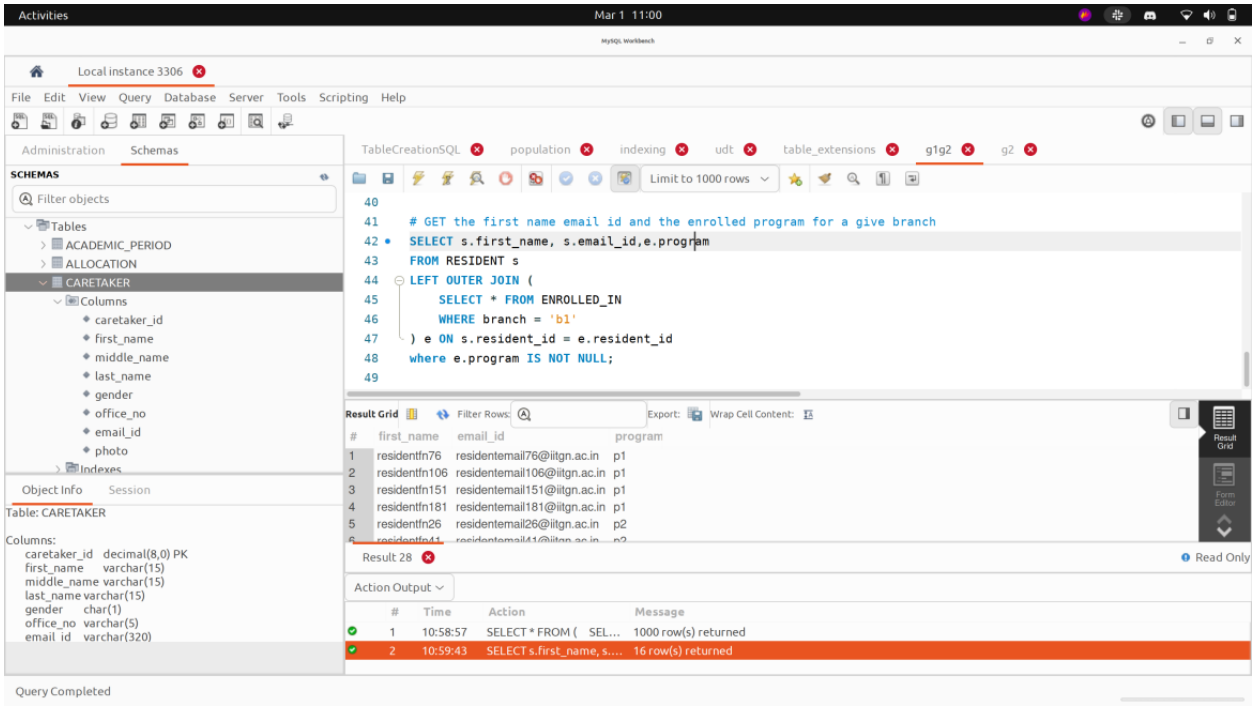
$$\Pi_{a.all}\left(\rho_a\left(\Pi_{\substack{ALLOCATION.all \cup \\ RESIDENT.all}}\left(ALLOCATION \bowtie RESIDENT\right) \bowtie ROOM\right)\right)$$

t.all → all attribute in table t.

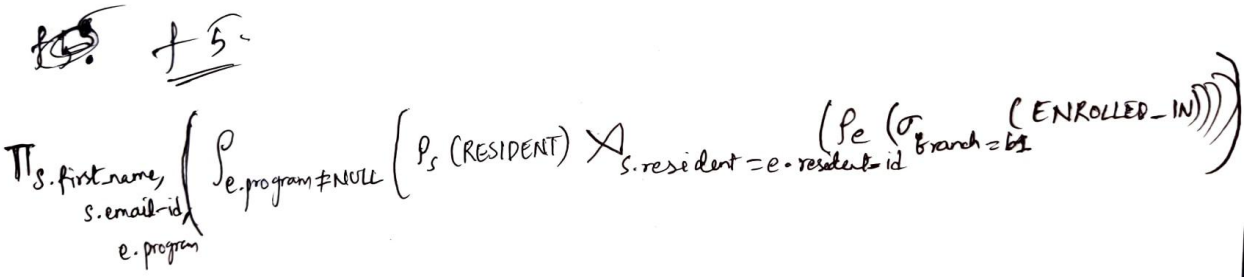
- **f5 :**

GET the first name email id and the enrolled program for a give branch

```
SELECT s.first_name, s.email_id,e.program
FROM RESIDENTs
LEFTOUTERJOIN(
     SELECT * FROM ENROLLED_IN
     WHERE branch = 'b1'
) e ON s.resident_id = e.resident_id
where e.program IS NOT NULL;
```



Relational algebra:



- **f1 satisfies specification 1**
- **f2 satisfies specification 1**
- **f3 satisfies specification 2**
- **f4 and f5 together satisfy specification 3**

Contributions :

Everyone in the group has equal contribution towards the project. Contributions of the people in each sub-group (G1 and G2) are mixed (several students are involved in each activity).

Group G2 Contribution:
- Bommisetty Siva Sai - 20110041
- Voorugonda Rajesh - 20110231
- Bhavini Korthi - 20110039
- Balu Karthik Ram - 20110036
- Kareena Beniwal - 20110095
- Rishabh Patidar - 20110165

Group G1 Contribution:
- Venkata Sriman Narayana Malli - 20110224
- Gali Sunny - 20110067
- S Sri Manish Goud - 20110174
- Talla Gnana Sai - 20110210
- Hamsini Kadali - 20110087
- Chaitanya Rao - 20110163