



# Mini Project

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# **PART A – RELATIONAL DATABASE**

## **CHAPTER 1 – Requirement Analysis**

### **1. Introduction**

According to database management project on the topic ‘jewelry’, a sql should be created with eight entities which are classified into two parts as strong entities and weak entities. According to that by considering the whole transactions that happens in jewelry shop we selected item details, sales details, billing details, customer, payment and sales representation as strong entities and daily gold rate, referee as week entities. These entities are containing many types of relationships and attributes. And also, one this has a recursive relationship. According to the instructions of the project attributes are classified. Further this contain a composite attribute on the entity sales representation as address and a multivalued attribute on the same entity (Phone no). Furthermore, an entity has multiple candidate key (Date and Time in Payment entity) also be included.

### **2. Functional Requirements**

From this project the tasks that happen in a gold jewelry shop is taken to the database system. Those tasks and relevant details are considered as the functional requirements of the project. The Functional Requirements specifies the operations and activities that a system can perform. And it should include the work performed by specific screens, outlines of workflows performed by the system, and other business or compliance requirements that the system must meet. The functional requirement of our database project represented as

- Inserting data of suppliers and details of their products.
- Inserting information of the sales representatives and the name of their referees.
- Inserting data of customers and payment method.
- Inserting daily rate of the gold according to the date.
- Upgrade the billing process of the sales product.
- Retrieving the material type and the weight of the product.
- Retrieving the details of sales representatives and their contact numbers.

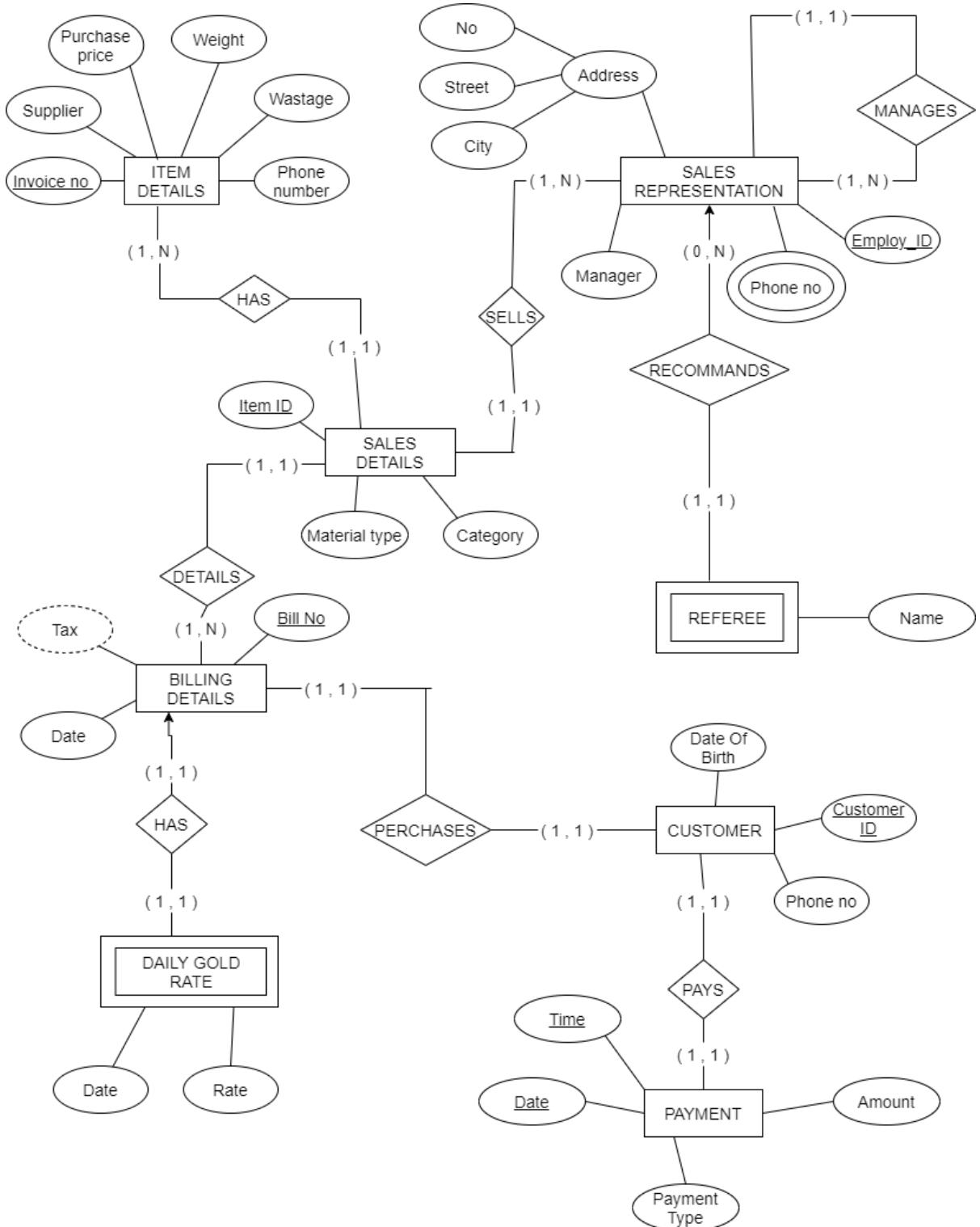
### **3. Data Requirements**

The data requirement of our database project represented as shown below

- Get the name and the employ ID of the sales representative according to a relevant sold product.
- Get the name of the supplier and invoice ID with the bill number of a sales product.
- Display the item ID and customer ID of the highest payment out of the transaction.
- Display the item ID according to their material type and the amount of wastage and weight.
- Find the sales highly performed sales representative with their sales transactions.
- Calculate the tax for relevant sales details to be sold which the help of derived attribute.
- Display the gold rate according to the date.
- Get the supplier and contact number using the item ID.

## **CHAPTER 2 – Conceptual Design**

### **1. Entity - Relationship Diagram**



**FIGURE 1 : ENTITY – RELATIONSHIP DIAGRAM**

## CHAPTER 3 – Logical Design

### 1. Mapping ER to the Relational Model

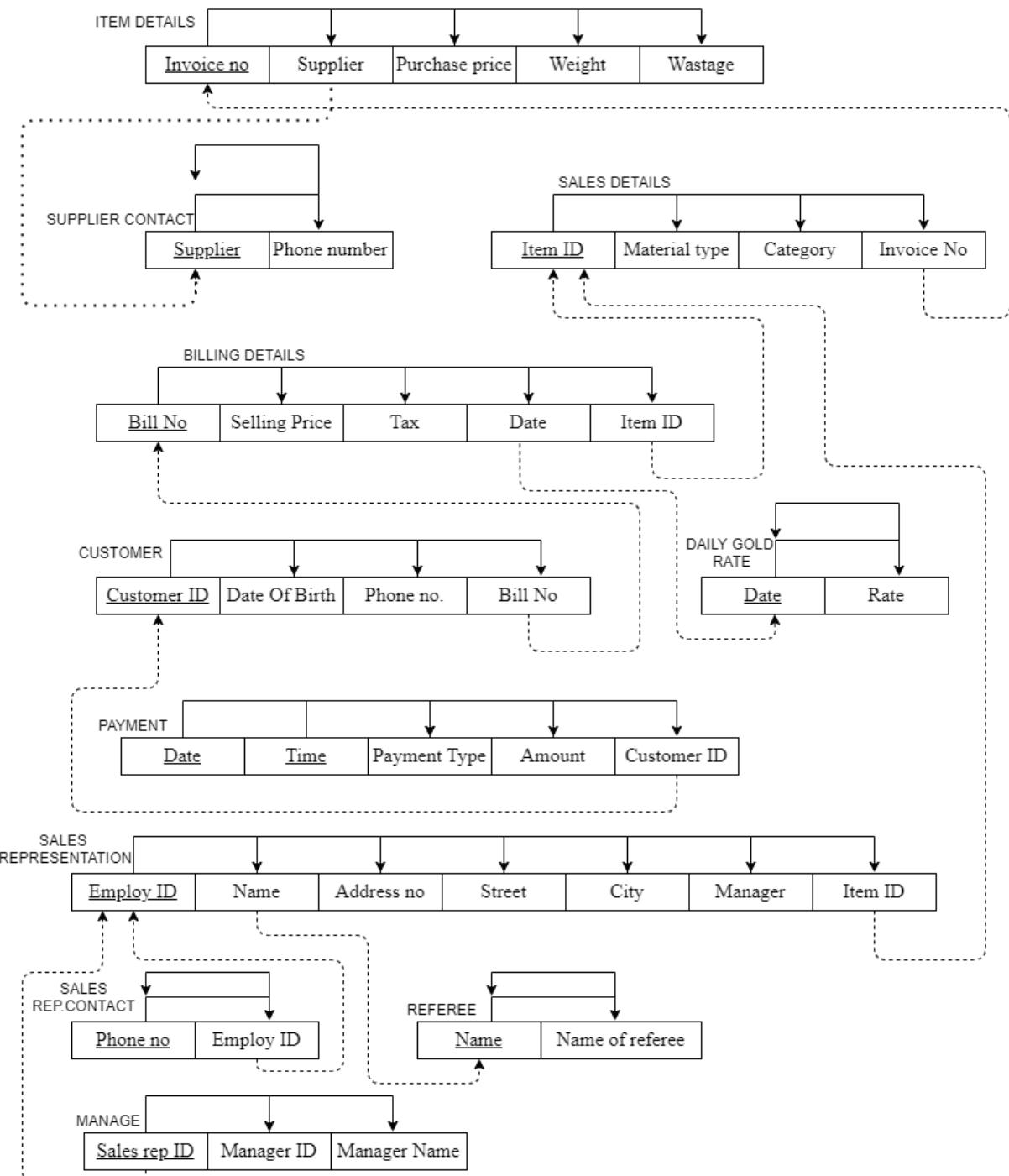
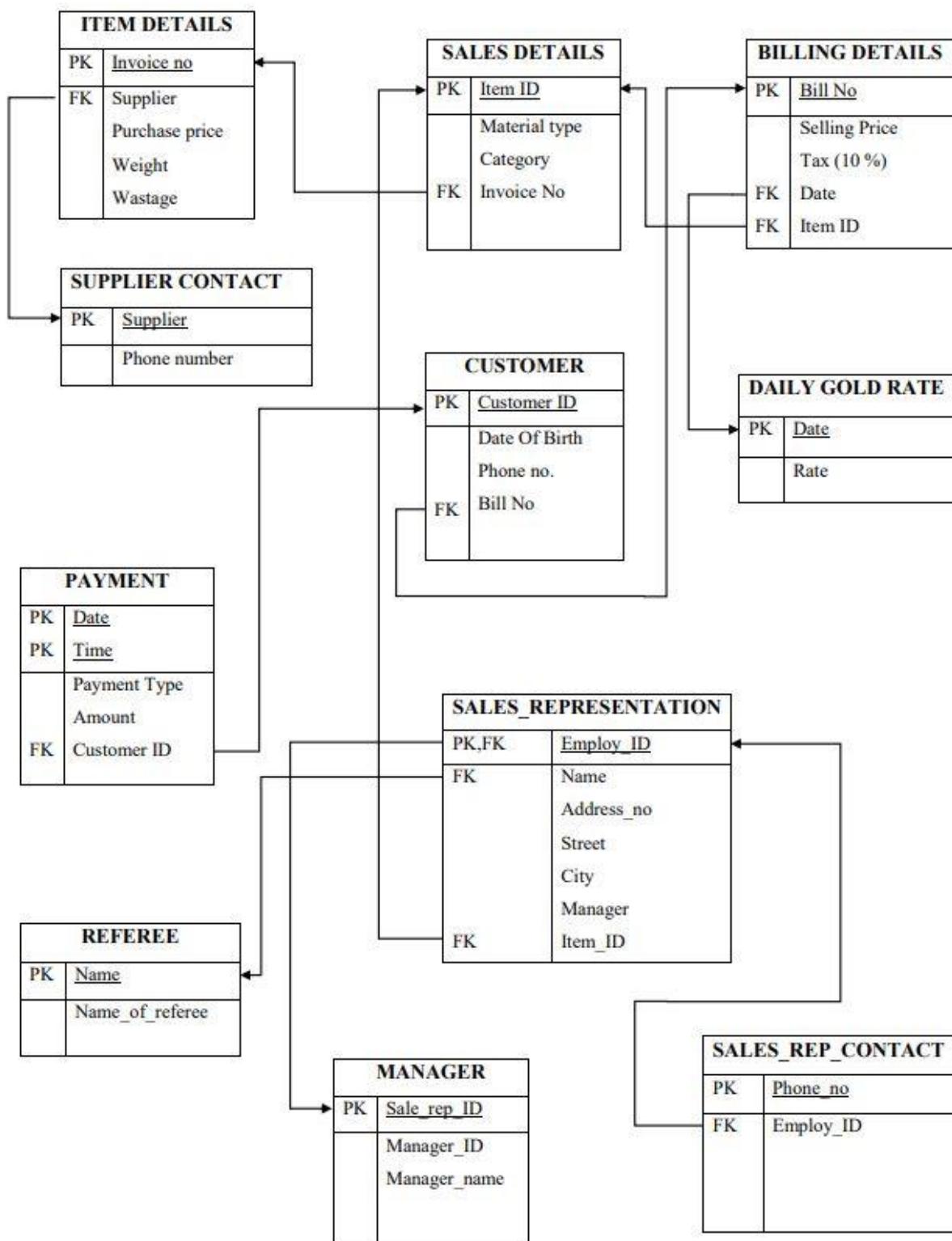


FIGURE 2 : FINAL DESIGN AFTER NORMALIZING



**FIGURE 3 : SECOND NORMAL FORM**

## 2. Inserted data in the Database

**TABLE 1 : ITEM DETAILS BEFORE NORMALIZING**

Invoice no	Supplier	Purchase price (Rs)	Weight (g)	Wastage (g)	Phone number
562	Ravi Jewelers	350000	27.5	0.5	0777805353
563	Ravi Jewelers	300000	23.6	0.5	0777805353
344	Devi Jewelers	200000	15.6	0.3	0777345673
345	Devi Jewelers	150000	11.9	0.1	0777345673
561	APA Jewelers	400000	39.2	0.8	0778874713
342	Swarna Jewelers	100000	7.9	0.1	0778438291

The above table is not in second normal form. So, it should be normalized according to the requirement.

### **2<sup>nd</sup> normalization**

**TABLE 2 : SUPPLIER CONTACT AFTER NORMALIZING**

Supplier	Phone number
Ravi Jewelers	0777805353
Devi Jewelers	0777345673
APA Jewelers	0778874713
Swarna Jewelers	0778438291

**TABLE 3 : ITEM DETAILS AFTER NORMALIZING**

Invoice No	Supplier	Purchase Price (Rs)	Weight (g)	Wastage (g)
560002	Ravi Jewelers	350000	27.5	0.5
560003	Ravi Jewelers	300000	23.6	0.4
34004	Devi Jewelers	200000	15.7	0.3
34005	Devi Jewelers	150000	11.9	0.1
56001	APA Jewelers	400000	39.2	0.8
34002	Swarna Jewelers	100000	7.9	0.1

**TABLE 4 : SALES DETAILS**

Item ID	Material type	Category	Invoice No
30045	21k gold	Box chain	562
30046	22k gold	Rope chain	563
30047	21k gold	Bangle	344
30048	21k gold	Pendent	345
30049	18k gold	Lock Bangle	561
30050	20k gold	Earing	342

**TABLE 5 : BILLING DETAILS**

Bill No	Selling Price	Tax (10 %)	Date	Item ID
234	330000	33000	01.01.2020	30046
235	161000	16100	03.01.2020	30048
236	112000	11200	04.01.2020	30050
237	370000	37000	07.01.2020	30045
238	450000	45000	09.01.2020	30049
239	210000	21000	10.01.2020	30047

**TABLE 6 : DAILY GOLD RATE**

Rate	Date
100000	01.01.2020
101000	03.01.2020
101500	04.01.2020
102000	07.01.2020
107000	09.01.2020
104000	10.01.2020

**TABLE 7 : CUSTOMER**

Customer ID	Date of Birth	Phone no.	Bill No
873166034	11.11.1987	0772384994	234
83310004	05.11.1983	0750489209	235
92524003	24.01.1992	0771873878	236
76511003	11.01.1976	0713493724	237
87502001	02.01.1987	0729183928	238
95023049	23.01.1995	0778738172	239

**TABLE 8 : PAYMENT**

Date	Time	Payment Type	Amount	Customer ID
01.01.2020	10.30	Cash	330000	873166034
03.01.2020	10.50	Credit Card	161000	83310004
04.01.2020	13.45	Commercial VISA	112000	92524003
07.01.2020	16.34	Master Card	370000	76511003
09.01.2020	08.23	Credit	450000	87502001
10.01.2020	11.46	Exchange	210000	95023049

**TABLE 9 : SALES REPRESENTATION BEFORE NORMALIZING**

Employ ID	Name	Address	Phone no	Manage	Item ID
21	Gunathilake R.M.S	202, Alpitiya Street, Mawanella	0777623323 0758874742		30045
22	Ranasinha H.N.M.	306, United Street, Mawanella.	0778823822 0723389234	Gunathilake R.M.S	30046
23	Ahamed H.M.N.	209, Vishaka Street, Mawanella	0773489433 0712323342	Gunathilake R.M.S	30047
24	Naveen K.L.J.	34/A, Ranasinha Street, Mawanella.	0775623456 0352234567	Ahamed H.M.N.	30048
25	Balasuriya M.J.K.	32, Mathugama Street, Kegalle	0352245456 0775678797	Ahamed H.M.N.	30049
26	Wijitha K.L.K.K.	45, Havelock Street, Kegalle	0352278788 0728832323	Ahamed H.M.N.	30050

The above table is not in first normal form. So, it should be normalized according to the requirement.

### 1<sup>st</sup> normalization

**TABLE 10 : SALES REPRESENTATION AFTER NORMALIZING COMPOSITE ATTRIBUTE ADDRESS**

Employ ID	Name	Address			Phone	Manage	Item ID
		No	Street	City			
21	Gunathilake R.M.S	202	Alpitiya Street	Mawanella	0777623323 0758874742		30045
22	Ranasinha H.N.M.	306	United Street	Mawanella	0778823822 0723389234	Gunathilake R.M.S	30046
23	Ahamed H.M.N.	209	Vishaka Street	Mawanella	0773489433 0712323342	Gunathilake R.M.S	30047
24	Naveen K.L.J.	34/A	Ranasinha Street	Mawanella	0775623456 0352234567	Ahamed H.M.N.	30048
25	Balasuriya M.J.K.	32	Mathugama Street	Kegalle	0352245456 0775678797	Ahamed H.M.N.	30049
26	Wijitha K.L.K.K.	45	Havelock Street	Kegalle	0352278788 0728832323	Ahamed H.M.N.	30050

Second step - Normalizing multi valued attribute phone no.

**TABLE 11 : SALES REP.CONTACT**

Employ ID	Phone no
21	0777623323
21	0758874742
22	0778823822
22	0723389234
23	0773489433
23	0712323342
24	0775623456
24	0352234567
25	0352245456
25	0775678797
26	0352278788
26	0728832323

**TABLE 12 : SALES REPRESENTATION AFTER NORMALIZING MULTI VALUED ATTRIBUTE ADDRESS**

Employ ID	Name	Address No	Street	City	Manage	Item ID
21	Gunathilake R.M.S	202	Alpitiya Street	Mawanella		30045
22	Ranasinha H.N.M.	306	United Street	Mawanella	Gunathilake R.M.S	30046
23	Ahamed H.M.N.	209	Vishaka Street	Mawanella	Gunathilake R.M.S	30047
24	Naveen K.L.J.	34/A	Ranasinha Street	Mawanella	Ahamed H.M.N	30048
25	Balasuriya M.J.K.	32	Mathugama Street	Kegalle	Ahamed H.M.N	30049
26	Wijitha K.L.K.K.	45	Havelock Street	Kegalle	Ahamed H.M.N	30050

**TABLE 13 : MANAGER**

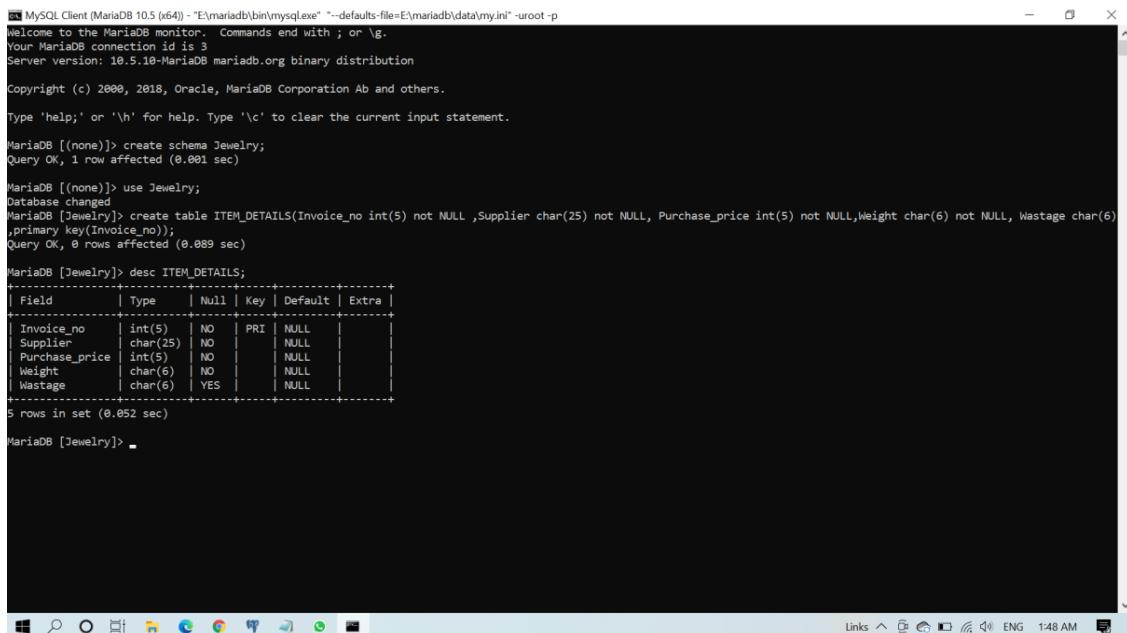
Sales rep_ID	Manager ID	Manager name
21	21	Gunathilake R.M.S
22	21	Gunathilake R.M.S
23	23	Ahamed H.M.N
24	23	Ahamed H.M.N
25	23	Ahamed H.M.N

**TABLE 14 : REFEREE**

Name of rep	Name referee
Gunathilake R.M.S	Jagath M.N.N.
Ranasinha H.N.M.	Malith D.N.K.
Ahamed H.M.N.	Jagath M.N.N.
Naveen K.L.J.	Jagath M.N.N.
Balasuriya M.J.K.	Malith D.N.K.
Wijitha K.L.K.K.	Nimal M.N.J.

# CHAPTER 4 – Implementation

## 1. Create schema



```
MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 3
Server version: 10.5.10-MariaDB mariadb.org binary distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> create schema Jewelry;
Query OK, 1 row affected (0.001 sec)

MariaDB [(none)]> use Jewelry;
Database changed
MariaDB [Jewelry]> create table ITEM_DETAILS(Invoice_no int(5) not NULL ,Supplier char(25) not NULL, Purchase_price int(5) not NULL,Weight char(6) not NULL, Wastage char(6) ,primary key(Invoice_no));
Query OK, 0 rows affected (0.009 sec)

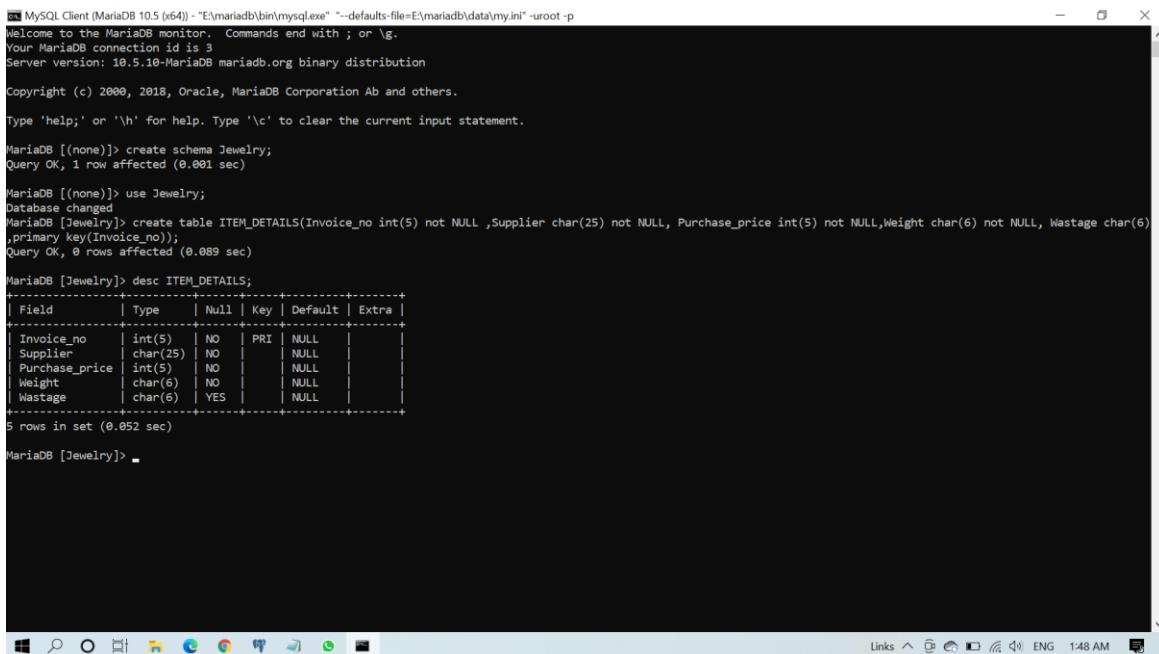
MariaDB [Jewelry]> desc ITEM_DETAILS;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| Invoice_no | int(5) | NO | PRI | NULL |
| Supplier | char(25) | NO | NULL |
| Purchase_price | int(5) | NO | NULL |
| Weight | char(6) | NO | NULL |
| Wastage | char(6) | YES | NULL |
+-----+-----+-----+-----+-----+
5 rows in set (0.052 sec)

MariaDB [Jewelry]>
```

**FIGURE 4 : CREATING SCHEMA**

## 2. Create tables

### Creating Item Details Table



```
MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 3
Server version: 10.5.10-MariaDB mariadb.org binary distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> create schema Jewelry;
Query OK, 1 row affected (0.001 sec)

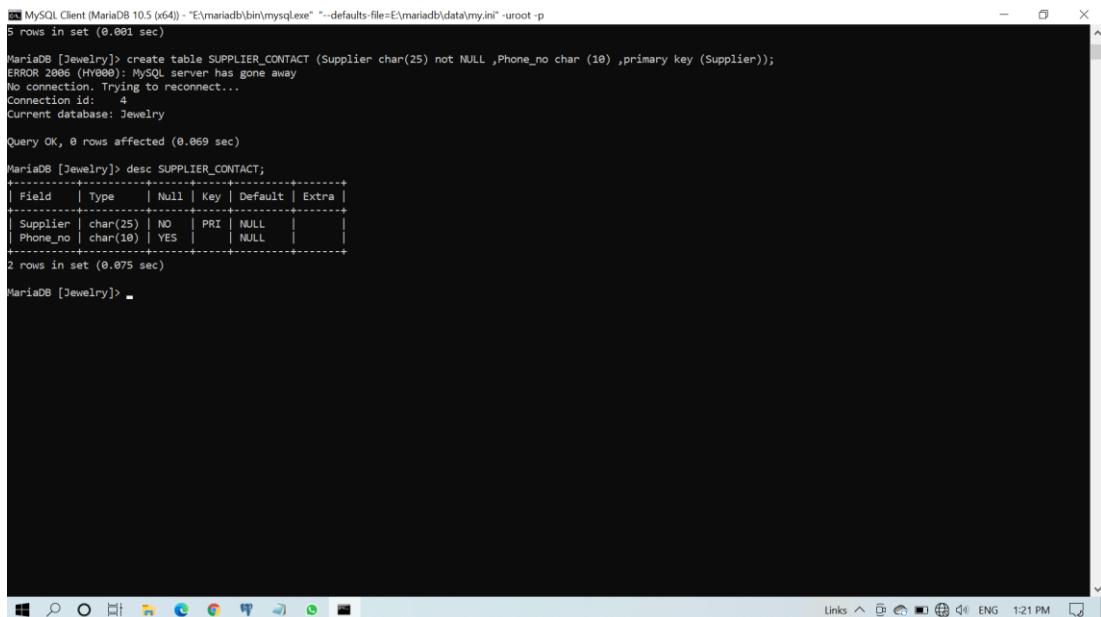
MariaDB [(none)]> use Jewelry;
Database changed
MariaDB [Jewelry]> create table ITEM_DETAILS(Invoice_no int(5) not NULL ,Supplier char(25) not NULL, Purchase_price int(5) not NULL,Weight char(6) not NULL, Wastage char(6) ,primary key(Invoice_no));
Query OK, 0 rows affected (0.009 sec)

MariaDB [Jewelry]> desc ITEM_DETAILS;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| Invoice_no | int(5) | NO | PRI | NULL |
| Supplier | char(25) | NO | NULL |
| Purchase_price | int(5) | NO | NULL |
| Weight | char(6) | NO | NULL |
| Wastage | char(6) | YES | NULL |
+-----+-----+-----+-----+-----+
5 rows in set (0.052 sec)

MariaDB [Jewelry]>
```

**FIGURE 5 : ITEM DETAILS TABLE**

## Creating Supplier Contact Table



```
MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p
5 rows in set (0.001 sec)

MariaDB [Jewelry]> create table SUPPLIER_CONTACT (Supplier char(25) not NULL ,Phone_no char (10) ,primary key (Supplier));
ERROR 2006 (HY000): MySQL server has gone away
No connection. Trying to reconnect...
Connection id: 4
current database: Jewelry

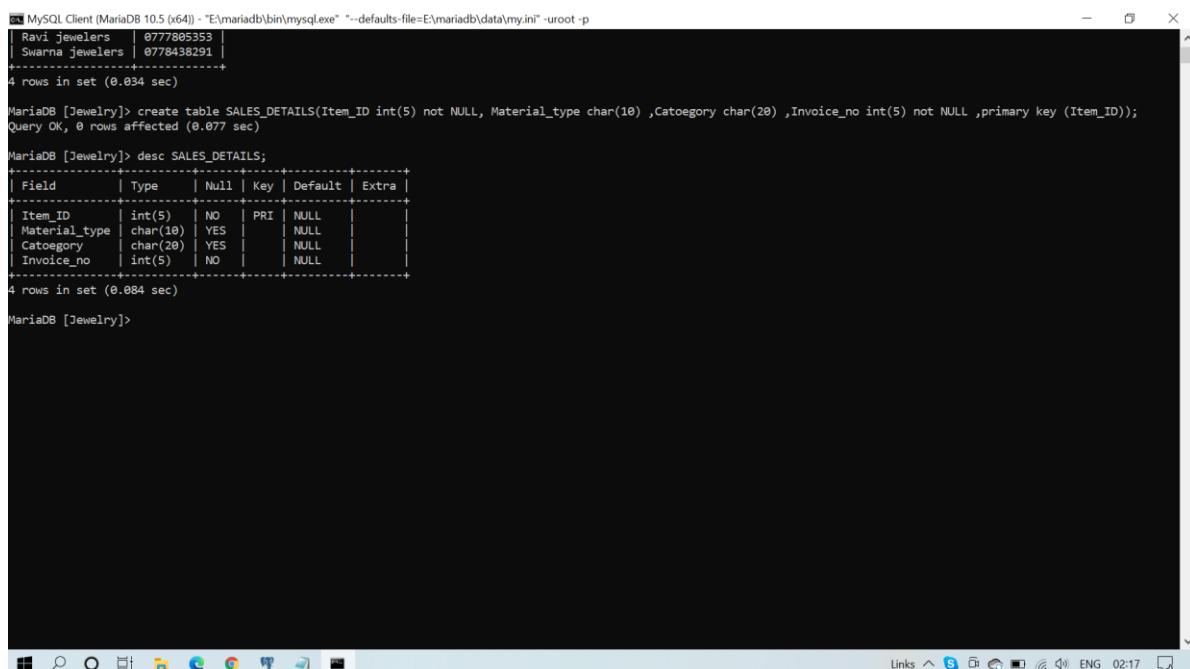
Query OK, 0 rows affected (0.069 sec)

MariaDB [Jewelry]> desc SUPPLIER_CONTACT;
+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| Supplier | char(25) | NO | PRI | NULL   |
| Phone_no | char(10) | YES |     | NULL   |
+-----+-----+-----+-----+
2 rows in set (0.075 sec)

MariaDB [Jewelry]>
```

**FIGURE 6 : SUPPLIER CONTACT TABLE**

## Create Sales Details Table



```
MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p
| Ravi jewelers | 0777805353 |
| Swarna jewelers | 0778438291 |
+-----+-----+
4 rows in set (0.034 sec)

MariaDB [Jewelry]> create table SALES_DETAILS(Item_ID int(5) not NULL, Material_type char(10) ,Catoegory char(20) ,Invoice_no int(5) not NULL ,primary key (Item_ID));
Query OK, 0 rows affected (0.077 sec)

MariaDB [Jewelry]> desc SALES_DETAILS;
+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| Item_ID | int(5) | NO | PRI | NULL   |
| Material_type | char(10) | YES |     | NULL   |
| Catoegory | char(20) | YES |     | NULL   |
| Invoice_no | int(5) | NO |     | NULL   |
+-----+-----+-----+-----+
4 rows in set (0.084 sec)

MariaDB [Jewelry]>
```

**FIGURE 7 : SALES DETAILS TABLE**

## Create Billing Detail Table

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
Enter password: \*\*\*\*  
Welcome to the MariaDB monitor. Commands end with ; or \g.  
Your MariaDB connection id is 3  
Server version: 10.5.10-MariaDB mariadb.org binary distribution  
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
MariaDB [(none)]> use Jewelry;  
Database changed  
MariaDB [Jewelry]> create table BILLING\_DETAILS(Bill\_no int(5) not NULL,Selling\_price int(10) ,Tax int(9),Date char(10),Item\_ID int(5) not NULL,primary key (Bill\_no));  
Query OK, 0 rows affected (0.042 sec)  
MariaDB [Jewelry]> desc BILLING\_DETAILS;  
+-----+-----+-----+-----+-----+  
| Field | Type | Null | Key | Default | Extra |  
+-----+-----+-----+-----+-----+  
Bill\_no	int(5)	NO	PRI	NULL
Selling\_price	int(10)	YES		NULL
Tax	int(9)	YES		NULL
Date	char(10)	YES		NULL
Item\_ID	int(5)	NO		NULL
+-----+-----+-----+-----+-----+  
5 rows in set (0.049 sec)  
MariaDB [Jewelry]>

**FIGURE 8 : BILLING DETAIL TABLE**

## Create Daily Gold Rate Table

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
MariaDB [Jewelry]> create table DAILY\_GOLD\_RATE(Date char(10) not NULL, Rate int (10) not NULL,primary key (Date));  
Query OK, 0 rows affected (0.017 sec)  
MariaDB [Jewelry]> desc DAILY\_GOLD\_RATE;  
+-----+-----+-----+-----+-----+  
| Field | Type | Null | Key | Default | Extra |  
+-----+-----+-----+-----+-----+  
| Date | char(10) | NO | PRI | NULL |  
| Rate | int(10) | NO | | NULL |  
+-----+-----+-----+-----+-----+  
2 rows in set (0.076 sec)  
MariaDB [Jewelry]>

**FIGURE 9 : DAILY GOLD RATE TABLE**

## Create Customer Table

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
MariaDB [Jewelry]> create table CUSTOMER(Customer\_ID int(12) not NULL,Date\_of\_birth char(10) ,Phone\_no int(10),Bill\_no int(5) not NULL,primary key (Customer\_ID));  
Query OK, 0 rows affected (0.069 sec)  
MariaDB [Jewelry]> desc CUSTOMER;  
+-----+-----+-----+-----+-----+  
| Field | Type | Null | Key | Default | Extra |  
+-----+-----+-----+-----+-----+  
Customer\_ID	int(12)	NO	PRI	NULL
Date\_of\_birth	char(10)	YES	NULL	
Phone\_no	int(10)	YES	NULL	
Bill\_no	int(5)	NO	NULL	
+-----+-----+-----+-----+  
4 rows in set (0.072 sec)  
MariaDB [Jewelry]>

**FIGURE 10 : CUSTOMER TABLE**

## Create Payment Table

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
Enter password: \*\*\*\*  
Welcome to the MariaDB monitor. Commands end with ; or \g.  
Your MariaDB connection id is 3  
Server version: 10.5.10-MariaDB mariadb.org binary distribution  
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
MariaDB [(none)]> use Jewelry;  
Database changed  
MariaDB [Jewelry]> create table PAYMENT(Date char(10) not NULL,Time char(5),Payment\_type char(20),Amount int(10),Customer\_ID int(12) not NULL,primary key(Date,Time));  
Query OK, 0 rows affected (0.071 sec)  
MariaDB [Jewelry]> desc PAYMENT;  
+-----+-----+-----+-----+-----+  
| Field | Type | Null | Key | Default | Extra |  
+-----+-----+-----+-----+-----+  
Date	char(10)	NO	PRI	NULL
Time	char(5)	NO	PRI	NULL
Payment\_type	char(20)	YES	NULL	
Amount	int(10)	YES	NULL	
Customer\_ID	int(12)	NO	NULL	
+-----+-----+-----+-----+  
5 rows in set (0.079 sec)  
MariaDB [Jewelry]>

**FIGURE 11 : PAYMENT TABLE**

## Create Sales Representation Table

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
MariaDB [Jewelry]> create table SALES\_RESPRESENTATION(Employ\_ID int(6) not NULL,Name char(20),Address\_no char(5),street char(15),City char(10),Manager char(20),Item\_ID int(5) not NULL,primary key(Employ\_ID));  
Query OK, 0 rows affected (0.115 sec)  
MariaDB [Jewelry]> desc SALES\_RESPRESENTATION;  
+-----+-----+-----+-----+-----+-----+  
| Field | Type | Null | Key | Default | Extra |  
+-----+-----+-----+-----+-----+-----+  
Employ\_ID	int(6)	NO	PRI	NULL
Name	char(20)	YES	NULL	
Address\_no	char(5)	YES	NULL	
street	char(15)	YES	NULL	
City	char(10)	YES	NULL	
Manager	char(20)	YES	NULL	
Item\_ID	int(5)	NO	NULL	
+-----+-----+-----+-----+-----+  
7 rows in set (0.049 sec)  
MariaDB [Jewelry]>

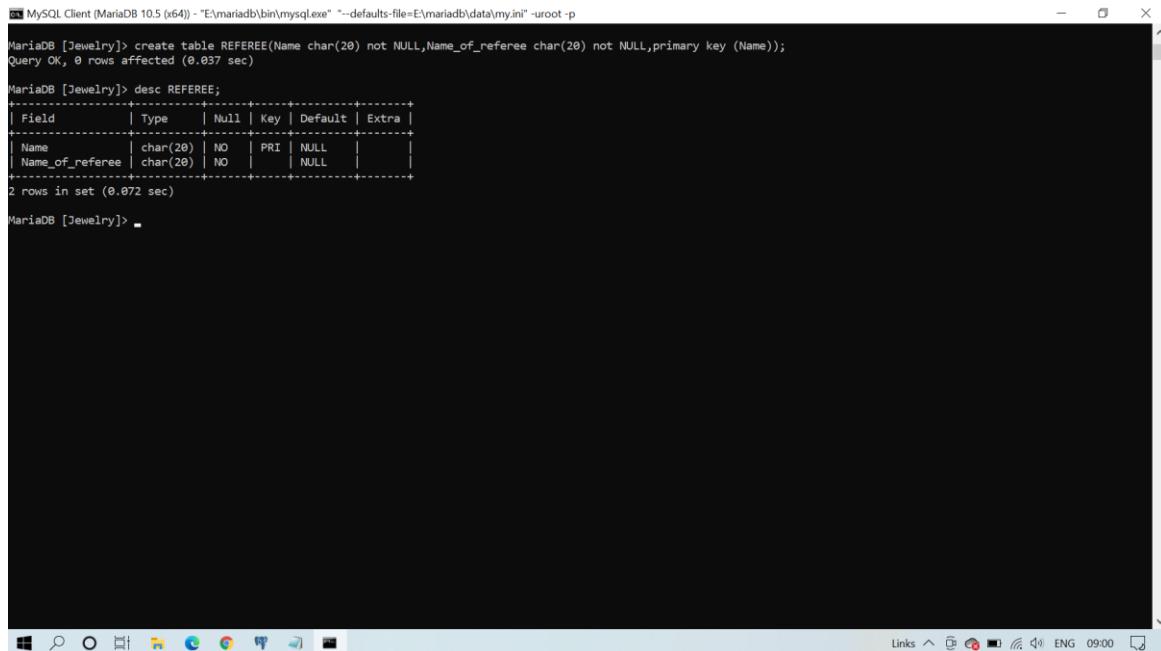
**FIGURE 12 : SALES REPRESENTATION TABLE**

## Create Sales Rep Contact Table

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
MariaDB [Jewelry]> create table SALES REP\_CONTACT(Phone\_no char(10) not NULL,Employ\_ID int(6) not NULL,primary key (Phone\_no));  
Query OK, 0 rows affected (0.071 sec)  
MariaDB [Jewelry]> dsec SALES REP\_CONTACT;  
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MariaDB server version for the right syntax to use near 'dsec SALES REP\_CONTACT' at line 1  
MariaDB [Jewelry]> desc SALES REP\_CONTACT;  
+-----+-----+-----+-----+-----+  
| Field | Type | Null | Key | Default | Extra |  
+-----+-----+-----+-----+-----+  
| Phone\_no | char(10) | NO | PRI | NULL |  
| Employ\_ID | int(6) | NO | NULL |  
+-----+-----+-----+-----+  
2 rows in set (0.071 sec)  
MariaDB [Jewelry]>

**FIGURE 13 : SALES REP CONTACT TABLE**

## Create Referee Table



The screenshot shows a MySQL Client window with the following command history:

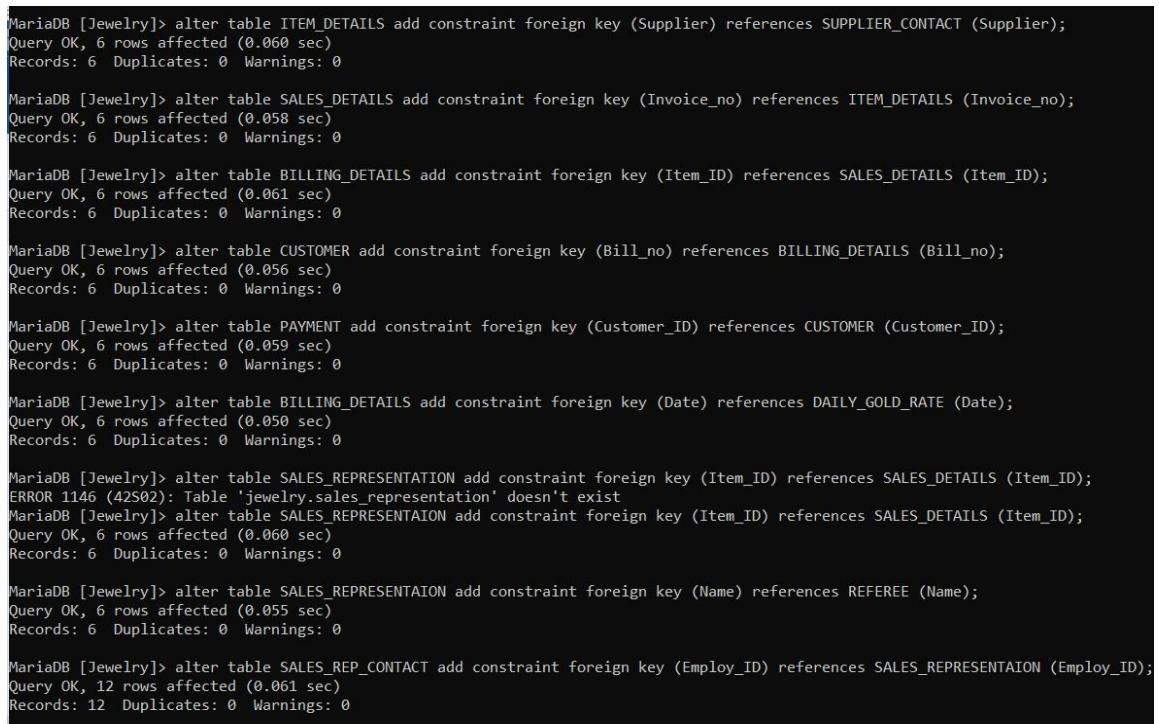
```
MariaDB [Jewelry]> create table REFEREE(Name char(20) not NULL,Name_of_referee char(20) not NULL,primary key (Name));
Query OK, 0 rows affected (0.037 sec)

MariaDB [Jewelry]> desc REFEREE;
+-----+-----+-----+-----+
| Field | Type  | Null | Key  | Default | Extra |
+-----+-----+-----+-----+
| Name  | char(20)| NO   | PRI  | NULL    |          |
| Name_of_referee | char(20)| NO   |      | NULL    |          |
+-----+-----+-----+-----+
2 rows in set (0.072 sec)

MariaDB [Jewelry]>
```

**FIGURE 14 : REFEREE TABLE**

Add foreign key constraint to link the table each other.



The screenshot shows a MySQL Client window with the following command history, demonstrating the addition of foreign key constraints:

```
MariaDB [Jewelry]> alter table ITEM_DETAILS add constraint foreign key (Supplier) references SUPPLIER_CONTACT (Supplier);
Query OK, 6 rows affected (0.060 sec)
Records: 6  Duplicates: 0  Warnings: 0

MariaDB [Jewelry]> alter table SALES_DETAILS add constraint foreign key (Invoice_no) references ITEM_DETAILS (Invoice_no);
Query OK, 6 rows affected (0.058 sec)
Records: 6  Duplicates: 0  Warnings: 0

MariaDB [Jewelry]> alter table BILLING_DETAILS add constraint foreign key (Item_ID) references SALES_DETAILS (Item_ID);
Query OK, 6 rows affected (0.061 sec)
Records: 6  Duplicates: 0  Warnings: 0

MariaDB [Jewelry]> alter table CUSTOMER add constraint foreign key (Bill_no) references BILLING_DETAILS (Bill_no);
Query OK, 6 rows affected (0.056 sec)
Records: 6  Duplicates: 0  Warnings: 0

MariaDB [Jewelry]> alter table PAYMENT add constraint foreign key (Customer_ID) references CUSTOMER (Customer_ID);
Query OK, 6 rows affected (0.059 sec)
Records: 6  Duplicates: 0  Warnings: 0

MariaDB [Jewelry]> alter table BILLING_DETAILS add constraint foreign key (Date) references DAILY_GOLD_RATE (Date);
Query OK, 6 rows affected (0.050 sec)
Records: 6  Duplicates: 0  Warnings: 0

MariaDB [Jewelry]> alter table SALES REPRESENTATION add constraint foreign key (Item_ID) references SALES_DETAILS (Item_ID);
ERROR 1146 (42S02): Table 'jewelry.sales_representation' doesn't exist
MariaDB [Jewelry]> alter table SALES REPRESENTATION add constraint foreign key (Item_ID) references SALES_DETAILS (Item_ID);
Query OK, 6 rows affected (0.060 sec)
Records: 6  Duplicates: 0  Warnings: 0

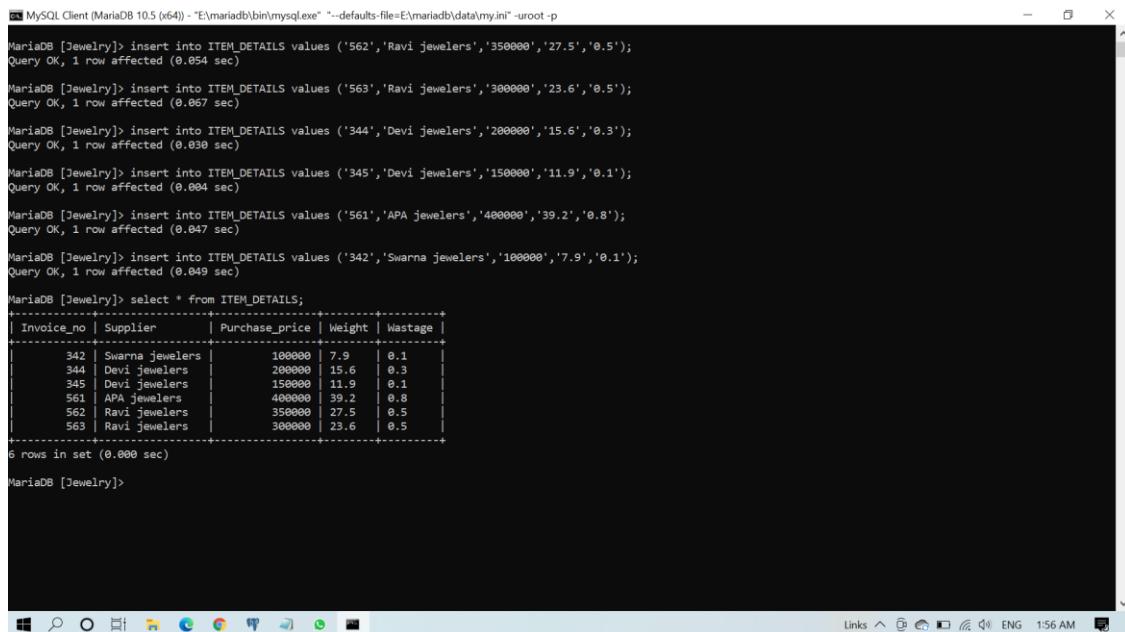
MariaDB [Jewelry]> alter table SALES REPRESENTATION add constraint foreign key (Name) references REFEREE (Name);
Query OK, 6 rows affected (0.055 sec)
Records: 6  Duplicates: 0  Warnings: 0

MariaDB [Jewelry]> alter table SALES REP CONTACT add constraint foreign key (Employ_ID) references SALES REPRESENTATION (Employ_ID);
Query OK, 12 rows affected (0.061 sec)
Records: 12  Duplicates: 0  Warnings: 0
```

**FIGURE 15 : ADD FOREIGN KEY CONSTRAINT**

### 3. Insert Operation

#### Insert Item Details



MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

```
MariaDB [Jewelry]> insert into ITEM_DETAILS values ('562','Ravi jewelers','350000','27.5','0.5');
Query OK, 1 row affected (0.054 sec)

MariaDB [Jewelry]> insert into ITEM_DETAILS values ('563','Ravi jewelers','300000','23.6','0.5');
Query OK, 1 row affected (0.067 sec)

MariaDB [Jewelry]> insert into ITEM_DETAILS values ('344','Devi jewelers','200000','15.6','0.3');
Query OK, 1 row affected (0.030 sec)

MariaDB [Jewelry]> insert into ITEM_DETAILS values ('345','Devi jewelers','150000','11.9','0.1');
Query OK, 1 row affected (0.004 sec)

MariaDB [Jewelry]> insert into ITEM_DETAILS values ('561','APA jewelers','400000','39.2','0.8');
Query OK, 1 row affected (0.047 sec)

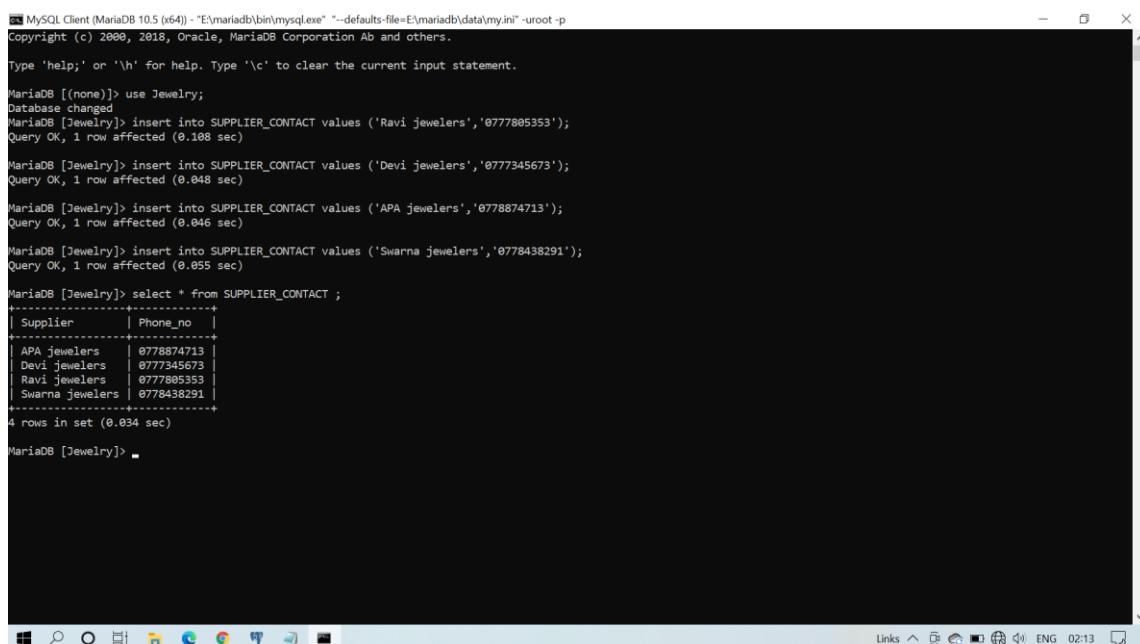
MariaDB [Jewelry]> insert into ITEM_DETAILS values ('342','Swarna jewelers','100000','7.9','0.1');
Query OK, 1 row affected (0.049 sec)

MariaDB [Jewelry]> select * from ITEM_DETAILS;
+-----+-----+-----+-----+
| Invoice_no | Supplier      | Purchase_price | Weight | Wastage |
+-----+-----+-----+-----+
| 342 | Swarna jewelers | 100000 | 7.9   | 0.1    |
| 344 | Devi jewelers  | 200000 | 15.6  | 0.3    |
| 345 | Devi jewelers  | 150000 | 11.9  | 0.1    |
| 561 | APA jewelers   | 400000 | 39.2  | 0.8    |
| 562 | Ravi jewelers  | 350000 | 27.5  | 0.5    |
| 563 | Ravi jewelers  | 300000 | 23.6  | 0.5    |
+-----+-----+-----+-----+
6 rows in set (0.000 sec)

MariaDB [Jewelry]>
```

**FIGURE 16 : INSERT OPERATION OF THE ITEM DETAILS TABLE**

#### Insert Supplier Contact



MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

```
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> use Jewelry;
Database changed
MariaDB [Jewelry]> insert into SUPPLIER_CONTACT values ('Ravi jewelers','0777805353');
Query OK, 1 row affected (0.108 sec)

MariaDB [Jewelry]> insert into SUPPLIER_CONTACT values ('Devi jewelers','0777345673');
Query OK, 1 row affected (0.048 sec)

MariaDB [Jewelry]> insert into SUPPLIER_CONTACT values ('APA jewelers','0778874713');
Query OK, 1 row affected (0.046 sec)

MariaDB [Jewelry]> insert into SUPPLIER_CONTACT values ('Swarna jewelers','0778438291');
Query OK, 1 row affected (0.055 sec)

MariaDB [Jewelry]> select * from SUPPLIER_CONTACT ;
+-----+-----+
| Supplier      | Phone_no |
+-----+-----+
| APA jewelers  | 0778874713 |
| Devi jewelers | 0777345673 |
| Ravi jewelers | 0777805353 |
| Swarna jewelers | 0778438291 |
+-----+-----+
4 rows in set (0.034 sec)

MariaDB [Jewelry]>
```

**FIGURE 17 : INSERT OPERATION OF THE SUPPLIER CONTACT TABLE**

## Insert Sales Details

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

Field	Type	Null	Key	Default	Extra
Item_ID	int(5)	NO	PRI	NULL	
Material_type	char(10)	YES		NULL	
Catogery	char(20)	YES		NULL	
Invoice_no	int(5)	NO		NULL	

4 rows in set (0.084 sec)

```
MariaDB [Jewelry]> insert into SALES_DETAILS values ('30045','21K gold','Box chain','562');
Query OK, 1 row affected (0.023 sec)

MariaDB [Jewelry]> insert into SALES_DETAILS values ('30046','22K gold','Rope chain','563');
Query OK, 1 row affected (0.049 sec)

MariaDB [Jewelry]> insert into SALES_DETAILS values ('30047','21K gold','Bangle','344');
Query OK, 1 row affected (0.049 sec)

MariaDB [Jewelry]> insert into SALES_DETAILS values ('30048','21K gold','Pendant','345');
Query OK, 1 row affected (0.056 sec)

MariaDB [Jewelry]> insert into SALES_DETAILS values ('30049','18K gold','Lock Bangle','561');
Query OK, 1 row affected (0.046 sec)

MariaDB [Jewelry]> insert into SALES_DETAILS values ('30050','20K gold','Earing','342');
Query OK, 1 row affected (0.004 sec)

MariaDB [Jewelry]> select * from SALES_DETAILS ;
+-----+-----+-----+
| Item_ID | Material_type | Catogery | Invoice_no |
+-----+-----+-----+
| 30045 | 21K gold     | Box chain |      562 |
| 30046 | 22K gold     | Rope chain |      563 |
| 30047 | 21K gold     | Bangle    |      344 |
| 30048 | 21K gold     | Pendant   |      345 |
| 30049 | 18K gold     | Lock Bangle |    561 |
| 30050 | 20K gold     | Earing    |      342 |
+-----+-----+-----+
6 rows in set (0.001 sec)
```

MariaDB [Jewelry]>

**FIGURE 18 : INSERT OPERATION OF THE SALES DETAILS TABLE**

## Insert Billing Details

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

Selling_price	int(10)	YES	NULL		
Tax	int(9)	YES	NULL		
Date	char(10)	YES	NULL		
Item_ID	int(5)	NO	NULL		

5 rows in set (0.049 sec)

```
MariaDB [Jewelry]> insert into BILLING_DETAILS values ('234','330000','330000','01-01-2020','30046');
Query OK, 1 row affected (0.090 sec)

MariaDB [Jewelry]> insert into BILLING_DETAILS values ('235','161000','161000','03-01-2020','30048');
Query OK, 1 row affected (0.057 sec)

MariaDB [Jewelry]> insert into BILLING_DETAILS values ('236','112000','112000','04-01-2020','30050')
-> \c
MariaDB [Jewelry]> insert into BILLING_DETAILS values ('236','112000','112000','04-01-2020','30050');
Query OK, 1 row affected (0.050 sec)

MariaDB [Jewelry]> insert into BILLING_DETAILS values ('237','370000','370000','07-01-2020','30045');
Query OK, 1 row affected (0.002 sec)

MariaDB [Jewelry]> insert into BILLING_DETAILS values ('238','450000','450000','09-01-2020','30049');
Query OK, 1 row affected (0.017 sec)

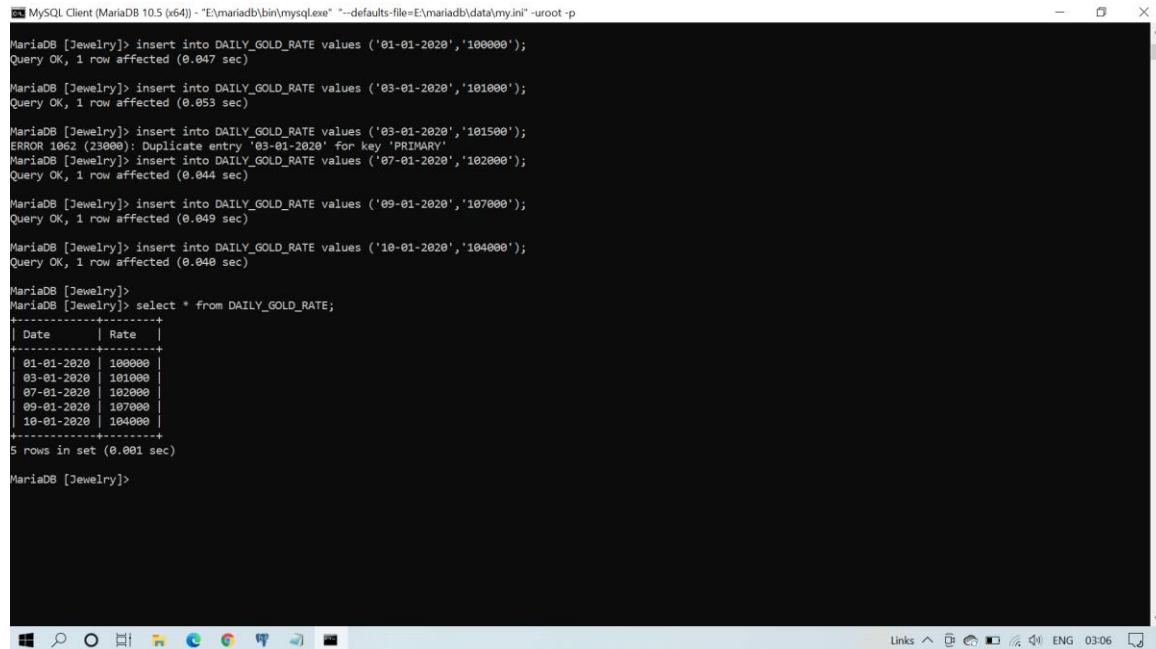
MariaDB [Jewelry]> insert into BILLING_DETAILS values ('239','210000','210000','10-01-2020','30047');
Query OK, 1 row affected (0.004 sec)

MariaDB [Jewelry]> select * from BILLING_DETAILS ;
+-----+-----+-----+-----+-----+
| Bill_no | Selling_price | Tax | Date | Item_ID |
+-----+-----+-----+-----+-----+
| 234 | 330000 | 330000 | 01-01-2020 | 30046 |
| 235 | 161000 | 161000 | 03-01-2020 | 30048 |
| 236 | 112000 | 112000 | 04-01-2020 | 30050 |
| 237 | 370000 | 370000 | 07-01-2020 | 30045 |
| 238 | 450000 | 450000 | 09-01-2020 | 30049 |
| 239 | 210000 | 210000 | 10-01-2020 | 30047 |
+-----+-----+-----+-----+-----+
6 rows in set (0.000 sec)
```

MariaDB [Jewelry]>

**FIGURE 19 : INSERT OPERATION OF THE BILLING DETAILS TABLE**

## Insert Daily Gold Rate



```
MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

MariaDB [Jewelry]> insert into DAILY_GOLD_RATE values ('01-01-2020','100000');
Query OK, 1 row affected (0.047 sec)

MariaDB [Jewelry]> insert into DAILY_GOLD_RATE values ('03-01-2020','101000');
Query OK, 1 row affected (0.053 sec)

MariaDB [Jewelry]> insert into DAILY_GOLD_RATE values ('05-01-2020','101500');
ERROR 1062 (23000): Duplicate entry '05-01-2020' for key 'PRIMARY'
MariaDB [Jewelry]> insert into DAILY_GOLD_RATE values ('07-01-2020','102000');
Query OK, 1 row affected (0.044 sec)

MariaDB [Jewelry]> insert into DAILY_GOLD_RATE values ('09-01-2020','107000');
Query OK, 1 row affected (0.049 sec)

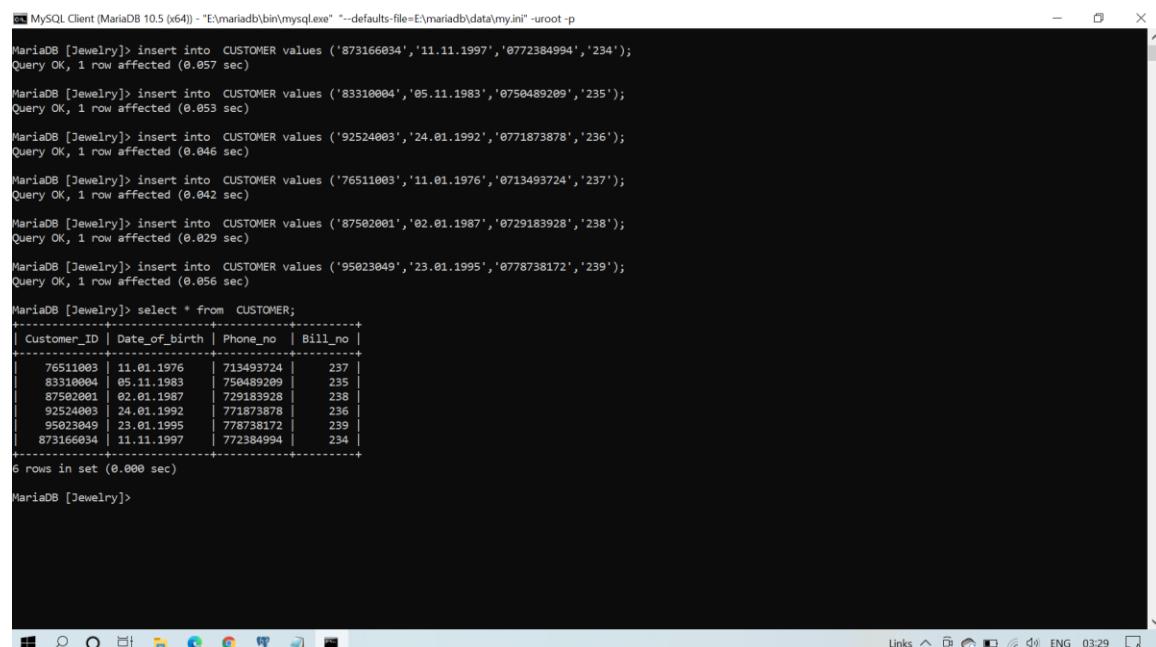
MariaDB [Jewelry]> insert into DAILY_GOLD_RATE values ('10-01-2020','104000');
Query OK, 1 row affected (0.040 sec)

MariaDB [Jewelry]>
MariaDB [Jewelry]> select * from DAILY_GOLD_RATE;
+-----+-----+
| Date | Rate |
+-----+-----+
| 01-01-2020 | 100000 |
| 03-01-2020 | 101000 |
| 05-01-2020 | 101500 |
| 07-01-2020 | 102000 |
| 09-01-2020 | 107000 |
| 10-01-2020 | 104000 |
+-----+
5 rows in set (0.001 sec)

MariaDB [Jewelry]>
```

**FIGURE 20 : INSERT OPERATION OF THE DAILY GOLD RATE TABLE**

## Insert Customer



```
MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

MariaDB [Jewelry]> insert into CUSTOMER values ('873166034','11.11.1997','0772384994','234');
Query OK, 1 row affected (0.057 sec)

MariaDB [Jewelry]> insert into CUSTOMER values ('83310004','05.11.1983','0750489269','235');
Query OK, 1 row affected (0.053 sec)

MariaDB [Jewelry]> insert into CUSTOMER values ('92524003','24.01.1992','0771873878','236');
Query OK, 1 row affected (0.046 sec)

MariaDB [Jewelry]> insert into CUSTOMER values ('76511003','11.01.1976','0713493724','237');
Query OK, 1 row affected (0.042 sec)

MariaDB [Jewelry]> insert into CUSTOMER values ('87502001','02.01.1987','0729183928','238');
Query OK, 1 row affected (0.029 sec)

MariaDB [Jewelry]> insert into CUSTOMER values ('95023049','23.01.1995','0778738172','239');
Query OK, 1 row affected (0.056 sec)

MariaDB [Jewelry]> select * from CUSTOMER;
+-----+-----+-----+-----+
| Customer_ID | Date_of_birth | Phone_no | Bill_no |
+-----+-----+-----+-----+
| 76511003 | 11.01.1976 | 713493724 | 237 |
| 83310004 | 05.11.1983 | 750489269 | 235 |
| 87562801 | 02.01.1987 | 729183928 | 238 |
| 92524003 | 24.01.1992 | 771873878 | 236 |
| 95023049 | 23.01.1995 | 77638172 | 239 |
| 873166034 | 11.11.1997 | 772384994 | 234 |
+-----+
6 rows in set (0.000 sec)

MariaDB [Jewelry]>
```

**FIGURE 21 : INSERT OPERATION OF THE CUSTOMER TABLE**

## Insert Payment

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

```
MariaDB [Jewelry]> insert into PAYMENT values('01.01.2020','10.30','cash','330000','873166034');
Query OK, 1 row affected (0.120 sec)

MariaDB [Jewelry]> insert into PAYMENT values('03.01.2020','10.50','credit card','161000','83310004');
Query OK, 1 row affected (0.033 sec)

MariaDB [Jewelry]> insert into PAYMENT values('04.01.2020','13.45','commercial visa','112000','92524003');
Query OK, 1 row affected (0.029 sec)

MariaDB [Jewelry]> insert into PAYMENT values('07.01.2020','16.34','master card','370000','76511003');
Query OK, 1 row affected (0.048 sec)

MariaDB [Jewelry]> insert into PAYMENT values('09.01.2020','08.23','credit','450000','87502001');
Query OK, 1 row affected (0.024 sec)

MariaDB [Jewelry]> insert into PAYMENT values('10.01.2020','11.46','exchange','210000','95023049');
Query OK, 1 row affected (0.004 sec)

MariaDB [Jewelry]> select * from PAYMENT;
+-----+-----+-----+-----+
| Date | Time | Payment_type | Amount | Customer_ID |
+-----+-----+-----+-----+
| 01.01.2020 | 10.30 | cash | 330000 | 873166034 |
| 03.01.2020 | 10.50 | credit card | 161000 | 83310004 |
| 04.01.2020 | 13.45 | commercial visa | 112000 | 92524003 |
| 07.01.2020 | 16.34 | master card | 370000 | 76511003 |
| 09.01.2020 | 08.23 | credit | 450000 | 87502001 |
| 10.01.2020 | 11.46 | exchange | 210000 | 95023049 |
+-----+-----+-----+-----+
6 rows in set (0.000 sec)
```

MariaDB [Jewelry]>

**FIGURE 22 : INSERT OPERATION OF THE PAYMENT TABLE**

## Insert Sales Representation

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p

```
Query OK, 1 row affected (0.007 sec)

MariaDB [jewelry]> insert into SALES_REPRESENTATION values ('22','Ranasinha','306','United Street','Mawanella','Gunathilake R.M.S','30046');
Query OK, 1 row affected (0.008 sec)

MariaDB [jewelry]> insert into SALES_REPRESENTATION values ('23','Ahamed H.M.N','209','Vishaka Street','Mawanella','Gunathilake R.M.S','30047');
Query OK, 1 row affected (0.008 sec)

MariaDB [jewelry]> insert into SALES_REPRESENTATION values ('24','Naveen H.M.N','34/A','Ranasinha Street','Mawanella','Ahamed H.M.N','30048');
ERROR 1406 (20001): Data too long for column 'street' at row 1
MariaDB [jewelry]> insert into SALES_REPRESENTATION values ('24','Naveen H.M.N','34/A','Ransiha Street','Mawanella','Ahamed H.M.N','30048');
Query OK, 1 row affected (0.007 sec)

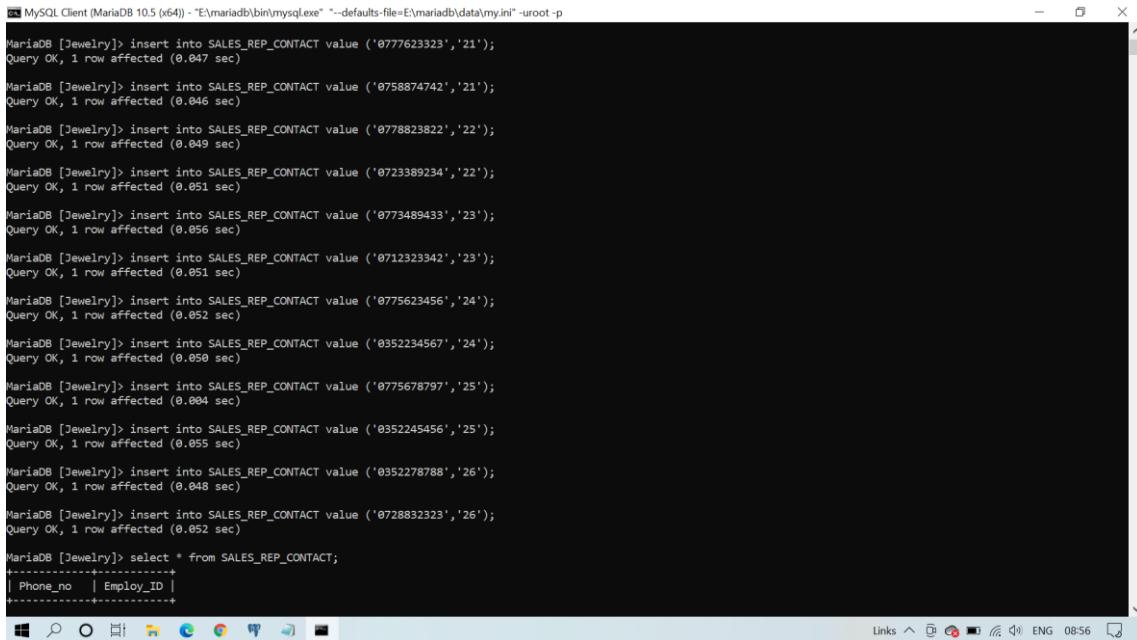
MariaDB [jewelry]> insert into SALES_REPRESENTATION values ('26','Wijitha K.L.K.K','45','Halock Street','Kegalla','Ahamed H.M.N','30050');
Query OK, 1 row affected (0.007 sec)

MariaDB [jewelry]> select * from SALES_REPRESENTATION;
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilake R.M.S. | 202 | Alipiti Street | Mawanella | Gunathilake R.M.S | 30045 |
| 22 | Ranasinha | 306 | United Street | Mawanella | Gunathilake R.M.S | 30046 |
| 23 | Ahamed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilake R.M.S | 30047 |
| 24 | Naveen H.M.N. | 34/A | Gunathilake Street | Mawanella | Ahamed H.M.N | 30048 |
| 25 | Balasuriya M.T.K. | 32 | Matuma Street | Kegalla | Ahamed H.M.N | 30049 |
| 26 | Wijitha K.L.K.K. | 45 | Halock Street | Kegalla | Ahamed H.M.N | 30050 |
+-----+-----+-----+-----+
6 rows in set (0.000 sec)
```

MariaDB [jewelry]>

**FIGURE 23 : INSERT OPERATION OF THE SALES REPRESENTATION TABLE**

## Insert Sales Rep Contact



```
c:\ MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p
MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0777623323','21');
Query OK, 1 row affected (0.047 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0758874742','21');
Query OK, 1 row affected (0.046 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0778823822','22');
Query OK, 1 row affected (0.049 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0723389234','22');
Query OK, 1 row affected (0.051 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0773489433','23');
Query OK, 1 row affected (0.056 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0712323342','23');
Query OK, 1 row affected (0.051 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0775623456','24');
Query OK, 1 row affected (0.052 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0352234567','24');
Query OK, 1 row affected (0.050 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0775678797','25');
Query OK, 1 row affected (0.084 sec)

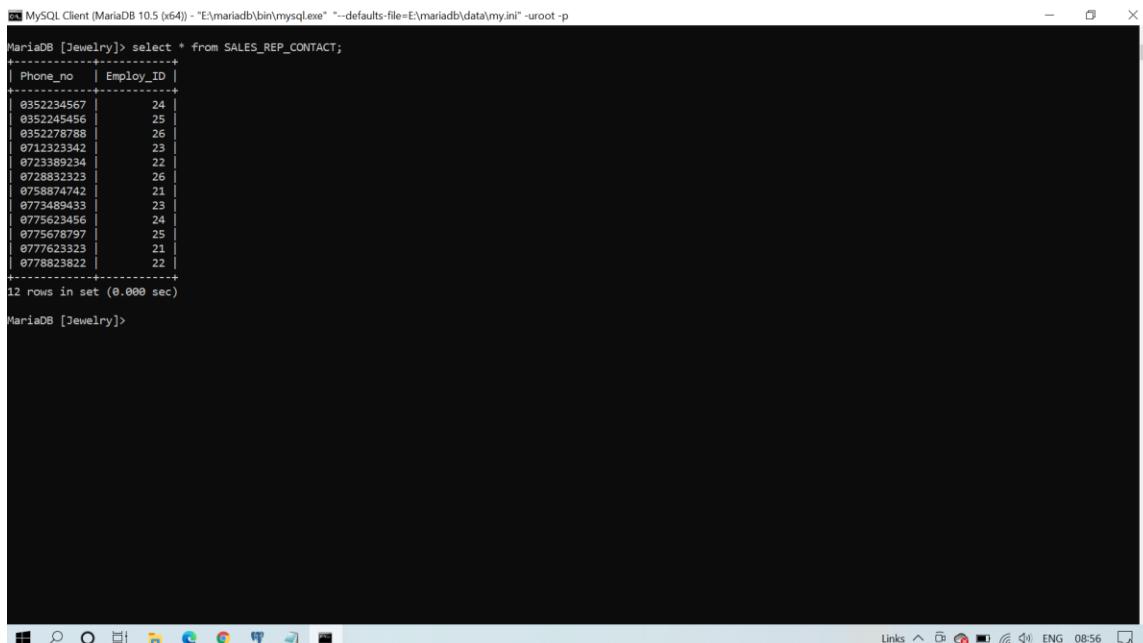
MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0352245456','25');
Query OK, 1 row affected (0.055 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0352278788','26');
Query OK, 1 row affected (0.048 sec)

MariaDB [Jewelry]> insert into SALES REP_CONTACT value ('0728832323','26');
Query OK, 1 row affected (0.052 sec)

MariaDB [Jewelry]> select * from SALES REP_CONTACT;
+-----+-----+
| Phone_no | Employ_ID |
+-----+-----+
12 rows in set (0.000 sec)
```

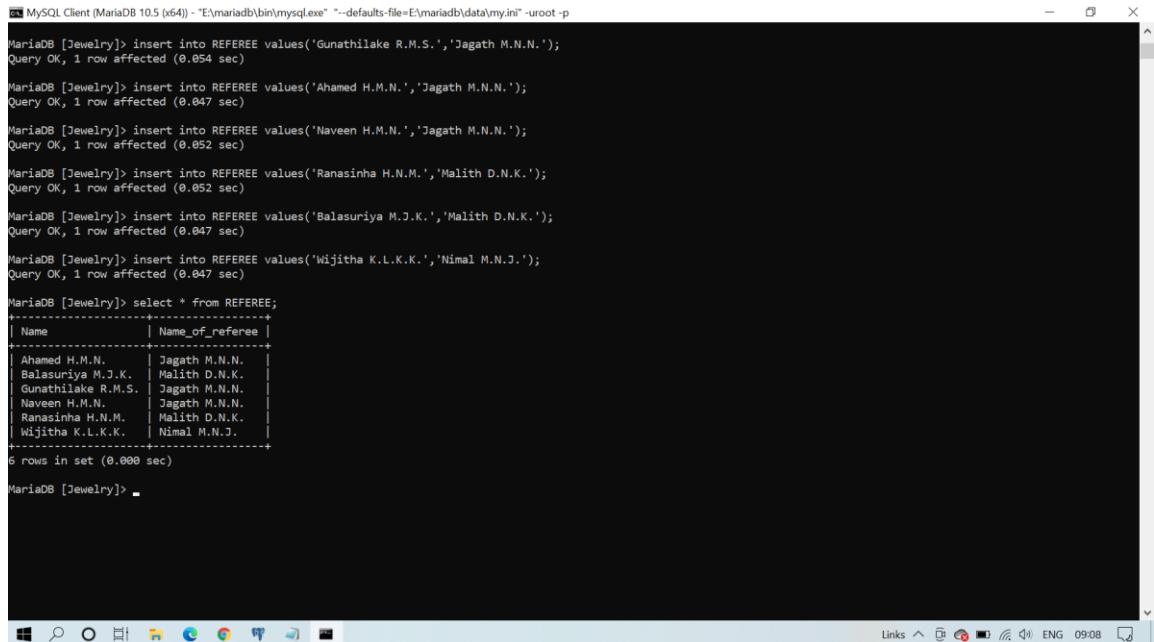
**FIGURE 24 : INSERT OPERATION 1 OF THE SALES REP CONTACT TABLE**



```
c:\ MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p
MariaDB [Jewelry]> select * from SALES REP_CONTACT;
+-----+-----+
| Phone_no | Employ_ID |
+-----+-----+
| 0352234567 | 24 |
| 0352245456 | 25 |
| 0352278788 | 26 |
| 0712323342 | 23 |
| 0723389234 | 22 |
| 0728832323 | 26 |
| 0758874742 | 21 |
| 0773489433 | 23 |
| 0775623456 | 24 |
| 0775678797 | 25 |
| 0777623323 | 21 |
| 0778823822 | 22 |
+-----+-----+
12 rows in set (0.000 sec)
```

**FIGURE 25 : INSERT OPERATION 2 OF THE SALES REP CONTACT TABLE**

## Insert Referee



MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

```
MariaDB [Jewelry]> insert into REFEREE values('Gunathilake R.M.S.', 'Jagath M.N.N.');
Query OK, 1 row affected (0.054 sec)

MariaDB [Jewelry]> insert into REFEREE values('Ahamed H.M.N.', 'Jagath M.N.N.');
Query OK, 1 row affected (0.047 sec)

MariaDB [Jewelry]> insert into REFEREE values('Naveen H.M.N.', 'Jagath M.N.N.');
Query OK, 1 row affected (0.052 sec)

MariaDB [Jewelry]> insert into REFEREE values('Ranasinha H.N.M.', 'Malith D.N.K.');
Query OK, 1 row affected (0.052 sec)

MariaDB [Jewelry]> insert into REFEREE values('Balasuriya M.J.K.', 'Malith D.N.K.');
Query OK, 1 row affected (0.047 sec)

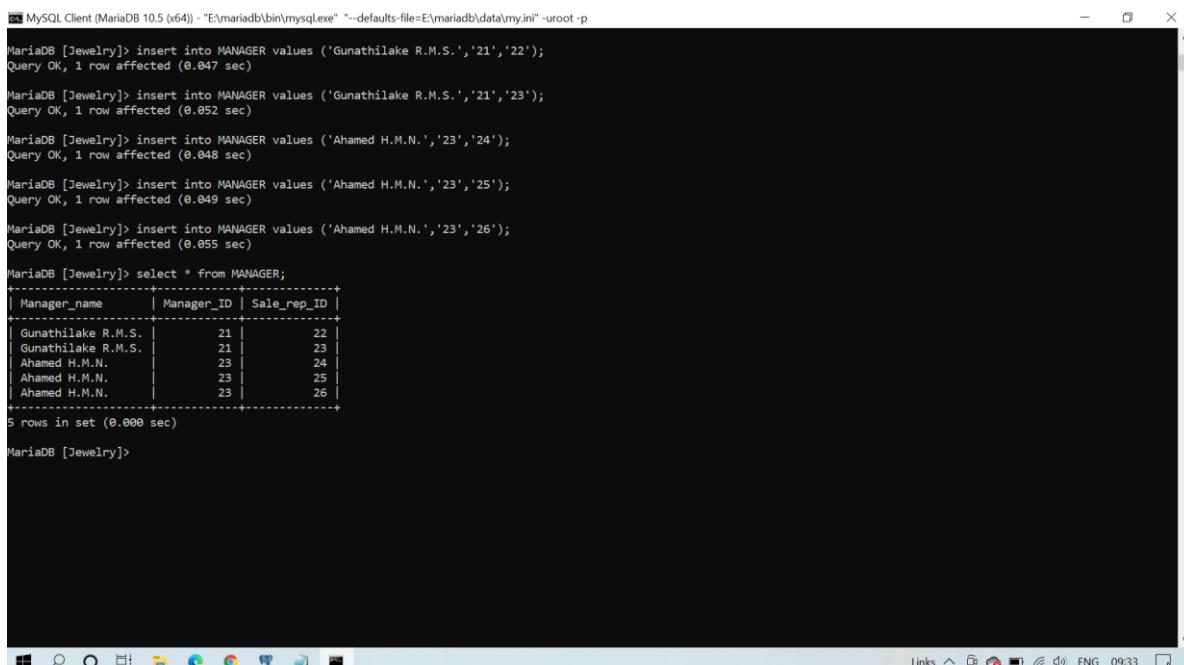
MariaDB [Jewelry]> insert into REFEREE values('Wijitha K.L.K.K.', 'Nimal M.N.J.');
Query OK, 1 row affected (0.047 sec)

MariaDB [Jewelry]> select * from REFEREE;
+-----+-----+
| Name | Name_of_referee |
+-----+-----+
| Ahamed H.M.N. | Jagath M.N.N. |
| Balasuriya M.J.K. | Malith D.N.K. |
| Gunathilake R.M.S. | Jagath M.N.N. |
| Naveen H.M.N. | Jagath M.N.N. |
| Ranasinha H.N.M. | Malith D.N.K. |
| Wijitha K.L.K.K. | Nimal M.N.J. |
+-----+-----+
6 rows in set (0.000 sec)

MariaDB [Jewelry]>
```

**FIGURE 26 : INSERT OPERATION OF THE REFEREE TABLE**

## Insert Manager



MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

```
MariaDB [Jewelry]> insert into MANAGER values ('Gunathilake R.M.S.', '21', '22');
Query OK, 1 row affected (0.047 sec)

MariaDB [Jewelry]> insert into MANAGER values ('Gunathilake R.M.S.', '21', '23');
Query OK, 1 row affected (0.052 sec)

MariaDB [Jewelry]> insert into MANAGER values ('Ahamed H.M.N.', '23', '24');
Query OK, 1 row affected (0.048 sec)

MariaDB [Jewelry]> insert into MANAGER values ('Ahamed H.M.N.', '23', '25');
Query OK, 1 row affected (0.049 sec)

MariaDB [Jewelry]> insert into MANAGER values ('Ahamed H.M.N.', '23', '26');
Query OK, 1 row affected (0.055 sec)

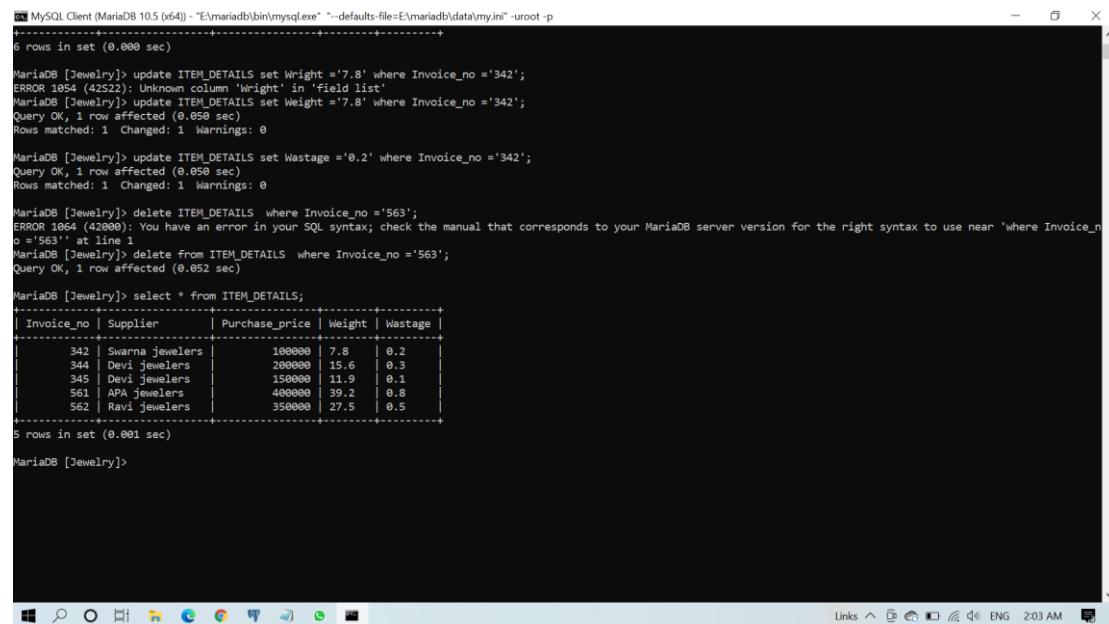
MariaDB [Jewelry]> select * from MANAGER;
+-----+-----+-----+
| Manager_name | Manager_ID | Sale_rep_ID |
+-----+-----+-----+
| Gunathilake R.M.S. | 21 | 22 |
| Gunathilake R.M.S. | 21 | 23 |
| Ahamed H.M.N. | 23 | 24 |
| Ahamed H.M.N. | 23 | 25 |
| Ahamed H.M.N. | 23 | 26 |
+-----+-----+-----+
5 rows in set (0.000 sec)

MariaDB [Jewelry]>
```

**FIGURE 27 : INSERT OPERATION OF THE MANAGER TABLE**

### 3. Update and Delete Operation

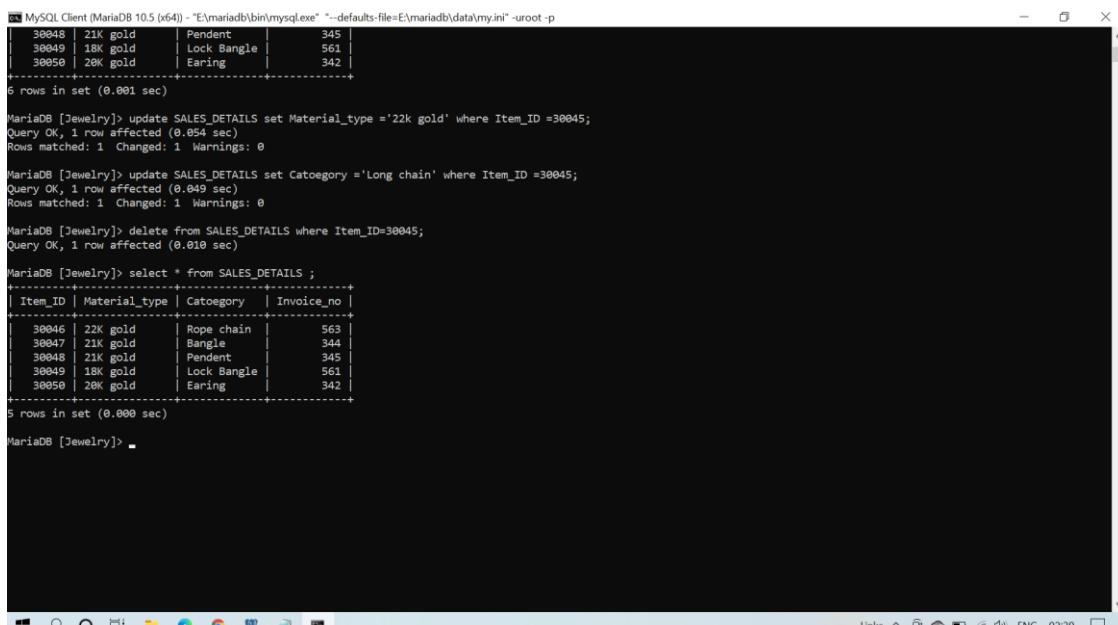
#### Update and Delete Item Details



MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
+-----+  
6 rows in set (0.000 sec)  
  
MariaDB [Jewelry]> update ITEM\_DETAILS set Wright ='7.8' where Invoice\_no ='342';  
ERROR 1054 (42S22): Unknown column 'Wright' in 'field list'  
MariaDB [Jewelry]> update ITEM\_DETAILS set Weight ='7.8' where Invoice\_no ='342';  
Query OK, 1 row affected (0.050 sec)  
Rows matched: 1 Changed: 1 Warnings: 0  
  
MariaDB [Jewelry]> update ITEM\_DETAILS set Wastage ='0.2' where Invoice\_no ='342';  
Query OK, 1 row affected (0.050 sec)  
Rows matched: 1 Changed: 1 Warnings: 0  
  
MariaDB [Jewelry]> delete ITEM\_DETAILS where Invoice\_no ='563';  
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MariaDB server version for the right syntax to use near 'where Invoice\_n  
o ='563'' at line 1  
MariaDB [Jewelry]> delete from ITEM\_DETAILS where Invoice\_no ='563';  
Query OK, 1 row affected (0.052 sec)  
  
MariaDB [Jewelry]> select \* from ITEM\_DETAILS;  
+-----+  
| Invoice\_no | Supplier | Purchase\_price | Weight | Wastage |  
+-----+  
342	Swarna jewelers	100000	7.8	0.2
344	Devi jewelers	200000	15.6	0.3
345	Devi jewelers	150000	11.9	0.1
561	APA jewelers	400000	39.2	0.8
562	Ravi jewelers	350000	27.5	0.5
+-----+  
5 rows in set (0.001 sec)  
  
MariaDB [Jewelry]>

**FIGURE 28 : UPDATE AND DELETE OPERATION OF THE ITEM DETAILS TABLE**

#### Update Sales Details



MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
+-----+  
6 rows in set (0.001 sec)  
  
MariaDB [Jewelry]> update SALES\_DETAILS set Material\_type ='22k gold' where Item\_ID =30045;  
Query OK, 1 row affected (0.054 sec)  
Rows matched: 1 Changed: 1 Warnings: 0  
  
MariaDB [Jewelry]> update SALES\_DETAILS set Cateogory ='Long chain' where Item\_ID =30045;  
Query OK, 1 row affected (0.049 sec)  
Rows matched: 1 Changed: 1 Warnings: 0  
  
MariaDB [Jewelry]> delete from SALES\_DETAILS where Item\_ID=30045;  
Query OK, 1 row affected (0.010 sec)  
  
MariaDB [Jewelry]> select \* from SALES\_DETAILS ;  
+-----+  
| Item\_ID | Material\_type | Cateogory | Invoice\_no |  
+-----+  
30046	21K gold	Pendent	345
30049	18K gold	Lock Bangle	561
30050	20K gold	Earing	342
+-----+  
5 rows in set (0.000 sec)  
  
MariaDB [Jewelry]>

**FIGURE 29 : UPDATE AND DELETE OPERATION OF THE SALES DETAILS TABLE**

## Update and Delete Billing Details

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

```
MariaDB [Jewelry]> update BILLING_DETAILS set Date ='02-01-2020' where Bill_no=234;
Query OK, 1 row affected (0.057 sec)
Rows matched: 1 Changed: 1 Warnings: 0

MariaDB [Jewelry]> update BILLING_DETAILS set Date ='05-01-2020' where Bill_no=236;
Query OK, 1 row affected (0.022 sec)
Rows matched: 1 Changed: 1 Warnings: 0

MariaDB [Jewelry]> delete from BILLING_DETAILS where Bill_no=235;
Query OK, 1 row affected (0.019 sec)

MariaDB [Jewelry]> select * from BILLING_DETAILS;
+----+-----+-----+-----+
| Bill_no | Selling_price | Tax | Date |
+----+-----+-----+-----+
| 234 | 330000 | 33000 | 02-01-2020 | 30045 |
| 236 | 112000 | 11200 | 05-01-2020 | 30059 |
| 237 | 370000 | 37000 | 07-01-2020 | 30045 |
| 238 | 450000 | 45000 | 09-01-2020 | 30049 |
| 239 | 210000 | 21000 | 10-01-2020 | 30047 |
+----+-----+-----+-----+
5 rows in set (0.001 sec)

MariaDB [Jewelry]> .
```

**FIGURE 30 : UPDATE AND DELETE OPERATION OF THE BILLING DETAILS TABLE**

## Update and Delete Daily Gold Rate

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p

```
MariaDB [Jewelry]> alter table DAILY_GOLD_RATE drop primary key;
Query OK, 5 rows affected (0.169 sec)
Records: 5 Duplicates: 0 Warnings: 0

MariaDB [Jewelry]> alter table DAILY_GOLD_RATE add primary key (Rate);
Query OK, 0 rows affected (0.138 sec)
Records: 0 Duplicates: 0 Warnings: 0

MariaDB [Jewelry]> desc DAILY_GOLD_RATE;
+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| Date | char(10) | NO | NO | NULL |          |
| Rate | int(10) | NO | PRI | NULL |          |
+-----+-----+-----+-----+
2 rows in set (0.044 sec)

MariaDB [Jewelry]> update DAILY_GOLD_RATE set Date ='02-01-2020' where Rate='100000';
Query OK, 1 row affected (0.057 sec)
Rows matched: 1 Changed: 1 Warnings: 0

MariaDB [Jewelry]> update DAILY_GOLD_RATE set Date ='05-01-2020' where Rate='101500';
Query OK, 0 rows affected (0.000 sec)
Rows matched: 0 Changed: 0 Warnings: 0

MariaDB [Jewelry]> alter table DAILY_GOLD_RATE drop primary key;
Query OK, 5 rows affected (0.185 sec)
Records: 5 Duplicates: 0 Warnings: 0

MariaDB [Jewelry]> alter table DAILY_GOLD_RATE add primary key (Date);
Query OK, 0 rows affected (0.172 sec)
Records: 0 Duplicates: 0 Warnings: 0

MariaDB [Jewelry]> desc DAILY_GOLD_RATE;
+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+
| Date | char(10) | NO | PRI | NULL |          |
| Rate | int(10) | NO | NO | NULL |          |
+-----+-----+-----+-----+
2 rows in set (0.065 sec)
```

**FIGURE 31 : UPDATE AND DELETE OPERATION 1 OF THE DAILY GOLD RATE TABLE**

```

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p
MariaDB [Jewelry]> delete from DAILY_GOLD_RATE where Date='02-01-2020';
Query OK, 1 row affected (0.021 sec)

MariaDB [Jewelry]> select * from DAILY_GOLD_RATE;
+-----+-----+
| Date      | Rate   |
+-----+-----+
| 03-01-2020 | 101000 |
| 07-01-2020 | 102000 |
| 09-01-2020 | 107000 |
| 10-01-2020 | 104000 |
+-----+-----+
4 rows in set (0.000 sec)

MariaDB [Jewelry]>

```

**FIGURE 32 : UPDATE AND DELETE OPERATION 2 OF THE DAILY GOLD RATE TABLE**

### Update and Delete Customer

```

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p
MariaDB [Jewelry]> update CUSTOMER set Phone_no='0778845654' where Customer_ID=76511003;
Query OK, 1 row affected (0.048 sec)
Rows matched: 1 Changed: 1 Warnings: 0

MariaDB [Jewelry]> update CUSTOMER set Phone_no='0778874714' where Customer_ID=83310004;
Query OK, 1 row affected (0.047 sec)
Rows matched: 1 Changed: 1 Warnings: 0

MariaDB [Jewelry]> delete from CUSTOMER where Customer_ID=873166034;
Query OK, 1 row affected (0.010 sec)

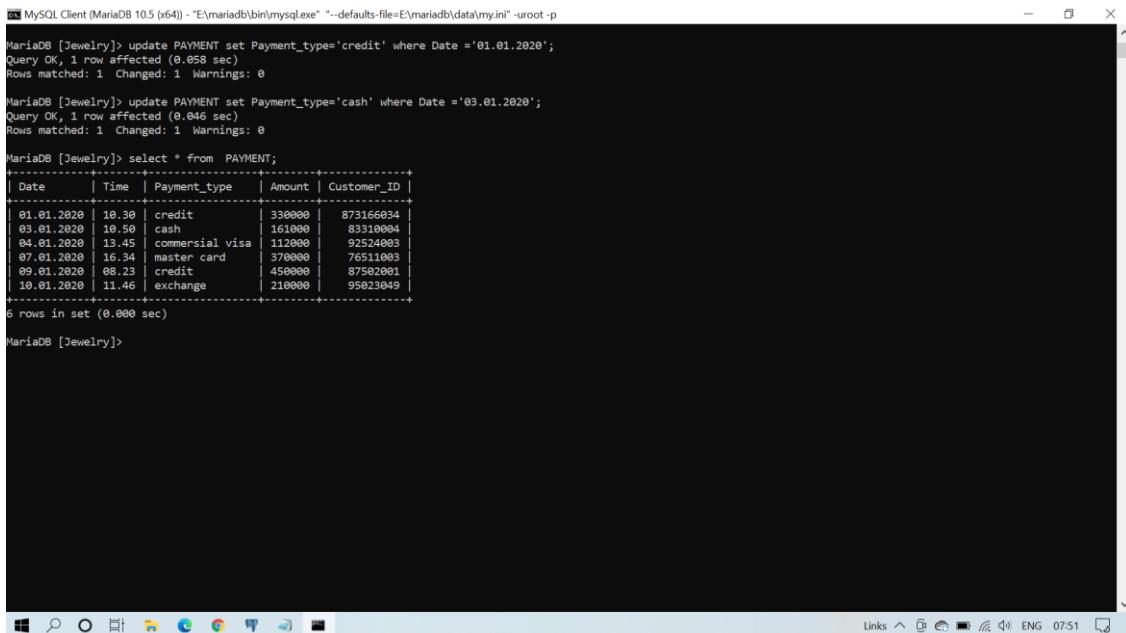
MariaDB [Jewelry]> select * from CUSTOMER;
+-----+-----+-----+-----+
| Customer_ID | Date_of_birth | Phone_no | Bill_no |
+-----+-----+-----+-----+
| 76511003 | 11.01.1976 | 778845654 | 237 |
| 83310004 | 05.11.1983 | 778874714 | 235 |
| 87502001 | 02.01.1987 | 729183928 | 238 |
| 92524003 | 24.01.1992 | 771873878 | 236 |
| 95023049 | 23.01.1995 | 776738172 | 239 |
+-----+-----+-----+-----+
5 rows in set (0.000 sec)

MariaDB [Jewelry]>

```

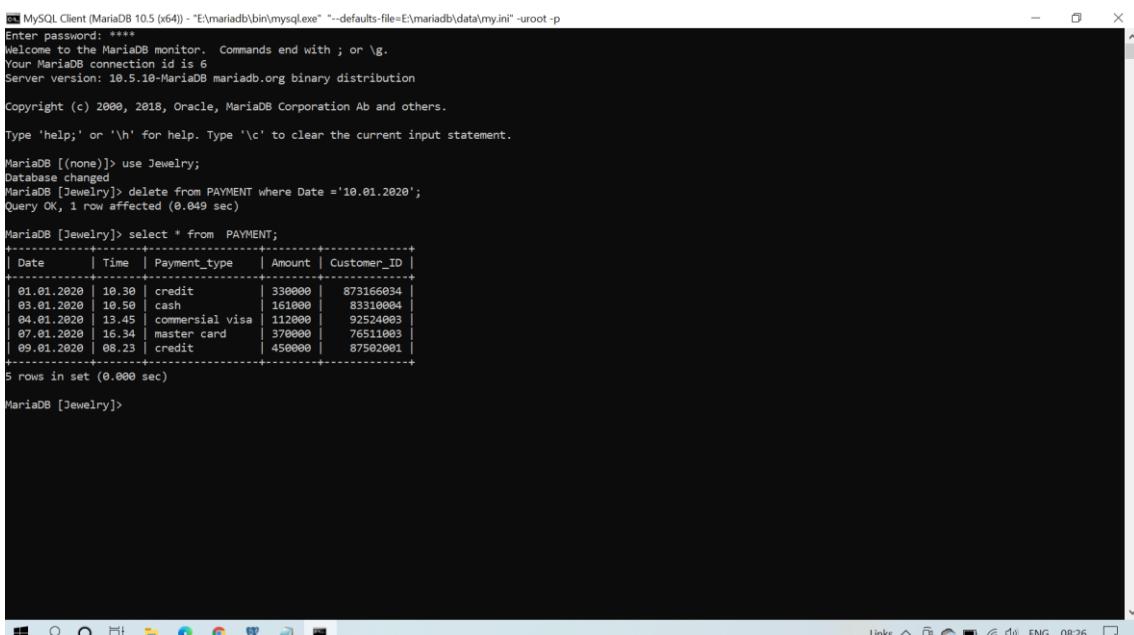
**FIGURE 33 : UPDATE AND DELETE OPERATION OF THE CUSTOMER TABLE**

## Update and Delete Payment



MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
MariaDB [Jewelry]> update PAYMENT set Payment\_type='credit' where Date ='01.01.2020';  
Query OK, 1 row affected (0.058 sec)  
Rows matched: 1 Changed: 1 Warnings: 0  
MariaDB [Jewelry]> update PAYMENT set Payment\_type='cash' where Date ='03.01.2020';  
Query OK, 1 row affected (0.046 sec)  
Rows matched: 1 Changed: 1 Warnings: 0  
MariaDB [Jewelry]> select \* from PAYMENT;  
+-----+-----+-----+-----+  
| Date | Time | Payment\_type | Amount | Customer\_ID |  
+-----+-----+-----+-----+  
01.01.2020	10.30	credit	330000	873166834
03.01.2020	10.50	cash	161000	83310004
04.01.2020	13.45	commercial visa	112000	92524083
07.01.2020	16.34	master card	370000	76511003
09.01.2020	08.23	credit	450000	87562001
10.01.2020	11.46	exchange	210000	95023849
+-----+-----+-----+-----+  
6 rows in set (0.000 sec)  
MariaDB [Jewelry]>

**FIGURE 34 : UPDATE OPERATION OF THE PAYMENT TABLE**



MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
Enter password: \*\*\*\*  
Welcome to the MariaDB monitor. Commands end with ; or \g.  
Your MariaDB connection id is 6  
Server version: 10.5.10-MariaDB mariadb.org binary distribution  
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.  
Type 'help;' or '\h' for help. Type 'c' to clear the current input statement.  
MariaDB [(none)]> use Jewelry;  
Database changed  
MariaDB [Jewelry]> delete from PAYMENT where Date ='10.01.2020';  
Query OK, 1 row affected (0.049 sec)  
MariaDB [Jewelry]> select \* from PAYMENT;  
+-----+-----+-----+-----+  
| Date | Time | Payment\_type | Amount | Customer\_ID |  
+-----+-----+-----+-----+  
01.01.2020	10.30	credit	330000	873166834
03.01.2020	10.50	cash	161000	83310004
04.01.2020	13.45	commercial visa	112000	92524083
07.01.2020	16.34	master card	370000	76511003
09.01.2020	08.23	credit	450000	87562001
+-----+-----+-----+-----+  
5 rows in set (0.000 sec)  
MariaDB [Jewelry]>

**FIGURE 35 : DELETE OPERATION OF THE PAYMENT TABLE**

## Update and Delete Sales Representation

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p  
6 rows in set (0.000 sec)  
MariaDB [jewelry]> update SALES\_REPRESENTATION set Name='Ranasinha H.N.M.' where Employ\_ID=22;  
Query OK, 1 row affected (0.009 sec)  
Rows matched: 1 Changed: 1 Warnings: 0  
MariaDB [jewelry]> update SALES\_REPRESENTATION set Address\_no='203' where Employ\_ID=21;  
Query OK, 1 row affected (0.002 sec)  
Rows matched: 1 Changed: 1 Warnings: 0  
MariaDB [jewelry]> delete from SALES\_REPRESENTATION where Employ\_ID=26;  
Query OK, 1 row affected (0.002 sec)  
MariaDB [jewelry]> select \* from SALES\_REPRESENTATION;  
+-----+-----+-----+-----+-----+  
| Employ\_ID | Name | Address\_no | street | City | Manager | Item\_ID |  
+-----+-----+-----+-----+-----+  
21	Gunathilake R.M.S.	203	Alpitiya Street	Mawanella	30045	
22	Ranasinha H.N.M.	306	United Street	Mawanella	Gunathilake R.M.S	30046
23	Ahmed H.M.N.	309	Vishnu Street	Mawanella	Gunathilake R.M.S	30047
24	Jagath M.N.N.	327/A	Rajapura Street	Mawanella	Ahmed H.M.N	30048
25	Balasuriya M.J.K.	32	Matuna Street	Kegalle	Ahmed H.M.N	30049
+-----+-----+-----+-----+-----+  
5 rows in set (0.000 sec)  
MariaDB [jewelry]>

**FIGURE 36 : UPDATE AND DELETE OPERATION OF THE SALES REPRESENTATION TABLE**

## Update and Delete Referee

MySQL Client (MariaDB 10.5 (x64)) - "E:\mariadb\bin\mysql.exe" "--defaults-file=E:\mariadb\data\my.ini" -uroot -p  
MariaDB [Jewelry]> update REFEREE set Name\_of\_referee='Nimal M.N.K.' where Name='Wijitha K.L.K.K.';  
Query OK, 1 row affected (0.004 sec)  
Rows matched: 1 Changed: 1 Warnings: 0  
MariaDB [Jewelry]> update REFEREE set Name\_of\_referee='Nimal M.N.K.' where Name='Wijitha K.L.K.K.';  
Query OK, 0 rows affected (0.000 sec)  
Rows matched: 1 Changed: 0 Warnings: 0  
MariaDB [Jewelry]> delete from REFEREE where Name='Gunathilake';  
Query OK, 0 rows affected (0.000 sec)  
MariaDB [Jewelry]> select \* from REFEREE;  
+-----+-----+  
| Name | Name\_of\_referee |  
+-----+-----+  
Ahamed H.M.N.	Jagath M.N.N.
Balasuriya M.J.K.	Malith D.N.K.
Gunathilake R.M.S.	Jagath M.N.N.
Naveen H.M.N.	Jagath M.N.N.
Ranasinha H.N.M.	Malith D.N.K.
Wijitha K.L.K.K.	Nimal M.N.K.
+-----+-----+  
6 rows in set (0.000 sec)  
MariaDB [Jewelry]>

**FIGURE 37 : UPDATE AND DELETE OPERATION OF THE REFEREE TABLE**

# CHAPTER 5 – Transactions

## 1. Simple Queries

### a) Select Operation

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" --defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini -uroot -p  
Query OK, 6 rows affected (0.022 sec)  
MariaDB [jewelry]> select \* from SALES\_REPRESENTATION;  
+-----+-----+-----+-----+-----+  
| Employ\_ID | Name | Address\_no | street | City | Manager | Item\_ID |  
+-----+-----+-----+-----+-----+  
21	Gunathilaka R.M.S.	203	Alpitiya Street	Mawanella	30045	
22	Ranasingha H.N.M.	306	United Street	Mawanella	Gunathilaka R.M.S.	30046
23	Ahmed H.M.N.	209	Vishaka Street	Mawanella	Gunathilaka R.M.S.	30047
24	Naveen H.M.N.	34/A	Ransinha Street	Mawanella	Ahmed H.M.N.	30048
25	Balasuriya M.J.K.	32	Matuma Street	Kegalla	Ahmed H.M.N.	30049
26	Wijitha K.L.K.K.	45	Halock Street	Kegalla	Ahmed H.M.N.	30050
+-----+-----+-----+-----+-----+						
6 rows in set (0.001 sec)						
MariaDB [jewelry]> select 'Employ\_ID' , 'Name' from SALES\_REPRESENTATION;						
+-----+-----+						
Employ\_ID	Name					
+-----+-----+						
Employ\_ID	Name					
+-----+-----+  
6 rows in set (0.007 sec)  
MariaDB [jewelry]>

**FIGURE 38 : DEMONSTRATION OF THE SELECT OPERATION**

### b) Project Operation

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" --defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini -uroot -p  
1 row in set (0.022 sec)  
MariaDB [jewelry]> select \* from SALES\_REPRESENTATION;  
+-----+-----+-----+-----+-----+  
| Employ\_ID | Name | Address\_no | street | City | Manager | Item\_ID |  
+-----+-----+-----+-----+-----+  
21	Gunathilaka R.M.S.	203	Alpitiya Street	Mawanella	30045	
22	Ranasingha H.N.M.	306	United Street	Mawanella	Gunathilaka R.M.S.	30046
23	Ahmed H.M.N.	209	Vishaka Street	Mawanella	Gunathilaka R.M.S.	30047
24	Naveen H.M.N.	34/A	Ransinha Street	Mawanella	Ahmed H.M.N.	30048
25	Balasuriya M.J.K.	32	Matuma Street	Kegalla	Ahmed H.M.N.	30049
26	Wijitha K.L.K.K.	45	Halock Street	Kegalla	Ahmed H.M.N.	30050
+-----+-----+-----+-----+-----+						
6 rows in set (0.001 sec)						
MariaDB [jewelry]> select Employ\_ID as Employ\_ID, Address\_No, Street, City from SALES\_REPRESENTATION as rep\_address ;						
+-----+-----+-----+						
Employ\_ID	Address\_No	Street	City			
+-----+-----+-----+						
21	203	Alpitiya Street	Mawanella			
22	306	United Street	Mawanella			
23	209	Vishaka Street	Mawanella			
24	34/A	Ransinha Street	Mawanella			
25	32	Matuma Street	Kegalla			
26	45	halock Street	Kegalla			
+-----+-----+-----+  
6 rows in set (0.000 sec)  
MariaDB [jewelry]>

**FIGURE 39 : DEMONSTRATION OF THE PROJECT OPERATION**

### c) Cartesian Product Operation

```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
MariaDB [jewelry]> select * from ITEM_DETAILS cross join PAYMENT;
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Invoice_no | Supplier | Purchase_price | Weight | Wastage | Date       | Time   | Payment_type | Amount | Customer_ID |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 342 | Swarna jewelers | 1000000 | 7.8 | 0.2 | 01.01.2020 | 10:30 | credit      | 330000 | 873166034 |
| 343 | Devi Jewelers    | 2000000 | 15.6 | 0.3 | 01.01.2020 | 10:30 | credit      | 330000 | 873166034 |
| 345 | Devi jewelers    | 1500000 | 11.9 | 0.1 | 01.01.2020 | 10:30 | credit      | 330000 | 873166034 |
| 561 | APA Jewelers     | 4000000 | 39.2 | 0.8 | 01.01.2020 | 10:30 | credit      | 330000 | 873166034 |
| 562 | Ravi jewelers    | 3500000 | 27.5 | 0.5 | 01.01.2020 | 10:30 | credit      | 330000 | 873166034 |
| 563 | Ravi jewelers    | 3000000 | 23.6 | 0.5 | 01.01.2020 | 10:30 | credit      | 330000 | 873166034 |
| 342 | Swarna jewelers | 1000000 | 7.8 | 0.2 | 03.01.2020 | 10:50 | cash        | 161000 | 833100004 |
| 344 | Devi jewelers    | 2000000 | 15.6 | 0.3 | 03.01.2020 | 10:50 | cash        | 161000 | 833100004 |
| 345 | Devi jewelers    | 1500000 | 11.9 | 0.1 | 03.01.2020 | 10:50 | cash        | 161000 | 833100004 |
| 561 | APA Jewelers     | 4000000 | 39.2 | 0.8 | 03.01.2020 | 10:50 | cash        | 161000 | 833100004 |
| 562 | Ravi jewelers    | 3500000 | 27.5 | 0.5 | 03.01.2020 | 10:50 | cash        | 161000 | 833100004 |
| 563 | Ravi jewelers    | 3000000 | 23.6 | 0.5 | 03.01.2020 | 10:50 | cash        | 161000 | 833100004 |
| 342 | Swarna jewelers | 1000000 | 7.8 | 0.2 | 04.01.2020 | 13:45 | commercial visa | 112000 | 92524003 |
| 344 | Devi jewelers    | 2000000 | 15.6 | 0.3 | 04.01.2020 | 13:45 | commercial visa | 112000 | 92524003 |
| 345 | Devi jewelers    | 1500000 | 11.9 | 0.1 | 04.01.2020 | 13:45 | commercial visa | 112000 | 92524003 |
| 561 | APA Jewelers     | 4000000 | 39.2 | 0.8 | 04.01.2020 | 13:45 | commercial visa | 112000 | 92524003 |
| 562 | Ravi jewelers    | 3500000 | 27.5 | 0.5 | 04.01.2020 | 13:45 | commercial visa | 112000 | 92524003 |
| 563 | Ravi jewelers    | 3000000 | 23.6 | 0.5 | 04.01.2020 | 13:45 | commercial visa | 112000 | 92524003 |
| 342 | Swarna jewelers | 1000000 | 7.8 | 0.2 | 07.01.2020 | 16:34 | master card   | 370000 | 76511003 |
| 344 | Devi jewelers    | 2000000 | 15.6 | 0.3 | 07.01.2020 | 16:34 | master card   | 370000 | 76511003 |
| 345 | Devi jewelers    | 1500000 | 11.9 | 0.1 | 07.01.2020 | 16:34 | master card   | 370000 | 76511003 |
| 561 | APA Jewelers     | 4000000 | 39.2 | 0.8 | 07.01.2020 | 16:34 | master card   | 370000 | 76511003 |
| 562 | Ravi jewelers    | 3500000 | 27.5 | 0.5 | 07.01.2020 | 16:34 | master card   | 370000 | 76511003 |
| 563 | Ravi jewelers    | 3000000 | 23.6 | 0.5 | 07.01.2020 | 16:34 | master card   | 370000 | 76511003 |
| 342 | Swarna jewelers | 1000000 | 7.8 | 0.2 | 09.01.2020 | 08:23 | credit      | 450000 | 87502001 |
| 344 | Devi jewelers    | 2000000 | 15.6 | 0.3 | 09.01.2020 | 08:23 | credit      | 450000 | 87502001 |
| 345 | Devi jewelers    | 1500000 | 11.9 | 0.1 | 09.01.2020 | 08:23 | credit      | 450000 | 87502001 |
| 561 | APA Jewelers     | 4000000 | 39.2 | 0.8 | 09.01.2020 | 08:23 | credit      | 450000 | 87502001 |
| 562 | Ravi jewelers    | 3500000 | 27.5 | 0.5 | 09.01.2020 | 08:23 | credit      | 450000 | 87502001 |
| 563 | Ravi jewelers    | 3000000 | 23.6 | 0.5 | 09.01.2020 | 08:23 | credit      | 450000 | 87502001 |
| 342 | Swarna jewelers | 1000000 | 7.8 | 0.2 | 10.01.2020 | 11:46 | exchange    | 210000 | 95023049 |
| 344 | Devi jewelers    | 2000000 | 15.6 | 0.3 | 10.01.2020 | 11:46 | exchange    | 210000 | 95023049 |
| 345 | Devi jewelers    | 1500000 | 11.9 | 0.1 | 10.01.2020 | 11:46 | exchange    | 210000 | 95023049 |
| 561 | APA Jewelers     | 4000000 | 39.2 | 0.8 | 10.01.2020 | 11:46 | exchange    | 210000 | 95023049 |
| 562 | Ravi jewelers    | 3500000 | 27.5 | 0.5 | 10.01.2020 | 11:46 | exchange    | 210000 | 95023049 |
| 563 | Ravi jewelers    | 3000000 | 23.6 | 0.5 | 10.01.2020 | 11:46 | exchange    | 210000 | 95023049 |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+
36 rows in set (6.019 sec)

MariaDB [jewelry]>
```

**FIGURE 40 : DEMONSTRATION OF THE CARTESIAN PRODUCT OPERATION**

### d) Creating A User View

```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
MariaDB [jewelry]> select * from SALES_REPRESENTATION;
+-----+-----+-----+-----+-----+
| Employ_ID | Name          | Address_no | street      | city       | Manager      | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilake R.M.S. | 203 | Alpitiya Street | Mawanella | 30045 | |
| 22 | Ramasinha H.N.M. | 306 | United Street   | Mawanella | 30046 |
| 23 | Ahmed H.M.N.     | 299 | Vishaka Street  | Mawanella | Gunathilaka R.M.S. | 30047 |
| 24 | Naveen H.N.N.    | 34/A | Raninha Street  | Mawanella | Ahmed H.M.N. | 30048 |
| 25 | Isuru M.J.K.     | 32  | Matma Street    | Kegalla   | Ahmed H.M.N. | 30049 |
| 26 | Wijitha K.L.K.K. | 45  | halock Street   | Kegalla   | Ahmed H.M.N. | 30050 |
+-----+-----+-----+-----+-----+
6 rows in set (0.001 sec)

MariaDB [jewelry]> create view user_v1 as select * from SALES REPRESENTATION where Employ_ID = 23;
Query OK, 0 rows affected (0.019 sec)

MariaDB [jewelry]> select * from user_v1;
+-----+-----+-----+-----+-----+
| Employ_ID | Name          | Address_no | street      | City       | Manager      | Item_ID |
+-----+-----+-----+-----+-----+
| 23 | Ahmed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
+-----+-----+-----+-----+-----+
1 row in set (0.022 sec)

MariaDB [jewelry]>
```

**FIGURE 41 : CREATION OF USER VIEW**

## e) Operation

```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p

MariaDB [jewelry]> select * from SALES_REPRESENTATION;
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager |
+-----+-----+-----+-----+-----+
| 21 | Gunathilake R.M.S. | 203 | Alipitiya Street | Mawanella | 30045 | |
| 22 | Ranasingha H.N.M. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahamed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahamed H.M.N. | 30048 |
| 25 | Balasuriya M.J.K. | 32 | Matuma Street | Kegalla | Ahamed H.M.N. | 30049 |
| 26 | Wijitha K.L.K.K. | 45 | halock Street | Kegalla | Ahamed H.M.N. | 30050 |
+-----+-----+-----+-----+-----+
6 rows in set (0.002 sec)

MariaDB [jewelry]> select Employ_ID as Name, Address_No, Street, City from SALES_REPRESENTATION as rep_address where city = 'Mawanella';
+-----+-----+-----+-----+
| Name | Address_No | Street | City |
+-----+-----+-----+-----+
| 21 | 203 | Alipitiya Street | Mawanella |
| 22 | 306 | United Street | Mawanella |
| 23 | 209 | Vishaka Street | Mawanella |
| 24 | 34/A | Ransinha Street | Mawanella |
+-----+-----+-----+-----+
4 rows in set (0.012 sec)

MariaDB [jewelry]>

```

**FIGURE 42 : DEMONSTRATION OF THE OPERATION**

## f) Demonstrating the Use of An Aggregation Function

```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p

MariaDB [jewelry]> select * from PAYMENT;
+-----+-----+-----+-----+-----+
| Date | Time | Payment_type | Amount | Customer_ID |
+-----+-----+-----+-----+-----+
| 01.01.2020 | 10.30 | credit | 330000 | 873166034 |
| 03.01.2020 | 19.58 | cash | 161000 | 83210004 |
| 04.01.2020 | 13.45 | commercial visa | 112000 | 92524003 |
| 07.01.2020 | 16.34 | master card | 370000 | 76511003 |
| 09.01.2020 | 08.23 | credit | 450000 | 87502001 |
| 10.01.2020 | 11.46 | exchange | 210000 | 95023049 |
+-----+-----+-----+-----+-----+
6 rows in set (0.001 sec)

MariaDB [jewelry]> select Payment_type, count(Customer_ID) as No_of_customers, avg(Amount) as Avg_payment from PAYMENT group by Payment_type;
+-----+-----+-----+
| Payment_type | No_of_customers | Avg_payment |
+-----+-----+-----+
| cash | 1 | 161000.0000 |
| commercial visa | 1 | 112000.0000 |
| credit | 2 | 390000.0000 |
| exchange | 1 | 210000.0000 |
| master card | 1 | 370000.0000 |
+-----+-----+-----+
5 rows in set (0.000 sec)

MariaDB [jewelry]>

```

**FIGURE 43 : DEMONSTRATION OF THE USE OF AN AGGREGATION FUNCTION**

g) Demonstrate the Use of Like Keyword

```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini"--uroot -p
5 rows in set (0.000 sec)

MariaDB [jewelry]> select * from PAYMENT;
+-----+-----+-----+-----+-----+
| Date | Time | Payment_type | Amount | Customer_ID |
+-----+-----+-----+-----+-----+
| 01.01.2020 | 10.30 | credit | 300000 | 873166034 |
| 01.01.2020 | 10.45 | cash | 100000 | 875023084 |
| 04.01.2020 | 13.45 | commercial visa | 112000 | 92524003 |
| 07.01.2020 | 16.34 | master card | 370000 | 76511003 |
| 09.01.2020 | 08.23 | credit | 450000 | 87502001 |
| 10.01.2020 | 11.46 | exchange | 210000 | 95023049 |
+-----+-----+-----+-----+-----+
6 rows in set (0.001 sec)

MariaDB [jewelry]> select * from PAYMENT where Payment_type like "%credit%";
+-----+-----+-----+-----+-----+
| Date | Time | Payment_type | Amount | Customer_ID |
+-----+-----+-----+-----+-----+
| 01.01.2020 | 10.30 | credit | 300000 | 873166034 |
| 09.01.2020 | 08.23 | credit | 450000 | 87502001 |
+-----+-----+-----+-----+-----+
2 rows in set (0.009 sec)

MariaDB [jewelry]> 

```

**FIGURE 44 : DEMONSTRATION OF THE USE OF LIKE KEYWORD**

## 2. Complex queries

a) Basic Set Operations (Union, Intersection, Set Difference, Division) Without User Views

### Union

```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini"--uroot -p
MariaDB [jewelry]> select * from SALES_REPRESENTATION;
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilake R.M.S. | 203 | Alpitiya Street | Mawanella | Gunathilaka R.M.S. | 30045 |
| 22 | Ranasinha H.N.M. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahmed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahmed H.M.N. | 30048 |
| 25 | Balasuriya M.J.K. | 32 | Motera Street | Kegalla | Ahmed H.M.N. | 30049 |
| 26 | Wijitha K.I.L.K.K. | 45 | halock Street | Kegalla | Ahmed H.M.N. | 30050 |
+-----+-----+-----+-----+-----+
6 rows in set (0.001 sec)

MariaDB [jewelry]> (select * from SALES_REPRESENTATION where city = 'Mawanella') union (select * from SALES_REPRESENTATION where Manager = 'Gunathilaka R.M.S.');
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilake R.M.S. | 203 | Alpitiya Street | Mawanella | Gunathilaka R.M.S. | 30045 |
| 22 | Ranasinha H.N.M. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahmed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahmed H.M.N. | 30048 |
+-----+-----+-----+-----+-----+
4 rows in set (0.009 sec)

MariaDB [jewelry]> 

```

**FIGURE 45 : DEMONSTRATION OF THE UNION OPERATION**

## Intersection

The screenshot shows a MySQL client window with the following SQL session:

```
MariaDB [jewelry]> select * from SALES_REPRESENTATION;
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilaka R.M.S. | 203 | Alpitiya Street | Mawanella | Gunathilaka R.M.S. | 30045 |
| 22 | Ranasingha H.M.N. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahamed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahamed H.M.N. | 30048 |
| 25 | Balasuriya M.J.K. | 32 | Matuma Street | Kegalla | Ahamed H.M.N. | 30049 |
| 26 | Wijitha K.L.K.K. | 45 | halock Street | Kegalla | Ahamed H.M.N. | 30050 |
+-----+-----+-----+-----+-----+
6 rows in set (0.001 sec)

MariaDB [jewelry]> (select * from SALES_REPRESENTATION where city = 'Mawanella') intersect (select * from SALES_REPRESENTATION where Manager = 'Gunathilaka R.M.S.');
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 22 | Ranasingha H.M.N. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahamed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
+-----+-----+-----+-----+-----+
2 rows in set (0.001 sec)

MariaDB [jewelry]>
```

**FIGURE 46 : DEMONSTRATION OF THE INTERSECTION OPERATION**

## Set Difference

The screenshot shows a MySQL client window with the following SQL session:

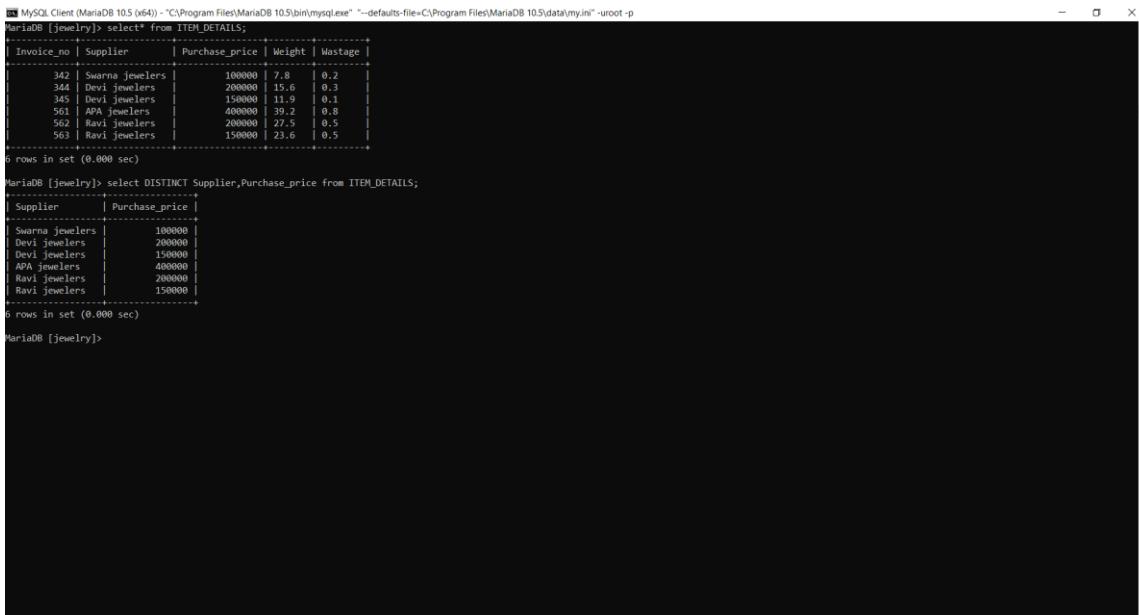
```
MariaDB [jewelry]> select * from SALES_REPRESENTATION;
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilaka R.M.S. | 203 | Alpitiya Street | Mawanella | Gunathilaka R.M.S. | 30045 |
| 22 | Ranasingha H.M.N. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahamed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahamed H.M.N. | 30048 |
| 25 | Balasuriya M.J.K. | 32 | Matuma Street | Kegalla | Ahamed H.M.N. | 30049 |
| 26 | Wijitha K.L.K.K. | 45 | halock Street | Kegalla | Ahamed H.M.N. | 30050 |
+-----+-----+-----+-----+-----+
6 rows in set (0.001 sec)

MariaDB [jewelry]> (select * from SALES_REPRESENTATION where city = 'Mawanella') except (select * from SALES_REPRESENTATION where Manager = 'Gunathilaka R.M.S.');
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilaka R.M.S. | 203 | Alpitiya Street | Mawanella | Gunathilaka R.M.S. | 30045 |
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahamed H.M.N. | 30048 |
+-----+-----+-----+-----+-----+
2 rows in set (0.001 sec)

MariaDB [jewelry]>
```

**FIGURE 47 : DEMONSTRATION OF THE SET DIFFERENCE OPERATION**

## Division



```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
MariaDB [jewelry]> select* from ITEM_DETAILS;
+-----+-----+-----+-----+
| invoice_no | supplier | purchase_price | weight | wastage |
+-----+-----+-----+-----+
| 342 | Swarna jewelers | 100000 | 7.8 | 0.2 |
| 344 | Devi jewelers | 200000 | 15.6 | 0.3 |
| 345 | Devi jewelers | 150000 | 11.9 | 0.1 |
| 501 | APA jewelers | 400000 | 39.2 | 0.8 |
| 562 | Ravi jewelers | 200000 | 27.5 | 0.5 |
| 563 | Ravi Jewelers | 150000 | 23.6 | 0.5 |
+-----+-----+-----+-----+
6 rows in set (0.000 sec)

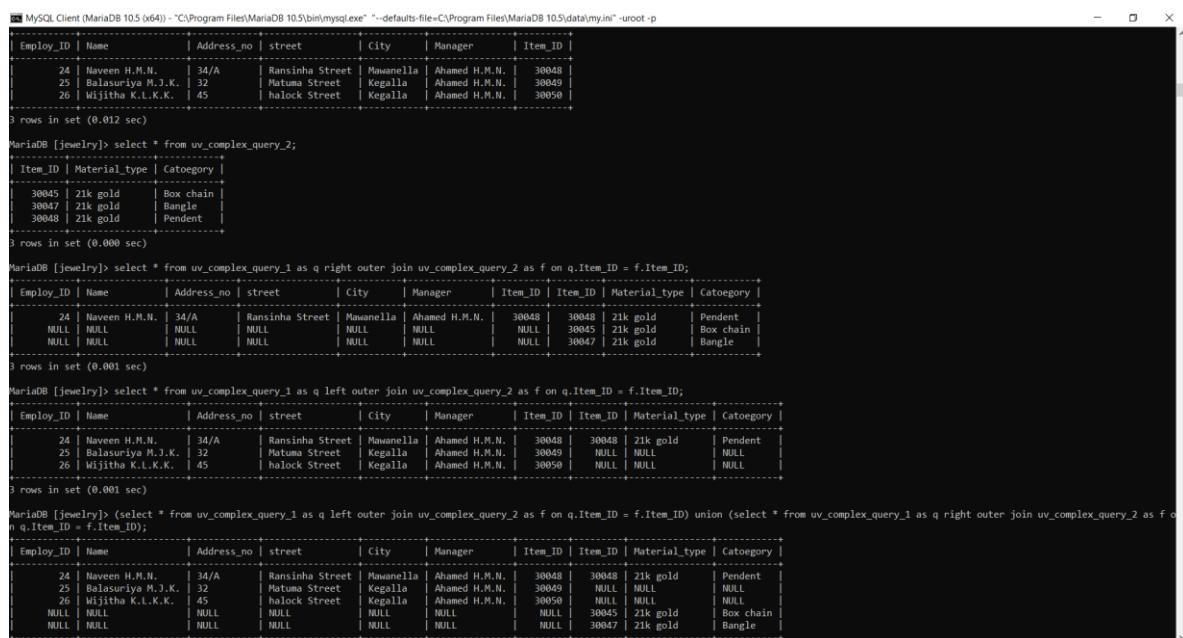
MariaDB [jewelry]> select DISTINCT Supplier,Purchase_price from ITEM_DETAILS;
+-----+-----+
| Supplier | Purchase_price |
+-----+-----+
| Swarna jewelers | 100000 |
| Devi jewelers | 200000 |
| Devi jewelers | 150000 |
| APA jewelers | 400000 |
| Ravi jewelers | 200000 |
| Ravi Jewelers | 150000 |
+-----+-----+
6 rows in set (0.000 sec)

MariaDB [jewelry]>

```

**FIGURE 48 : DEMONSTRATION OF THE DIVISION OPERATION**

## b) Left Outer Join, Right Outer Join, Outer Join and Full Outer Join



```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahmed H.M.N. | 30048 |
| 25 | Balasuriya M.J.K. | 32 | Matuma Street | Kegalla | Ahmed H.M.N. | 30049 |
| 26 | Wijitha K.L.K.K. | 45 | halock Street | Kegalla | Ahmed H.M.N. | 30050 |
+-----+-----+-----+-----+-----+
3 rows in set (0.012 sec)

MariaDB [jewelry]> select * from uv_complex_query_2;
+-----+-----+-----+
| Item_ID | Material_type | Catoegory |
+-----+-----+-----+
| 30045 | 21k gold | Box chain |
| 30046 | 21k gold | Bangle |
| 30048 | 21k gold | Pendant |
+-----+-----+-----+
3 rows in set (0.000 sec)

MariaDB [jewelry]> select * from uv_complex_query_1 as q right outer join uv_complex_query_2 as f on q.Item_ID = f.Item_ID;
+-----+-----+-----+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID | Item_ID | Material_type | Catoegory |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahmed H.M.N. | 30048 | 30048 | 21k gold | Pendant |
| NULL | 30045 | 21k gold | Box chain |
| NULL | 30047 | 21k gold | Bangle |
+-----+-----+-----+-----+-----+-----+-----+-----+
3 rows in set (0.001 sec)

MariaDB [jewelry]> select * from uv_complex_query_1 as q left outer join uv_complex_query_2 as f on q.Item_ID = f.Item_ID;
+-----+-----+-----+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID | Item_ID | Material_type | Catoegory |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahmed H.M.N. | 30048 | 30048 | 21k gold | Pendant |
| 25 | Balasuriya M.J.K. | 32 | Matuma Street | Kegalla | Ahmed H.M.N. | 30049 | NULL | NULL | NULL |
| 26 | Wijitha K.L.K.K. | 45 | halock Street | Kegalla | Ahmed H.M.N. | 30050 | NULL | NULL | NULL |
+-----+-----+-----+-----+-----+-----+-----+-----+
3 rows in set (0.001 sec)

MariaDB [jewelry]> (select * from uv_complex_query_1 as q left outer join uv_complex_query_2 as f on q.Item_ID = f.Item_ID) union (select * from uv_complex_query_1 as q right outer join uv_complex_query_2 as f on q.Item_ID = f.Item_ID);
+-----+-----+-----+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID | Item_ID | Material_type | Catoegory |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahmed H.M.N. | 30048 | 30048 | 21k gold | Pendant |
| 25 | Balasuriya M.J.K. | 32 | Matuma Street | Kegalla | Ahmed H.M.N. | 30049 | NULL | NULL | NULL |
| 26 | Wijitha K.L.K.K. | 45 | halock Street | Kegalla | Ahmed H.M.N. | 30050 | NULL | NULL | NULL |
| NULL | 30045 | 21k gold | Box chain |
| NULL | 30047 | 21k gold | Bangle |
+-----+-----+-----+-----+-----+-----+-----+-----+
5 rows in set (0.001 sec)

```

**FIGURE 49 : DEMONSTRATION OF THE LEFT OUTER JOIN, RIGHT OUTER JOIN, OUTER JOIN AND FULL OUTER JOIN OPERATIONS**

c) Inner Join

```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
MariaDB [jewelry]> select * from DAILY_GOLD_RATE;
+-----+-----+
| Date | Rate |
+-----+-----+
| 02-01-2020 | 1800000 |
| 01-01-2020 | 1810000 |
| 05-01-2020 | 1815000 |
| 07-01-2020 | 1820000 |
| 09-01-2020 | 1870000 |
| 10-01-2020 | 1840000 |
+-----+-----+
6 rows in set (0.029 sec)

MariaDB [jewelry]> select * from BILLING_DETAILS;
+-----+-----+-----+-----+
| Bill_no | Selling_price | Tax | Date | Item_ID |
+-----+-----+-----+-----+
| 234 | 330000 | 33000 | 02-01-2020 | 30046 |
| 235 | 161000 | 16100 | 03-01-2020 | 30048 |
| 236 | 112000 | 11200 | 05-01-2020 | 30050 |
| 237 | 370000 | 37000 | 07-01-2020 | 30045 |
| 238 | 450000 | 45000 | 09-01-2020 | 30049 |
| 239 | 210000 | 21000 | 10-01-2020 | 30047 |
+-----+-----+-----+-----+
6 rows in set (0.019 sec)

MariaDB [jewelry]> select * from DAILY_GOLD_RATE as e inner join BILLING_DETAILS as u on e.Date = u.Date;
+-----+-----+-----+-----+-----+-----+
| Date | Rate | Bill_no | Selling_price | Tax | Date | Item_ID |
+-----+-----+-----+-----+-----+-----+
| 02-01-2020 | 1800000 | 234 | 330000 | 33000 | 02-01-2020 | 30046 |
| 03-01-2020 | 1810000 | 235 | 161000 | 16100 | 03-01-2020 | 30048 |
| 05-01-2020 | 1815000 | 236 | 112000 | 11200 | 05-01-2020 | 30050 |
| 07-01-2020 | 1820000 | 237 | 370000 | 37000 | 07-01-2020 | 30045 |
| 09-01-2020 | 1870000 | 238 | 450000 | 45000 | 09-01-2020 | 30049 |
| 10-01-2020 | 1840000 | 239 | 210000 | 21000 | 10-01-2020 | 30047 |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.002 sec)

MariaDB [jewelry]>
```

**FIGURE 50 : DEMONSTRATION OF THE INNER JOIN OPERATION**

d) Natural Join

```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
MariaDB [jewelry]> create view uv15 as select U.Employ_ID,U.Name,U.Address_No From SALES REPRESENTATION as U NATURAL JOIN ITEM_DETAILS where Item_ID = '30045';
Query OK, 0 rows affected (0.009 sec)

MariaDB [jewelry]> select * from uv15;
+-----+-----+-----+
| Employ_ID | Name | Address_No |
+-----+-----+-----+
| 21 | Gunathilake R.M.S. | 203 |
+-----+-----+-----+
6 rows in set (0.022 sec)

MariaDB [jewelry]>
```

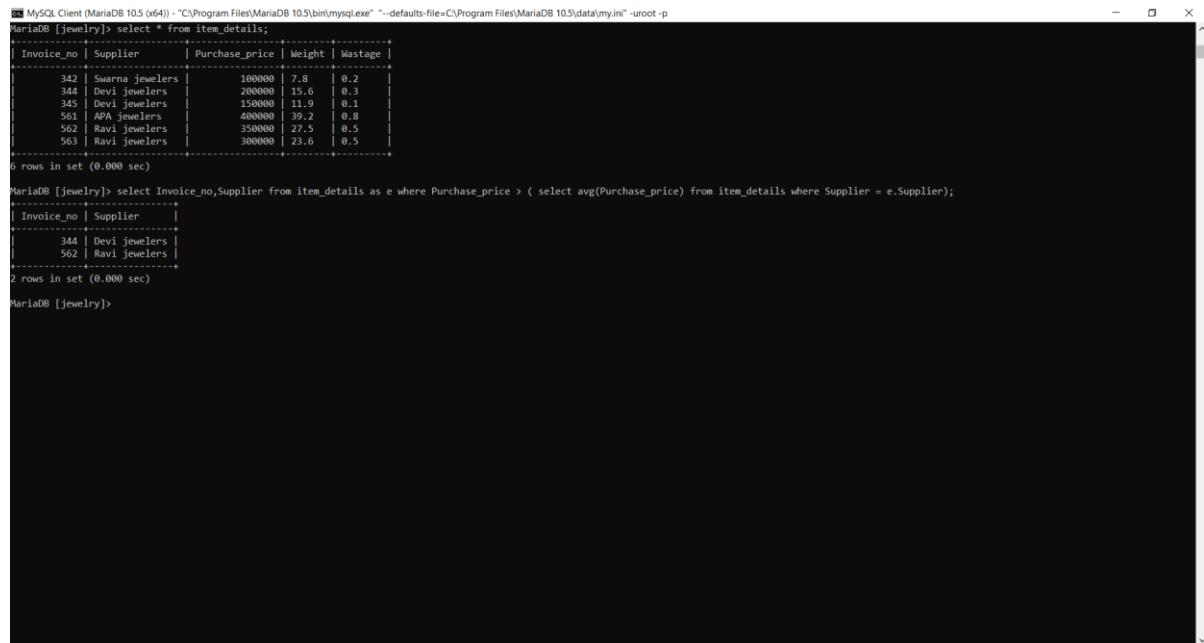
**FIGURE 51 : DEMONSTRATION OF THE NATURAL JOIN**

### 3. Nested Queries

#### a) Nested Query 1

**Description** - Display Invoice No and Supplier Name of The Bill More Than the Average from Each of The Suppliers

**Code** - select Invoice\_no,Supplier from item\_details as e where Purchase\_price > ( select avg(Purchase\_price) from item\_details where Supplier = e.Supplier);



The screenshot shows a MySQL client window with two command-line sessions. The first session displays the contents of the 'item\_details' table:

Invoice_no	Supplier	Purchase_price	Weight	Wastage
343	Swarna jewelers	1000000	7.8	0.2
344	Devi jewelers	2000000	16.6	1.0
345	Ravi jewelers	1500000	11.9	0.1
561	APA jewelers	4000000	39.2	0.8
562	Ravi jewelers	3500000	27.5	0.5
563	Ravi jewelers	3000000	23.6	0.5

Below this, the second session executes a nested query to find invoices with suppliers whose average purchase price is exceeded:

```
MariaDB [jewelry]> select * from item_details;
+-----+-----+-----+-----+
| Invoice_no | Supplier | Purchase_price | Weight | Wastage |
+-----+-----+-----+-----+
| 343 | Swarna jewelers | 1000000 | 7.8 | 0.2 |
| 344 | Devi jewelers | 2000000 | 16.6 | 1.0 |
| 345 | Ravi jewelers | 1500000 | 11.9 | 0.1 |
| 561 | APA jewelers | 4000000 | 39.2 | 0.8 |
| 562 | Ravi jewelers | 3500000 | 27.5 | 0.5 |
| 563 | Ravi jewelers | 3000000 | 23.6 | 0.5 |
+-----+-----+-----+-----+
6 rows in set (0.000 sec)

MariaDB [jewelry]> select Invoice_no,Supplier from item_details as e where Purchase_price > ( select avg(Purchase_price) from item_details where Supplier = e.Supplier);
+-----+-----+
| Invoice_no | Supplier |
+-----+-----+
| 344 | Devi jewelers |
| 562 | Ravi jewelers |
+-----+-----+
2 rows in set (0.000 sec)

MariaDB [jewelry]>
```

**FIGURE 52 : NESTED QUERY 1**

#### b) Nested Query 2

**Description** - Display the Customer ID of Second Highest Amount

**Code** - select Customer\_ID from payment where Amount = ( select max(Amount) from payment where Amount < (select max(Amount) from payment));

```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
MariaDB [jewelry]> select * from payment;
+-----+-----+-----+-----+
| Date | time | Payment_type | Amount | customer_ID |
+-----+-----+-----+-----+
| 01.01.2020 | 10.30 | credit | 330000 | 873160834 |
| 03.01.2020 | 10.50 | cash | 161000 | 833100004 |
| 04.01.2020 | 13.45 | commercial visa | 112000 | 92524003 |
| 07.01.2020 | 18.00 | master card | 370000 | 76511001 |
| 09.01.2020 | 10.23 | credit | 450000 | 875000001 |
| 10.01.2020 | 11.40 | exchange | 210000 | 93023049 |
+-----+-----+-----+-----+
6 rows in set (0.000 sec)

MariaDB [jewelry]> select customer_ID from payment where Amount = ( select max(Amount) from payment where Amount < ( select max(Amount) from payment));
+-----+
| Customer_ID |
+-----+
| 76511003 |
+-----+
1 row in set (0.000 sec)

MariaDB [jewelry]>

```

**FIGURE 53 : NESTED QUERY 2**

c) Nested Query 3

**Description** – Retrieve Supplier and Invoice\_no of the item details table whose purchase\_price is greater than the purchase\_price of supplier who has given 21k material type gold.

**Code** - select Tu.Invoice\_no ,Tu.Supplier from item\_details as Tu where Tu.Purchase\_price >ALL(select T.Purchase\_price from item\_details as T where(T.Invoice\_no IN (select P.Invoice\_no from sales\_details as p where P.Material\_type="21k gold")));

```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
MariaDB [jewelry]> select * from item_details;
+-----+-----+-----+-----+
| Invoice_no | Supplier | Purchase_price | Weight | Wastage |
+-----+-----+-----+-----+
| 342 | Swarna jewelers | 100000 | 7.8 | 0.2 |
| 344 | Devi jewelers | 200000 | 15.6 | 0.3 |
| 345 | Devi jewelers | 150000 | 11.9 | 0.1 |
| 501 | Ravi jewelers | 400000 | 27.5 | 0.8 |
| 562 | Ravi jewelers | 350000 | 27.5 | 0.5 |
| 563 | Ravi jewelers | 300000 | 23.6 | 0.5 |
+-----+-----+-----+-----+
6 rows in set (0.000 sec)

MariaDB [jewelry]> select * from sales_details;
+-----+-----+-----+
| Item_ID | Material_type | Category | Invoice_no |
+-----+-----+-----+
| 30045 | 21k gold | Box chain | 562 |
| 30046 | 22k gold | Rope chain | 561 |
| 30047 | 21k gold | Bangle | 344 |
| 30048 | 18k gold | Bracelet | 345 |
| 30049 | 18k gold | Lock Bangle | 561 |
| 30050 | 20k gold | Earing | 342 |
+-----+-----+-----+
6 rows in set (0.000 sec)

MariaDB [jewelry]> select Tu.Invoice_no ,Tu.Supplier from item_details as Tu where Tu.Purchase_price >ALL(select T.Purchase_price from item_details as T where(T.Invoice_no IN (select P.Invoice_no from sales_details as p where P.Material_type="21k gold")));
+-----+-----+
| Invoice_no | Supplier |
+-----+-----+
| 561 | APA jewelers |
+-----+-----+
1 row in set (0.001 sec)

MariaDB [jewelry]>

```

**FIGURE 54 : NESTED QUERY 3**

## CHAPTER 6 - Database Tuning

### 1. Tuning using indexes

1

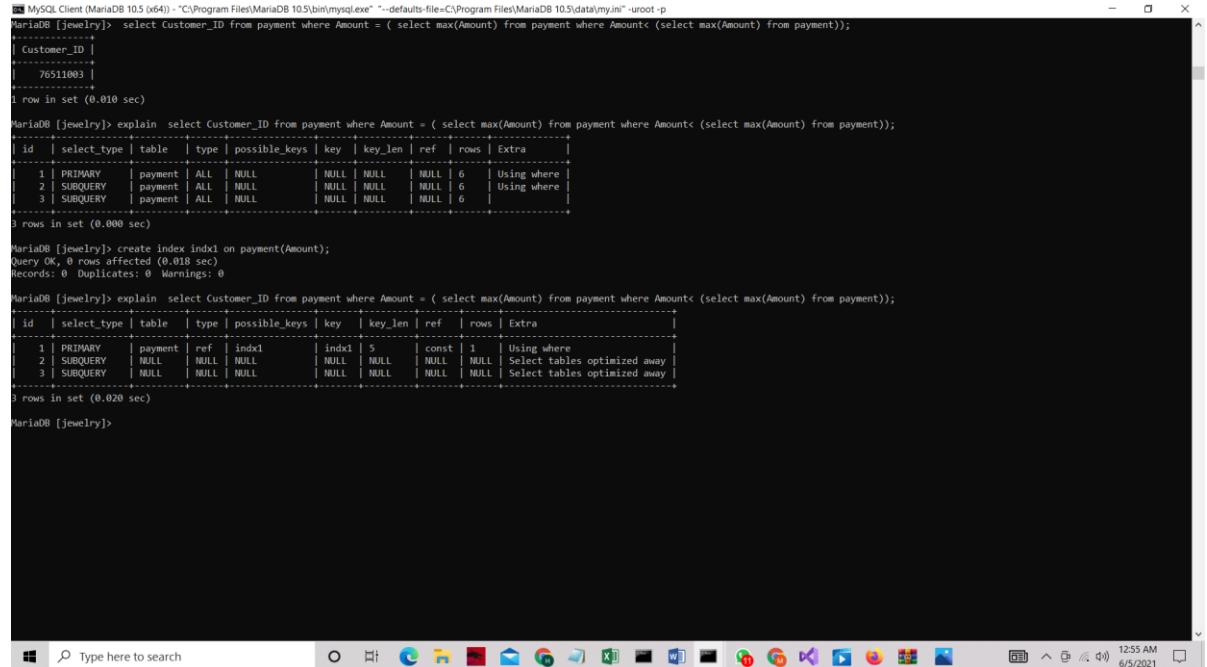
**Description** - Created an Index to Attribute 'Amount' of the Table 'Payment'. Due to That Number of Running Step Reduced as Show in The Figure.

**Code** - select Customer\_ID from payment where Amount = ( select max(Amount) from payment where Amount < (select max(Amount) from payment));

explain select Customer\_ID from payment where Amount = ( select max(Amount) from payment where Amount < (select max(Amount) from payment));

create index idx1 on payment(Amount);

explain select Customer\_ID from payment where Amount = ( select max(Amount) from payment where Amount < (select max(Amount) from payment));



The screenshot shows a terminal window for MySQL Client (MariaDB 10.5.0 (x64)) running on Windows. The user is connected to the 'jewelry' database. The session starts with a simple query to find the maximum amount in the 'payment' table:

```
MariaDB [jewelry]> select Customer_ID from payment where Amount = ( select max(Amount) from payment where Amount < (select max(Amount) from payment));
```

This query returns one row with Customer\_ID 76511003, and it takes 0.010 seconds.

Next, the user runs an EXPLAIN command for the same query to analyze the execution plan:

```
MariaDB [jewelry]> explain select Customer_ID from payment where Amount = ( select max(Amount) from payment where Amount < (select max(Amount) from payment));
```

The EXPLAIN output shows three rows in the table 'payment' being scanned with a type of 'ALL' (full table scan). The 'Extra' column indicates 'Using where' for all three rows.

Then, the user creates an index 'idx1' on the 'Amount' column of the 'payment' table:

```
MariaDB [jewelry]> create index idx1 on payment(Amount);
```

After creating the index, the user runs the EXPLAIN command again to see if the query has been optimized:

```
MariaDB [jewelry]> explain select Customer_ID from payment where Amount = ( select max(Amount) from payment where Amount < (select max(Amount) from payment));
```

The new EXPLAIN output shows a different execution plan. It uses a PRIMARY key scan for the first row (id 1), a SUBQUERY for the second row (id 2), and another SUBQUERY for the third row (id 3). The 'Extra' column now includes 'Select tables optimized away' for the second and third rows.

The bottom of the terminal window shows the Windows taskbar with various icons like File Explorer, Task View, and Start.

**FIGURE 55 : CREATE IDX1 ON PAYMENT TO INDEX TUNNING FOR MAX FINDING FUNCTION**

**Description** - Created an Index to Attribute 'Material\_Type' Of the Table ' Sales\_Details'. Due to That Number of Running Step Reduced as Show in The Figure.

**Code** - select Tu.Invoice\_no ,Tu.Supplier from item\_details as Tu where Tu.Purchase\_price >ALL(select T.Purchase\_price from item\_details as T where(T.Invoice\_no IN (select P.Invoice\_no from sales\_details as p where P.Material\_type="21k gold")));

explain select Tu.Invoice\_no ,Tu.Supplier from item\_details as Tu where Tu.Purchase\_price >ALL(select T.Purchase\_price from item\_details as T where(T.Invoice\_no IN (select P.Invoice\_no from sales\_details as p where P.Material\_type="21k gold")));

create index indx3 on sales\_details(Material\_type);

explain select Tu.Invoice\_no ,Tu.Supplier from item\_details as Tu where Tu.Purchase\_price >ALL(select T.Purchase\_price from item\_details as T where(T.Invoice\_no IN (select P.Invoice\_no from sales\_details as p where P.Material\_type="21k gold")));

```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MySQL\MySQL Server 8.0\bin\mysql.exe" "--defaults-file=C:\Program Files\MySQL\MySQL Server 8.0\data\my.ini" -uroot -p
MariaDB [jewelry]> select Tu.Invoice_no ,Tu.Supplier from item_details as Tu where Tu.Purchase_price >ALL(select T.Purchase_price from item_details as T where(T.Invoice_no IN (select P.Invoice_no from sales_details as p where P.Material_type="21k gold")));
+-----+-----+
| Invoice_no | Supplier |
+-----+-----+
|      561 | APA jewelers |
+-----+-----+
1 row in set (0.000 sec)

MariaDB [jewelry]> explain select Tu.Invoice_no ,Tu.Supplier from item_details as Tu where Tu.Purchase_price >ALL(select T.Purchase_price from item_details as T where(T.Invoice_no IN (select P.Invoice_no from sales_details as p where P.Material_type="21k gold")));
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | PRIMARY    | Tu   | ALL  | NULL          | NULL | NULL    | NULL | 6    | Using where | |
| 2 | SUBQUERY   | T   | ALL  | PRIMARY       | NULL | NULL    | NULL | 6    | Using where |
| 3 | SUBQUERY   | <subquery> | eq_ref | distinct_key | distinct_key | 4   | func   | NULL | 6    | Using where |
| 4 | MATERIALIZED | p   | ALL  | Invoice_no   | NULL | NULL    | NULL | 6    | Using where |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
4 rows in set (0.005 sec)

MariaDB [jewelry]> create index indx3 on sales_details(Material_type);
Query OK, 0 rows affected (0.014 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [jewelry]> explain select Tu.Invoice_no ,Tu.Supplier from item_details as Tu where Tu.Purchase_price >ALL(select T.Purchase_price from item_details as T where(T.Invoice_no IN (select P.Invoice_no from sales_details as p where P.Material_type="21k gold")));
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | PRIMARY    | Tu   | ALL  | NULL          | NULL | NULL    | NULL | 6    | Using where | |
| 2 | SUBQUERY   | T   | ALL  | PRIMARY       | NULL | NULL    | NULL | 6    | Using where |
| 3 | SUBQUERY   | <subquery> | eq_ref | distinct_key | distinct_key | 4   | func   | 1    | 1    | Using index condition |
| 4 | MATERIALIZED | p   | ALL  | Invoice_no,indx3 | indx3 | 11    | const | 3    | Using index condition |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
4 rows in set (0.019 sec)

MariaDB [jewelry]>

```

**FIGURE 56 : CREATE INDX3 ON SALES DETAILS TO INDEX TUNNING FOR MIN FINDING FUNCTION**

**Description** - Created an index to attribute 'City' of the table 'SALES REPRESENTATION'. Due to that number of running step reduced as show in the figure.

**Code** - (select \* from SALES REPRESENTATION where city = 'Mawanella') union (select \* from SALES REPRESENTATION where Manager = 'Gunathilaka R.M.S.');

explain (select \* from SALES REPRESENTATION where city = 'Mawanella') union (select \* from SALES REPRESENTATION where Manager = 'Gunathilaka R.M.S.');

create index idx5 on SALES REPRESENTATION(Manager);

explain (select \* from SALES REPRESENTATION where city = 'Mawanella') union (select \* from SALES REPRESENTATION where Manager = 'Gunathilaka R.M.S.');

```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini"--uroot--p
MariaDB [jewelry]> (select * from SALES_REPRESENTATION where city = 'Mawanella') union (select * from SALES_REPRESENTATION where Manager = 'Gunathilaka R.M.S.');
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilake R.M.S. | 203 | Alipitiya Street | Mawanella | 30045 | |
| 22 | Ranasingha H.N.M. | 306 | United Street | Mawanella | 30046 |
| 23 | Ahamed H.M.N. | 209 | Vishaka Street | Mawanella | 30047 |
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahamed H.M.N. | 30048 |
+-----+-----+-----+-----+-----+
4 rows in set (0.009 sec)

MariaDB [jewelry]> explain (select * from SALES_REPRESENTATION where city = 'Mawanella') union (select * from SALES_REPRESENTATION where Manager = 'Gunathilaka R.M.S.');
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | PRIMARY | SALES_REPRESENTATION | ALL | pro.ind | NULL | NULL | NULL | 6 | Using where |
| 2 | UNION | SALES_REPRESENTATION | ALL | NULL | NULL | NULL | NULL | 6 | Using where |
| NULL | UNION RESULT | union1,2> | ALL | NULL | NULL | NULL | NULL | NULL | |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
3 rows in set (0.000 sec)

MariaDB [jewelry]> create index idx4 on SALES_REPRESENTATION(city);
Query OK, 0 rows affected, 1 warning (0.015 sec)
Records: 0 Duplicates: 0 Warnings: 1

MariaDB [jewelry]> create index idx4 on SALES_REPRESENTATION(Manager);
ERROR 1061 (42000): Duplicate key name 'idx4'
MariaDB [jewelry]> create index idx5 on SALES_REPRESENTATION(Manager);
Query OK, 0 rows affected (0.015 sec)
Records: 0 Duplicates: 0 Warnings: 0

MariaDB [jewelry]> explain (select * from SALES_REPRESENTATION where city = 'Mawanella') union (select * from SALES_REPRESENTATION where Manager = 'Gunathilaka R.M.S.');
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | PRIMARY | SALES_REPRESENTATION | ALL | pro.ind,indx4 | NULL | NULL | NULL | 6 | Using where |
| 2 | UNION | SALES_REPRESENTATION | ref | idx5 | indx5 | 21 | const | 2 | Using index condition |
| NULL | UNION RESULT | union1,2> | ALL | NULL | NULL | NULL | NULL | NULL | |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
3 rows in set (0.015 sec)

MariaDB [jewelry]>
```

**FIGURE 57 : CREATE IDX5 ON SALES REPRESENTATION TO INDEX TUNNING FOR A UNION FUNCTION**

**Description** - This code prints the customer\_ID of second largest payment amount and second smallest payment amount in the transaction.

Here to that number of running step of execution an index is created to the attribute 'amount' of the table 'payment'.

**Code** - (select Customer\_ID from payment where Amount = ( select max(Amount) from payment where Amount< (select max(Amount) from payment)))union(select Customer\_ID from payment where Amount = ( select min(Amount) from payment where Amount> (select min(Amount) from payment)));

explain (select Customer\_ID from payment where Amount = ( select max(Amount) from payment where Amount< (select max(Amount) from payment)))union(select Customer\_ID from payment where Amount = ( select min(Amount) from payment where Amount> (select min(Amount) from payment)));

create index indx3 on payment(Amount);

explain (select Customer\_ID from payment where Amount = ( select max(Amount) from payment where Amount< (select max(Amount) from payment)))union(select Customer\_ID from payment where Amount = ( select min(Amount) from payment where Amount> (select min(Amount) from payment)));

```

MariaDB [jewelry]> explain (select Customer_ID from payment where Amount = ( select max(Amount) from payment where Amount< (select max(Amount) from payment)))union(select Customer_ID from payment where Amount = ( select min(Amount) from payment where Amount> (select min(Amount) from payment)));
+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra
+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | PRIMARY | payment | ALL | NULL | NULL | NULL | NULL | 6 | Using where
| 2 | SUBQUERY | payment | ALL | NULL | NULL | NULL | NULL | 6 | Using where
| 3 | SUBQUERY | payment | ALL | NULL | NULL | NULL | NULL | 6 |
| 4 | UNION | payment | ALL | NULL | NULL | NULL | NULL | 6 | Using where
| 5 | SUBQUERY | payment | ALL | NULL | NULL | NULL | NULL | 6 | Using where
| 6 | SUBQUERY | payment | ALL | NULL | NULL | NULL | NULL | 6 | Using where
| NULL | UNION RESULT | <union1,4> | ALL | NULL | NULL | NULL | NULL | NULL |
+-----+-----+-----+-----+-----+-----+-----+-----+
7 rows in set (0.001 sec)

MariaDB [jewelry]> create index indx8 on payment(Amount);
Query OK, 0 rows affected (0.013 sec)
Records: 0 Duplicates: 0 Warnings: 0

MariaDB [jewelry]> explain (select Customer_ID from payment where Amount = ( select max(Amount) from payment where Amount< (select max(Amount) from payment)))union(select Customer_ID from payment where Amount = ( select min(Amount) from payment where Amount> (select min(Amount) from payment)));
+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra
+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | PRIMARY | payment | ref | indx8 | indx8 | 5 | const | 1 | Using where
| 2 | SUBQUERY | NULL | NULL | NULL | NULL | NULL | NULL | Select tables optimized away
| 3 | SUBQUERY | NULL | NULL | NULL | NULL | NULL | NULL | Select tables optimized away
| 4 | UNION | payment | ref | indx8 | indx8 | 5 | const | 1 | Using where
| 5 | SUBQUERY | NULL | NULL | NULL | NULL | NULL | NULL | Select tables optimized away
| 6 | SUBQUERY | NULL | NULL | NULL | NULL | NULL | NULL | Select tables optimized away
| NULL | UNION RESULT | <union1,4> | ALL | NULL | NULL | NULL | NULL | NULL |
+-----+-----+-----+-----+-----+-----+-----+-----+
7 rows in set (0.026 sec)

MariaDB [jewelry]>

```

**FIGURE 58 : CREATE INDX3 ON PAYMENT TO INDEX TUNNING FOR A UNION FUNCTION**

**Description** – To reduce the number of execution in the complex query right outer join, an index is created to the attribute 'Material\_type' of the table 'SALES\_DETAILS'.

**Code** - explain select ch.Employ\_ID,ch.Name,ch.Address\_no, ch.street,ch.City, tr.Material\_type, tr.Catogory from SALES REPRESENTATION as ch right outer join SALES DETAILS as tr on tr.Item\_ID = ch.Item\_ID where tr.Material\_type = '21k gold';

```
create index inx1 on SALES_DETAILS(Material_type);
```

```
explain select ch.Employ_ID,ch.Name,ch.Address_no, ch.street,ch.City, tr.Material_type, tr.Catogory from SALES REPRESENTATION as ch right outer join SALES DETAILS as tr on tr.Item_ID = ch.Item_ID where tr.Material_type = '21k gold';
```

```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
3 rows in set (0.000 sec)

MariaDB [jewelry]> explain select ch.Employ_ID,ch.Name,ch.Address_no, ch.street,ch.City, tr.Material_type, tr.Catogory from SALES REPRESENTATION as ch right outer join SALES DETAILS as tr on tr.Item_ID = ch.Item_ID where tr.Material_type = '21k gold';
+----+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra
+----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | SIMPLE     | tr    | ALL   | NULL          | NULL | NULL    | NULL | 6   | Using where
| 1 | SIMPLE     | ch    | ALL   | Item_ID       | NULL | NULL    | NULL | 6   | Using where; Using join buffer (flat, BNL join)
+----+-----+-----+-----+-----+-----+-----+-----+-----+
2 rows in set (0.001 sec)

MariaDB [jewelry]> create index inx1 on SALES_DETAILS(Material_type);
Query OK, 0 rows affected (0.033 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [jewelry]> explain select ch.Employ_ID,ch.Name,ch.Address_no, ch.street,ch.City, tr.Material_type, tr.Catogory from SALES REPRESENTATION as ch right outer join SALES DETAILS as tr on tr.Item_ID = ch.Item_ID where tr.Material_type = '21k gold';
+----+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra
+----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1 | SIMPLE     | tr    | ref  | inx1         | inx1 | 11      | const | 3   | Using index condition
| 1 | SIMPLE     | ch    | ALL   | Item_ID       | NULL | NULL    | NULL | 6   | Using where; Using join buffer (flat, BNL join)
+----+-----+-----+-----+-----+-----+-----+-----+-----+
2 rows in set (0.021 sec)

MariaDB [jewelry]>

```

**FIGURE 59 : CREATE INX1 ON SALES DETAILS TO INDEX TUNNING FOR RIGHT OUTER JOIN**

**Description – select**

```
ch.Employ_ID,ch.Name,ch.Address_no,ch.street,ch.City,tr.Material_type,tr.Catoegory from
SALES_DETAILS as tr left outer join uv_complex_query_1 as ch on tr.Item_ID=ch.Item_ID where
tr.Material_type = '21k gold';
```

```
explain select ch.Employ_ID,ch.Name,ch.Address_no,ch.street,ch.City,tr.Material_type,tr.Catoegory
from SALES_DETAILS as tr left outer join uv_complex_query_1 as ch on tr.Item_ID=ch.Item_ID
where tr.Material_type = '21k gold';
```

```
create index inx1 on SALES_DETAILS(Material_type);
```

```
explain select ch.Employ_ID,ch.Name,ch.Address_no,ch.street,ch.City,tr.Material_type,tr.Catoegory
from SALES_DETAILS as tr left outer join uv_complex_query_1 as ch on tr.Item_ID=ch.Item_ID
where tr.Material_type = '21k gold';
```

**Code –** To reduce the number of execution in the complex query left outer join, an index is created to the attribute 'Material\_type' of the table 'SALES\_DETAILS'.

```

MariaDB [jewelry]> select ch.Employ_ID,ch.Name,ch.Address_no,ch.street,ch.City,tr.Material_type,tr.Catoegory from SALES_DETAILS as tr left outer join uv_complex_query_1 as ch on tr.Item_ID=ch.Item_ID where tr.Material_type = '21k gold';
+-----+-----+-----+-----+-----+
| Employ_ID | Name      | Address_no | street    | City     | Material_type | Catoegory |
+-----+-----+-----+-----+-----+
| 24       | Navene H.M.N. | 3A/A       | Ransinha Street | Mawancilla | 21k gold   | Pendant   |
| NULL     | NULL        | NULL       | NULL      | NULL     | 21k gold   | Box chain |
| NULL     | NULL        | NULL       | NULL      | NULL     | 21k gold   | Bangle    |
+-----+-----+-----+-----+-----+
3 rows in set (0.001 sec)

MariaDB [jewelry]> explain select ch.Employ_ID,ch.Name,ch.Address_no,ch.street,ch.City,tr.Material_type,tr.Catoegory from SALES_DETAILS as tr left outer join uv_complex_query_1 as ch on tr.Item_ID=ch.Item_ID where tr.Material_type = '21k gold';
+----+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table      | type    | possible_keys | key     | key_len | ref    | rows   | Extra          |
+----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1  | SIMPLE     | tr         | ALL    | NULL        | NULL    | NULL    | NULL   | 6      | Using where   |
| 1  | SIMPLE     | sales_representation | ALL    | Item_ID    | NULL    | NULL    | NULL   | 6      | Using where; Using join buffer (flat, BNL join) |
+----+-----+-----+-----+-----+-----+-----+-----+-----+
2 rows in set (0.000 sec)

MariaDB [jewelry]> create index inx2 on SALES_DETAILS(Material_type);
Query OK, 0 rows affected (0.013 sec)
Records: 0 Duplicates: 0 Warnings: 0

MariaDB [jewelry]> explain select ch.Employ_ID,ch.Name,ch.Address_no,ch.street,ch.City,tr.Material_type,tr.Catoegory from SALES_DETAILS as tr left outer join uv_complex_query_1 as ch on tr.Item_ID=ch.Item_ID where tr.Material_type = '21k gold';
+----+-----+-----+-----+-----+-----+-----+-----+-----+
| id | select_type | table      | type    | possible_keys | key     | key_len | ref    | rows   | Extra          |
+----+-----+-----+-----+-----+-----+-----+-----+-----+
| 1  | SIMPLE     | tr         | ref    | idx2        | inv2   | 11     | const  | 3      | Using index condition |
| 1  | SIMPLE     | sales_representation | ALL    | Item_ID    | NULL    | NULL    | NULL   | 6      | Using where; Using join buffer (flat, BNL join) |
+----+-----+-----+-----+-----+-----+-----+-----+-----+
2 rows in set (0.013 sec)

MariaDB [jewelry]>

```

**FIGURE 60 : CREATE INX1 ON SALES DETAILS TO INDEX TUNNING FOR LAFT OUTER JOIN**

**Description** - Created an index to attribute 'amount' of the table 'payment'. Due to that number of running step reduced as show in the figure.

**Code** - select Customer\_ID from payment where Amount =( select max(Amount) from payment where Amount< ( select max(Amount) from payment where Amount< (select max(Amount) from payment)));

explain select Customer\_ID from payment where Amount =( select max(Amount) from payment where Amount< ( select max(Amount) from payment where Amount< (select max(Amount) from payment)));

create index indx3 on payment(Amount);

explain select Customer\_ID from payment where Amount =( select max(Amount) from payment where Amount< ( select max(Amount) from payment where Amount< (select max(Amount) from payment)));

```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
MariaDB [jewelry]> select Customer_ID from payment where Amount =( select max(Amount) from payment where Amount< ( select max(Amount) from payment where Amount< (select max(Amount) from payment)));
+-----+
| Customer_ID |
+-----+
| 873166034 |
1 row in set (0.002 sec)

MariaDB [jewelry]> explain select Customer_ID from payment where Amount =( select max(Amount) from payment where Amount< ( select max(Amount) from payment where Amount< (select max(Amount) from payment)));
+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra |
+-----+
| 1 | PRIMARY    | payment | ALL | NULL        | NULL | NULL   | NULL | 6   | Using where |
| 2 | SUBQUERY   | payment | ALL | NULL        | NULL | NULL   | NULL | 6   | Using where |
| 3 | SUBQUERY   | payment | ALL | NULL        | NULL | NULL   | NULL | 6   | Using where |
| 4 | SUBQUERY   | payment | ALL | NULL        | NULL | NULL   | NULL | 6   | Using where |
+-----+
4 rows in set (0.000 sec)

MariaDB [jewelry]> create index indx3 on payment(Amount);
Query OK, 0 rows affected (0.013 sec)
Records: 0  Duplicates: 0  Warnings: 0

MariaDB [jewelry]> explain select Customer_ID from payment where Amount <( select max(Amount) from payment where Amount< ( select max(Amount) from payment where Amount< (select max(Amount) from payment)));
+-----+
| id | select_type | table | type | possible_keys | key | key_len | ref | rows | Extra |
+-----+
| 1 | PRIMARY    | payment | ref | indx3       | indx3 | 5      | const | 1   | Using where |
| 2 | SUBQUERY   | NULL    | NULL | NULL        | NULL  | NULL   | NULL | Select tables optimized away |
| 3 | SUBQUERY   | NULL    | NULL | NULL        | NULL  | NULL   | NULL | Select tables optimized away |
| 4 | SUBQUERY   | NULL    | NULL | NULL        | NULL  | NULL   | NULL | Select tables optimized away |
+-----+
4 rows in set (0.015 sec)

MariaDB [jewelry]>
```

**FIGURE 61 : CREATE INDX3 ON PAYMENT TO INDEX TUNNING**

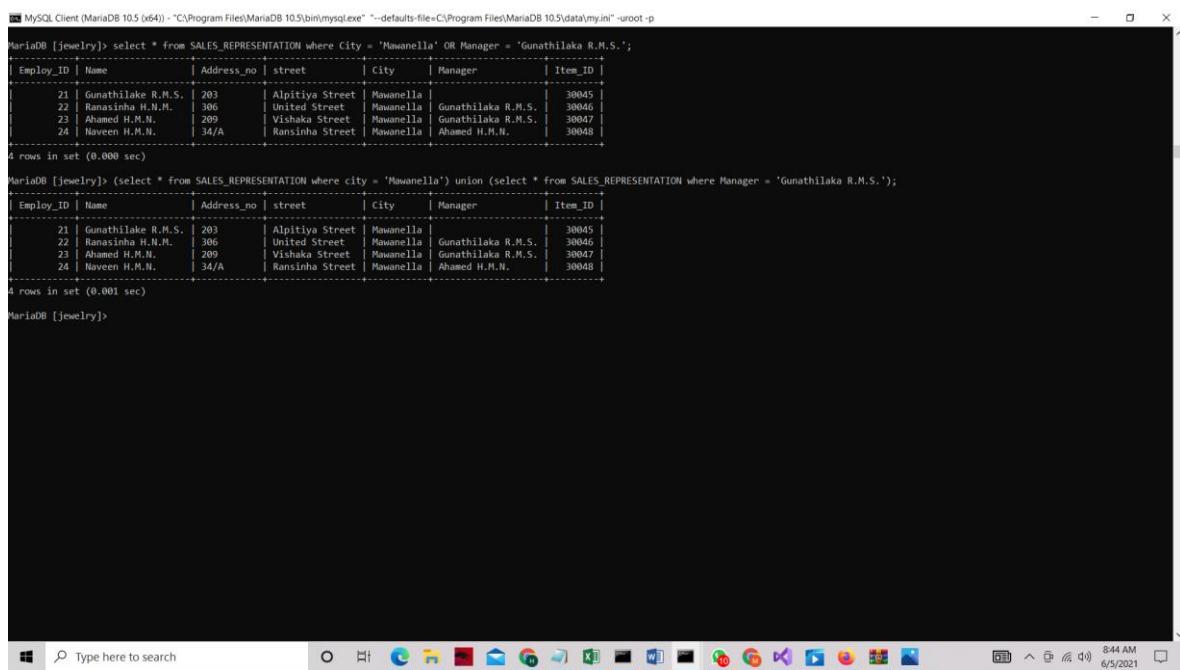
## 2. Tuning using indexes and Tuning guidelines

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**Description** - By avoiding the 'OR' operator query is split into two parts and it is connected by 'UNION'.

**Code** - select \* from SALES REPRESENTATION where City = 'Mawanella' OR Manager = 'Gunathilaka R.M.S.';

(select \* from SALES REPRESENTATION where city = 'Mawanella') union (select \* from SALES REPRESENTATION where Manager = 'Gunathilaka R.M.S.');



```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini"--root -p
MariaDB [jewelry]> select * from SALES_REPRESENTATION where City = 'Mawanella' OR Manager = 'Gunathilaka R.M.S.';
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilake R.M.S. | 203 | Alpitiya Street | Mawanella | Gunathilaka R.M.S. | 30045 |
| 22 | Ranasinha H.N.M. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahmed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahmed H.M.N. | 30048 |
+-----+-----+-----+-----+-----+
4 rows in set (0.000 sec)

MariaDB [jewelry]> (select * from SALES_REPRESENTATION where city = 'Mawanella') union (select * from SALES_REPRESENTATION where Manager = 'Gunathilaka R.M.S.');
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilake R.M.S. | 203 | Alpitiya Street | Mawanella | Gunathilaka R.M.S. | 30045 |
| 22 | Ranasinha H.N.M. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahmed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
| 24 | Naveen H.M.N. | 34/A | Ransinha Street | Mawanella | Ahmed H.M.N. | 30048 |
+-----+-----+-----+-----+-----+
4 rows in set (0.001 sec)

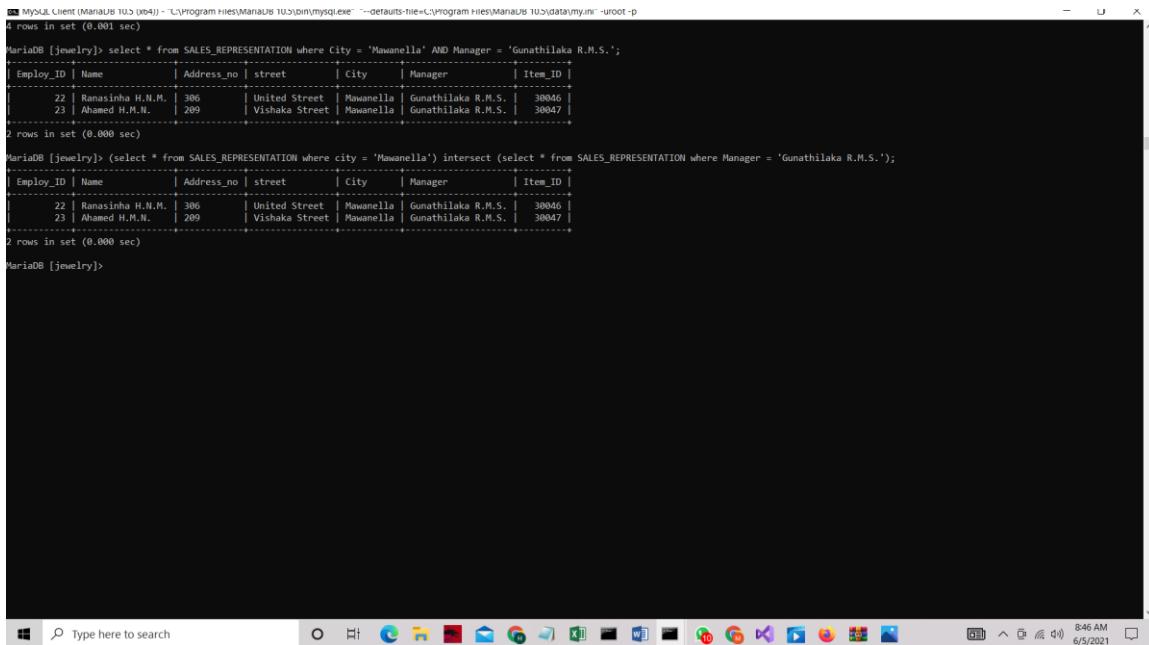
MariaDB [jewelry]>
```

**FIGURE 62 : QUERY TUNNING GUIDELINE TO REMOVE OR CONDITION AND USE UNION**

**Description -** Without using 'AND'. Operator query connected using 'INTERSECT' operator.

**Code –** select \* from SALES REPRESENTATION where City = 'Mawanella' AND Manager = 'Gunathilaka R.M.S.';

(select \* from SALES REPRESENTATION where city = 'Mawanella') intersect (select \* from SALES REPRESENTATION where Manager = 'Gunathilaka R.M.S.');



```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" --defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini -uroot -p
4 rows in set (0.001 sec)

MariaDB [jewelry] > select * from SALES_REPRESENTATION where City = 'Mawanella' AND Manager = 'Gunathilaka R.M.S.';
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager |
+-----+-----+-----+-----+-----+
| 22 | Ranasinha H.N.M. | 306 | United Street | Mawanella | Gunathilaka R.M.S. |
| 23 | Ahmed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. |
+-----+-----+-----+-----+-----+
2 rows in set (0.000 sec)

MariaDB [jewelry] > (select * from SALES_REPRESENTATION where city = 'Mawanella') intersect (select * from SALES_REPRESENTATION where Manager = 'Gunathilaka R.M.S.');
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager |
+-----+-----+-----+-----+-----+
| 22 | Ranasinha H.N.M. | 306 | United Street | Mawanella | Gunathilaka R.M.S. |
| 23 | Ahmed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. |
+-----+-----+-----+-----+-----+
2 rows in set (0.000 sec)

MariaDB [jewelry]>

```

**FIGURE 63 : QUERY TUNNING GUIDELINE TO REMOVE AND CONDITION AND USE INTERSECT**

**Description -** Without using 'AND' and 'NOT' Operator query connected using 'EXCEPT' operator.

```

MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" "--defaults-file=C:\Program Files\MariaDB 10.5\data\my.ini" -uroot -p
2 rows in set (0.000 sec)

MariaDB [jewelry]> select * from SALES_REPRESENTATION where City = 'Mawanella' AND NOT Manager = 'Ahamed H.M.N.';
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilaka R.M.S. | 203 | Alipitiya Street | Mawanella | Ahamed H.M.N. | 30045 |
| 22 | Ranasingha H.N.M. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahamed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
+-----+-----+-----+-----+-----+
3 rows in set (0.000 sec)

MariaDB [jewelry]> (select * from SALES_REPRESENTATION where city = 'Mawanella') except (select * from SALES_REPRESENTATION where Manager = 'Ahamed H.M.N.');
+-----+-----+-----+-----+-----+
| Employ_ID | Name | Address_no | street | City | Manager | Item_ID |
+-----+-----+-----+-----+-----+
| 21 | Gunathilaka R.M.S. | 203 | Alipitiya Street | Mawanella | Ahamed H.M.N. | 30045 |
| 22 | Ranasingha H.N.M. | 306 | United Street | Mawanella | Gunathilaka R.M.S. | 30046 |
| 23 | Ahamed H.M.N. | 209 | Vishaka Street | Mawanella | Gunathilaka R.M.S. | 30047 |
+-----+-----+-----+-----+-----+
3 rows in set (0.000 sec)

MariaDB [jewelry]>

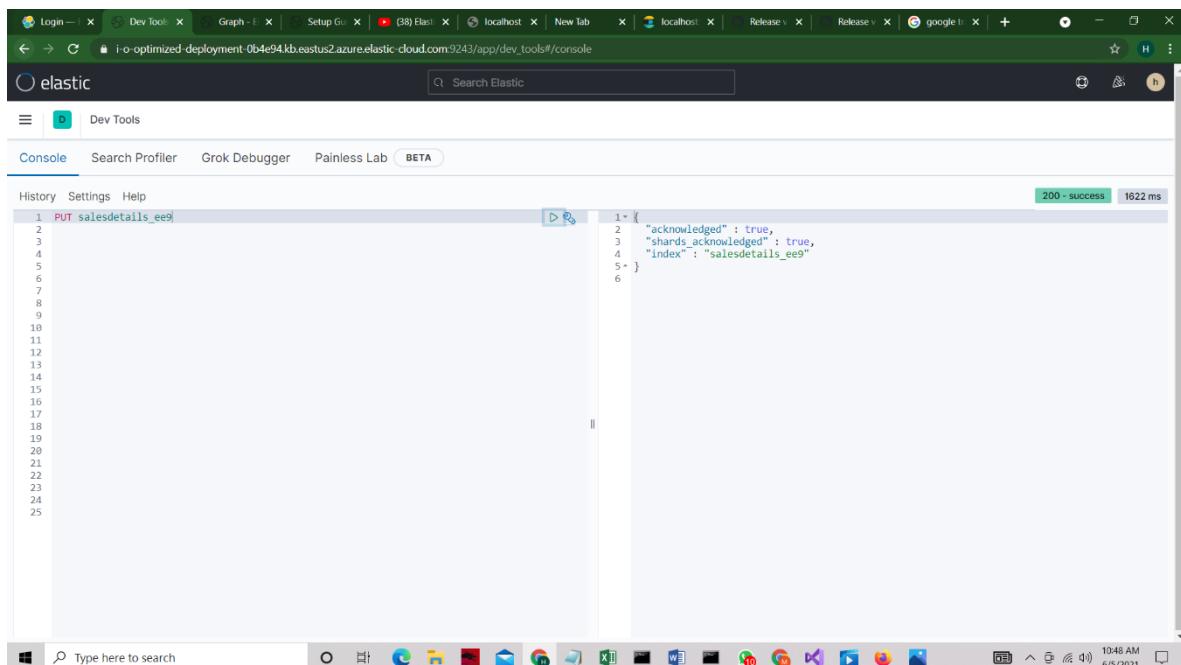
```

**FIGURE 64 : QUERY TUNNING GUIDELINE TO REMOVE NOT CONDITION AND USE EXCEPT**

# PART B - NoSQL DATABASES

## CHAPTER 1 - Aggregation model

Create node sales details



The screenshot shows the Elasticsearch Dev Tools interface. In the left panel, there is a code editor with the following JSON code:

```
1 PUT salesdetails_ee9
```

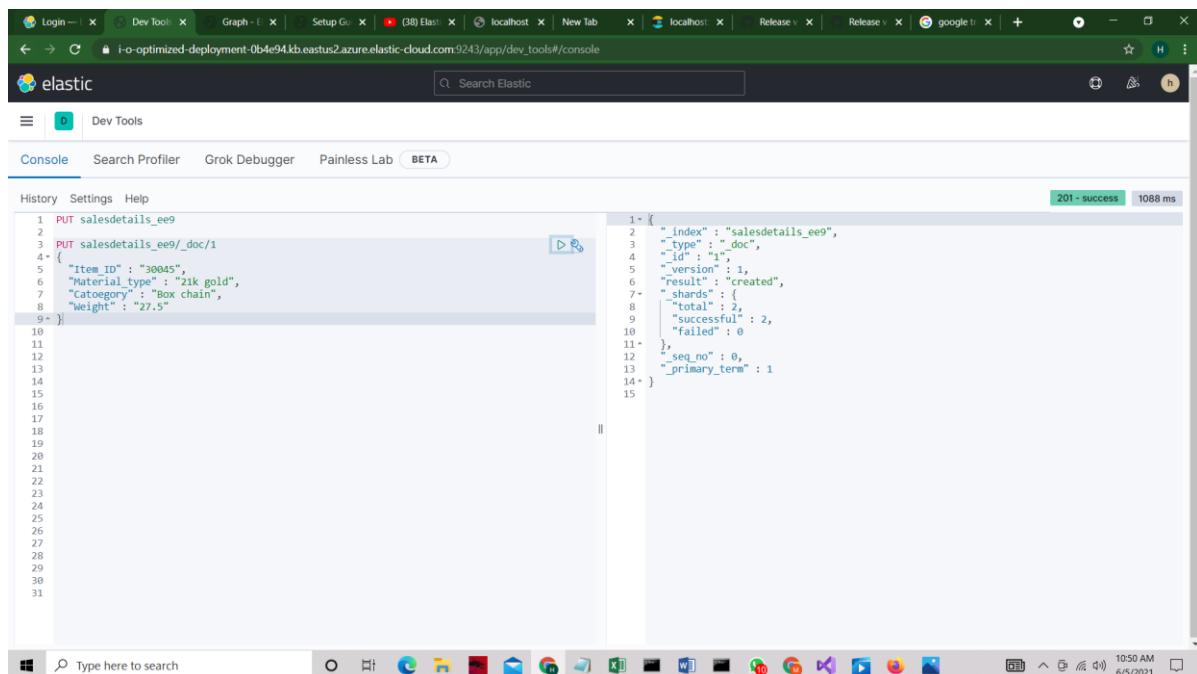
In the right panel, the response is displayed:

```
1+ {  
2 "acknowledged": true,  
3 "shards_acknowledged": true,  
4 "index": "salesdetails_ee9"  
5+ }  
6
```

At the bottom right of the interface, it says "200 - success" and "1622 ms".

**FIGURE 65 : CREATE NODE SALES DETAILS**

1<sup>st</sup> Data insertion



The screenshot shows the Elasticsearch Dev Tools interface. In the left panel, there is a code editor with the following JSON code:

```
1 PUT salesdetails_ee9  
2 PUT salesdetails_ee9/_doc/1  
3 {  
4   "Item ID": "30045",  
5   "Material_type": "21k gold",  
6   "Category": "Box chain",  
7   "Weight": "27.5"  
8 }  
9+ }
```

In the right panel, the response is displayed:

```
1+ {  
2   "index": "salesdetails_ee9",  
3   "type": "_doc",  
4   "_id": "1",  
5   "version": 1,  
6   "result": "created",  
7   "shards": {  
8     "total": 2,  
9     "successful": 2,  
10    "failed": 0  
11  },  
12  "seq_no": 0,  
13  "_primary_term": 1  
14+ }  
15
```

At the bottom right of the interface, it says "201 - success" and "1088 ms".

**FIGURE 66 : 1<sup>st</sup> DATA INSERTION**

## 5<sup>th</sup> Data insertion

The screenshot shows the Elasticsearch Dev Tools interface. The left pane displays a series of PUT requests for the 'salesdetails\_e9/\_doc' index. The right pane shows the response for the last request, which was successful with a status of 201 and a duration of 527 ms. The response JSON indicates that two shards were created, totaling 2 successful and 0 failed operations, with a primary term of 1 and a sequence number of 4.

```
20 "Item_ID" : "30047",
21 "Material_type" : "21k gold",
22 "Category" : "Bangle",
23 "Weight" : "15.6"
24+
25 PUT salesdetails_e9/_doc/4
26 {
27   "Item_ID" : "30047",
28   "Material_type" : "21k gold",
29   "Category" : "Penden",
30   "Weight" : "11.9"
31 }
32+
33 PUT salesdetails_e9/_doc/5
34{
35   "Item_ID" : "30047",
36   "Material_type" : "18k gold",
37   "Category" : "Lock Bangle",
38   "Weight" : "39.2"
39+
40
41
42
43
44
45
46
47
48
49
50
51
52
53+
54+
55+
56 PUT salesdetails_e9/_doc/8
57{
58   "Item_ID" : "30052",
59   "Material_type" : "22k gold",
60   "Category" : "Box chain",
61   "Weight" : "11.4"
62+
63
64 PUT salesdetails_e9/_doc/9
65{
66   "Item_ID" : "30053",
67   "Material_type" : "22k gold",
68   "Category" : "Box chain",
69   "Weight" : "15.4"
70+
71
72 PUT salesdetails_e9/_doc/10
73{
74   "Item_ID" : "30054",
75   "Material_type" : "22k gold",
76   "Category" : "Earing",
77   "Weight" : "17.4"
78+
79
80
81
82
83
84
85
86
```

201 - success 527 ms

```
1+ {
2   "index" : "salesdetails_e9",
3   "type" : "_doc",
4   "id" : "5",
5   "version" : 1,
6   "result" : "created",
7   "shards" : {
8     "total" : 2,
9     "successful" : 2,
10    "failed" : 0
11  },
12  "_seq_no" : 4,
13  "_primary_term" : 1
14+
15
```

**FIGURE 67 : 5<sup>th</sup> DATA INSERTION**

## 10<sup>th</sup> Data insertion

The screenshot shows the Elasticsearch Dev Tools interface. The left pane displays a series of PUT requests for the 'salesdetails\_e9/\_doc' index. The right pane shows the response for the last request, which was successful with a status of 201 and a duration of 991 ms. The response JSON indicates that two shards were created, totaling 2 successful and 0 failed operations, with a primary term of 1 and a sequence number of 9.

```
52 "Category" : "Bangle",
53 "Weight" : "10.3"
54+
55+
56 PUT salesdetails_e9/_doc/8
57{
58   "Item_ID" : "30052",
59   "Material_type" : "22k gold",
60   "Category" : "Box chain",
61   "Weight" : "11.4"
62+
63
64 PUT salesdetails_e9/_doc/9
65{
66   "Item_ID" : "30053",
67   "Material_type" : "22k gold",
68   "Category" : "Box chain",
69   "Weight" : "15.4"
70+
71
72 PUT salesdetails_e9/_doc/10
73{
74   "Item_ID" : "30054",
75   "Material_type" : "22k gold",
76   "Category" : "Earing",
77   "Weight" : "17.4"
78+
79
80
81
82
83
84
85
86
```

201 - success 991 ms

```
1+ {
2   "index" : "salesdetails_e9",
3   "type" : "_doc",
4   "id" : "10",
5   "version" : 1,
6   "result" : "created",
7   "shards" : {
8     "total" : 2,
9     "successful" : 2,
10    "failed" : 0
11  },
12  "_seq_no" : 9,
13  "_primary_term" : 1
14+
15
```

**FIGURE 68 : 10<sup>th</sup> DATA INSERTION**

## Retrieval of whole data 1

The screenshot shows the Elasticsearch Dev Tools interface with the following details:

- URL:** i-o-optimized-deployment-0b4e94kb.eastus2.azure.elastic-cloud.com:9243/app/dev\_tools#/console
- Search Bar:** Search Elastic
- Toolbar:** Dev Tools (selected), Console, Search Profiler, Grok Debugger, Painless Lab (BETA)
- Console Tab:** History, Settings, Help
- Code Area:** A code editor with two panels. The left panel contains the following code:

```
68 "Category": "Box chain",
69 "Weight": "15.4"
70 }
71
72 PUT salesdetails_ee9/_doc/10
73 { "Item_ID": "30054",
74 "Material_type": "22k gold",
75 "Category": "Earring",
76 "Weight": "17.4"
77 }
78 }
79
80 GET salesdetails_ee9/_search
```
- Result Panel:** Shows a successful search result with a total of 10 hits. One hit is displayed in detail:

```
1 {
2   "took": 412,
3   "timed_out": false,
4   "_shards": 1,
5   "_score": 1.0,
6   "successful": 1,
7   "skipped": 0,
8   "failed": 0
9 },
10 {
11   "hits": {
12     "total": {
13       "value": 10,
14       "relation": "eq"
15     },
16     "max_score": 1.0,
17     "hits": [
18       {
19         "_index": "salesdetails_ee9",
20         "_type": "doc",
21         "_id": "1",
22         "_score": 1.0,
23         "_source": {
24           "Item_ID": "30054",
25           "Material_type": "22k gold",
26           "Category": "Box chain",
27           "Weight": "27.5"
28         }
29       },
30       {
31         "_index": "salesdetails_ee9",
32         "_type": "doc",
33         "_id": "2",
34         "_score": 1.0,
35         "_source": {
36           "Item_ID": "30046"
37         }
38     ]
39   }
40 }
```
- Bottom Status:** 200 - success 1839 ms

**FIGURE 69 : RETRIEVAL OF WHOLE DATA 1**

## Retrieval of whole data 2

The screenshot shows the Elasticsearch Dev Tools Console interface. The top navigation bar includes tabs for 'Login -' (highlighted), 'Dev Tools', 'Graph -', 'Setup Guide', '(38) Elasticsearch', 'localhost', 'New Tab', 'localhost', 'Release v', 'Release v', 'google', and a '+' icon. Below the navigation is a search bar with the placeholder 'Search Elastic'. The main area has tabs for 'Console' (selected), 'Search Profiler', 'Grok Debugger', and 'Painless Lab (BETA)'. The 'Console' tab displays a code editor with the following JSON document:

```
68     "Cateoegory" : "Box chain",
69     "Weight" : "15.4"
70   }
71
72 PUT salesdetails_ee9/_doc/10
73 {
74   "Item_ID" : "30054",
75   "Material_type" : "22k gold",
76   "Cateoegory" : "Earing",
77   "Weight" : "17.4"
78 }
79
80 GET salesdetails_ee9/_search
```

The code editor highlights the 'PUT' and 'GET' requests. To the right of the code editor, the response is shown in a collapsible panel:

```
{
  "took": 1,
  "timed_out": false,
  "_index": "salesdetails_ee9",
  "_type": "doc",
  "_id": "30047",
  "_score": 1.0,
  "_source": {
    "Item_ID": "30047",
    "Material_type": "21k gold",
    "Cateoegory": "Bangle",
    "Weight": "15.6"
  }
},
{
  "took": 1,
  "timed_out": false,
  "_index": "salesdetails_ee9",
  "_type": "doc",
  "_id": "30048",
  "_score": 1.0,
  "_source": {
    "Item_ID": "30048",
    "Material_type": "21k gold",
    "Cateoegory": "Penden",
    "Weight": "11.9"
  }
},
{
  "took": 1,
  "timed_out": false,
  "_index": "salesdetails_ee9",
  "_type": "doc",
  "_id": "30049",
  "_score": 1.0,
  "_source": {
    "Item_ID": "30049",
    "Material_type": "18k gold",
    "Cateoegory": "Lock Bangle",
    "Weight": "39.2"
  }
}
```

The response indicates a success status (200) and a duration of 1839 ms. The bottom of the screen shows the Windows taskbar with various pinned icons.

**FIGURE 70 : RETRIEVAL OF WHOLE DATA 2**

## Retrieval of whole data 3

The screenshot shows the Elasticsearch Dev Tools interface. In the top navigation bar, there are tabs for 'Login', 'Dev Tools' (which is active), 'Graph', 'Setup GUI', 'localhost', 'New Tab', 'localhost', 'Release', 'google', and a '+' button. Below the tabs, there's a search bar with the placeholder 'Search Elastic'. The main area is titled 'Console' and contains a code editor with the following log entries:

```
68 "Category": "Box chain",
69 "Weight": "15.4"
70 }
71
72 PUT salesdetails_e09/_doc/10
73 {
74   "Item_ID": "30054",
75   "Material_type": "22k gold",
76   "Category": "Earring",
77   "Weight": "17.4"
78 }
79
80 GET salesdetails_e09/_search
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
```

On the right side of the code editor, the response is displayed:

```
90   },
91   "index": "salesdetails_e09",
92   "_type": "doc",
93   "_id": "g",
94   "_score": 1.0,
95   "_source": {
96     "Item_ID": "30051",
97     "Material_type": "20k gold",
98     "Category": "Bangle",
99     "Weight": "10.3"
100   },
101   },
102   {
103     "index": "salesdetails_e09",
104     "_type": "doc",
105     "_id": "g",
106     "_score": 1.0,
107     "_source": {
108       "Item_ID": "30052",
109       "Material_type": "22k gold",
110       "Category": "Box chain",
111       "Weight": "11.4"
112     },
113   },
114   {
115     "index": "salesdetails_e09",
116     "_type": "doc",
117     "_id": "g",
118     "_score": 1.0,
119     "_source": {
120       "Item_ID": "30053",
121       "Material_type": "22k gold",
122       "Category": "Box chain",
123       "Weight": "15.4"
124     },
125 }
```

At the bottom of the interface, there's a search bar with 'Type here to search' and a toolbar with various icons.

**FIGURE 71 : RETRIEVAL OF WHOLE DATA 3**

## Retrieval of data according to Item ID

The screenshot shows the Elasticsearch Dev Tools interface. In the top navigation bar, there are tabs for 'Login', 'Dev Tools' (which is active), 'Graph', 'Setup GUI', 'localhost', 'New Tab', 'localhost', 'Release', 'google', and a '+' button. Below the tabs, there's a search bar with the placeholder 'Search Elastic'. The main area is titled 'Console' and contains a code editor with the following log entries:

```
68 "Category": "Box Chain",
69 "Weight": "15.4"
70 }
71
72 PUT salesdetails_e09/_doc/10
73 {
74   "item_ID": "30054",
75   "Material_type": "22k gold",
76   "Category": "Earring",
77   "Weight": "17.4"
78 }
79
80 GET salesdetails_e09/_search
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
```

On the right side of the code editor, the response is displayed:

```
1+ {
2   "took": 10,
3   "timed_out": false,
4   "_shards": {
5     "total": 1,
6     "successful": 1,
7     "skipped": 0,
8     "failed": 0
9   },
10   "hits": [
11     {
12       "total": 1,
13       "value": 1,
14       "relation": "eq"
15     }
16   ],
17   "max_score": 1.9924302,
18   "hits": [
19     {
20       "index": "salesdetails_e09",
21       "_type": "doc",
22       "_id": "g",
23       "_score": 1.9924302,
24       "_source": {
25         "item_ID": "30049",
26         "Material_type": "18k gold",
27         "Category": "Lock Bangle",
28         "Weight": "39.2"
29       }
30     }
31   ]
32 }
```

At the bottom of the interface, there's a search bar with 'Type here to search' and a toolbar with various icons.

**FIGURE 72 : RETRIEVAL OF DATA ACCORDING TO ITEM ID**

## Retrieval of data according to category

The screenshot shows the Elasticsearch Dev Tools interface. The top navigation bar includes tabs for Login, Dev Tools, Graph, Setup GUI, YouTube, localhost, New Tab, localhost, Release, Release v, google, and a plus sign. The main title bar says "elastic" and has a search bar. Below the title bar, there are tabs for Console, Search Profiler, Grok Debugger, and Painless Lab (BETA). A status bar at the bottom right shows "200 - success" and "1045 ms". The main area contains a code editor with a syntax-highlighted JSON search query and its corresponding results.

```
68 "Category": "Box chain",
69 "Weight": "15.4"
70 }
71
72 PUT salesdetails_e9/_doc/10
73 {
74   "Item_ID": "30054",
75   "Material_type": "22k gold",
76   "Category": "Earing",
77   "Weight": "17.4"
78 }
79
80 GET salesdetails_e9/_search
81
82 GET /salesdetails_e9/_search?q=30049
83
84 GET /salesdetails_e9/_search
85 {
86   "query": {
87     "multi_match": {
88       "query": "Box chain",
89       "fields": ["Category"]
90     }
91   }
92 }
93
94
95
96
97
98
99
100
101
102
```

```
15   "max_score": 1.7942764,
16+
17+
18   "hits": [
19     {
20       "_index": "salesdetails_e9",
21       "_type": "doc",
22       "_id": "1",
23       "_score": 1.7942764,
24       "_source": {
25         "Item_ID": "30045",
26         "Material_type": "22k gold",
27         "Category": "Box chain",
28         "Weight": "27.5"
29     }
30   },
31   {
32     "_index": "salesdetails_e9",
33     "_type": "doc",
34     "_id": "8",
35     "_score": 1.7942764,
36     "_source": {
37       "Item_ID": "30052",
38       "Material_type": "22k gold",
39       "Category": "Box chain",
40       "Weight": "11.4"
41   },
42   {
43     "_index": "salesdetails_e9",
44     "_type": "doc",
45     "_id": "9",
46     "_score": 1.7942764,
47     "_source": {
48       "Item_ID": "30053",
49       "Material_type": "22k gold",
50       "Category": "Box chain"
51     }
52 }
```

**FIGURE 73 : RETRIEVAL OF DATA ACCORDING TO CATEGORY**

## CHAPTER 2 - Graph data model

### Creating node user

The screenshot shows the Microsoft Visual Studio IDE interface. The main code editor window displays the `User.cs` file under the `Socialnetwork2` project. The code defines a `User` entity with properties like `Id`, `UserName`, `Country`, `Hobby`, and `Occupation`, along with a `friends` collection. The Solution Explorer on the right shows the project structure with files like `MyEntityContext.tt`, `Program.cs`, and `user.cs`. The Output window at the bottom shows the application has exited successfully.

```
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace Socialnetwork2
{
    [Entity]
    public interface IUser
    {
        string Id { get; }
        string UserName { get; set; }
        string Country { get; set; }
        string Hobby { get; set; }
        string Occupation { get; set; }

        ICollection<IUser> friend { get; set; }

        [InverseProperty("friend")]
        ICollection<IUser> friends { get; set; }
    }
}
```

**FIGURE 74 : CREATING NODE USER**

### Adding user details 1

The screenshot shows the Microsoft Visual Studio IDE interface. The main code editor window displays the `Program.cs` file under the `Socialnetwork2` project. The code contains five blocks of code comments, each creating a new `User` object with specific details. The Solution Explorer on the right shows the project structure with files like `MyEntityContext.tt`, `Program.cs`, and `user.cs`. The Output window at the bottom shows the application has exited successfully.

```
static void Main(string[] args)
{
    // Connection String
    const string connectionString = "Type=embedded;StoresDirectory=c:\\brightstar;storename=Socialnetwork3";

    var ctx = new MyEntityContext(connectionString);

    // Creating users
    //1
    var hamni = ctx.users.Create();
    hamni.UserName = "Hamni";
    hamni.Country = "Sri Lanka";
    hamni.Hobby = "Collecting stamps";
    hamni.Occupation = "Engineer";
    //2
    var emma = ctx.users.Create();
    emma.UserName = "Emma";
    emma.Country = "Australia";
    emma.Hobby = "Reading Books";
    emma.Occupation = "Singer";
    //3
    var shamika = ctx.users.Create();
    shamika.UserName = "Shamika";
    shamika.Country = "Sri Lanka";
    shamika.Hobby = "Reading Books";
    shamika.Occupation = "Doctor";
    //4
    var jackson = ctx.users.Create();
    jackson.UserName = "Jackson";
    jackson.Country = "USA";
    jackson.Hobby = "Watching films";
    jackson.Occupation = "Actor";
    //5
    var robert = ctx.users.Create();
```

**FIGURE 75 : ADDING USER DETAILS 1**

## Adding user details 2

The screenshot shows the Visual Studio IDE interface. The main window displays the `Program.cs` file for the `Socialnetwork2` project. The code creates several user objects and adds them to a context. The Solution Explorer on the right shows the project structure with files like `MyEntityContext.tt`, `User.cs`, and `Program.cs`.

```

44    robert.country = "India";
45    robert.hobby = "Watching films";
46    robert.occupation = "Dancer";
47    //..6
48    var chris = ctx.users.Create();
49    chris.UserName = "Chris";
50    chris.country = "USA";
51    chris.hobby = "Playing guitar";
52    chris.occupation = "Singer";
53    //..7
54    var muzni = ctx.users.Create();
55    muzni.UserName = "Muzni";
56    muzni.country = "Italy";
57    muzni.hobby = "Collecting stamps";
58    muzni.occupation = "Engineer";
59    //..8
60    var larson = ctx.users.Create();
61    larson.UserName = "Larson";
62    larson.country = "Australia";
63    larson.hobby = "Cooking";
64    larson.occupation = "Chef";
65    //..9
66    var amith = ctx.users.Create();
67    amith.UserName = "Amith";
68    amith.country = "Australia";
69    amith.hobby = "Watching files";
70    amith.occupation = "Teacher";
71    //..10
72    var ahshan = ctx.users.Create();
73    ahshan.UserName = "Ahshan";
74    ahshan.country = "Australia";
75    ahshan.hobby = "Watching files";
76    ahshan.occupation = "Doctor";
77
78    ctx.SaveChanges();

```

**FIGURE 76 : ADDING USER DETAILS 2**

## Building relationship between user names

The screenshot shows the Visual Studio IDE interface. The main window displays the `Program.cs` file for the `Socialnetwork2` project. The code adds friends to each user's friend list. The Solution Explorer on the right shows the project structure with files like `MyEntityContext.tt`, `User.cs`, and `Program.cs`.

```

83
84    namni.friend.Add(larson);
85    namni.friend.Add(larson);
86
87    emma.friend.Add(larson);
88    emma.friend.Add(robert);
89    emma.friend.Add(chris);
90
91    shamika.friend.Add(amith);
92    shamika.friend.Add(ahshan);
93    shamika.friend.Add(muzni);
94
95    jackson.friend.Add(chris);
96    jackson.friend.Add(emma);
97
98    robert.friend.Add(jackson);
99    robert.friend.Add(hamni);
100   robert.friend.Add(shamika);
101
102   chris.friend.Add(larson);
103   chris.friend.Add(amith);
104   chris.friend.Add(muzni);
105
106   larson.friend.Add(ahshan);
107   larson.friend.Add(chris);
108
109   muzni.friend.Add(hamni);
110   muzni.friend.Add(ahshan);
111   muzni.friend.Add(robert);
112
113   amith.friend.Add(muzni);
114   amith.friend.Add(robert);
115
116   ahshan.friend.Add(chris);
117   ahshan.friend.Add(emma);
118
119   ctx.SaveChanges();
120
121   var Persons = ctx.users.Select(x => x.UserName).ToList();

```

**FIGURE 77 : BUILDING RELATIONSHIP BETWEEN USER NAMES**

## Retrieving all users

The screenshot shows the Microsoft Visual Studio IDE interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and Search (Ctrl+Q). The title bar says "Socialnetwork2". The tabs pane shows files like Socialnetwork2.cs, MyEntityContext.tt, [Solution], NuGet - Solution, Socialnetwork2, User.cs, Program.cs, and Miscellaneous Files README.txt. The main code editor displays C# code for retrieving users:

```
122 muzni.friend.Add(hanni);
123 muzni.friend.Add(ahsan);
124 muzni.friend.Add(robert);
125
126 amith.friend.Add(muzni);
127 amith.friend.Add(robert);
128
129 ahsan.friend.Add(chris);
130 ahsan.friend.Add(emma);
131
132 ctx.SaveChanges();
133
134 var Persons = ctx.users.Select(x => x.UserName).ToList();
135
136 Console.WriteLine("----all users---");
137 Console.WriteLine(" ");
138 int i = 0;
139 Console.WriteLine(" Name ");
140 foreach (var Person in Persons)
141 {
142     i++;
143     Console.WriteLine(i + ". " + Person);
144 }
145
146 //line breaks
147
148
```

The Output window shows the results of the program execution:

```
--all users---
Name
1. Robert
2. Shamika
3. Hamni
4. Ahsan
5. Amith
6. Muzni
7. Chris
8. Emma
9. Jackson
10. Larson
```

The bottom status bar shows the date and time as 6/6/2021 11:24 AM.

**FIGURE 78 : RETRIEVING ALL USERS**

## Retrieving all users' details

The screenshot shows the Microsoft Visual Studio IDE interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and Search (Ctrl+Q). The title bar says "Socialnetwork2". The tabs pane shows files like Socialnetwork2.cs, MyEntityContext.tt, [Solution], NuGet - Solution, Socialnetwork2, User.cs, Program.cs, and Miscellaneous Files README.txt. The main code editor displays C# code for retrieving users' details:

```
119 var Persons = ctx.users.ToList();
120
121 Console.WriteLine("----all users---");
122 Console.WriteLine(" ");
123 int i = 0;
124 Console.WriteLine(" Name - Country - Hobby - Occupation");
125 foreach (var Person in Persons)
126 {
127     i++;
128     Console.WriteLine(i + ". " + Person.UserName + " - " + Person.country + " - " + Person.hobby + " - " + Person.occupation);
129 }
130
131 //line breaks
132 Console.WriteLine(" ");
133 Console.WriteLine(" ");
134
135 // Enter a paerson from the user
136
137 //Console.Write("Enter any name : ");
138 string personname = Console.ReadLine();
139
140 Console.WriteLine(" ");
141 //check whether the person is null or not
142 if (string.IsNullOrEmpty(personname))
143 {
144     Console.WriteLine("Enter again - ");
145     personname = Console.ReadLine();
146 }
```

The Output window shows the results of the program execution:

```
--all users---
Name - Country - Hobby - Occupation
1. Hamni - Sri Lanka - Collecting stamps - Engineer
2. Shamika - Sri Lanka - Reading Books - Doctor
3. Muzni - Italy - Collecting stams - Engineer
4. Chris - USA - Playing guitar - Singer
5. Emma - Australia - Reading Books - Singer
6. Jackson - USA - Watching films - Actor
7. Robert - Australia - Watching films - Teacher
8. Ahsan - India - Watching films - Dancer
9. Larson - Australia - Watching films - Doctor
```

The bottom status bar shows the date and time as 6/6/2021 11:41 AM.

**FIGURE 79 : RETRIEVING ALL USERS' DETAILS**

## Search followings according to the user name

The screenshot shows the Visual Studio IDE interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and Search (Ctrl+Q). The title bar says "Socialnetwork2". The main code editor window displays C# code for a "Program.cs" file. The code uses Entity Framework to query the database for users named Hamni and prints their details to the console. The output window shows the results for Hamni's followers. The bottom status bar indicates the current time as 1:47 PM on 6/6/2021.

```
var frds = hamni.friends;
Console.WriteLine("Followings of Hamni and their details");
Console.WriteLine(" ");
int j = 0;
Console.WriteLine("   Name   ");
foreach (var frd in frds)
{
    j++;
    Console.WriteLine(j + ". " + frd.userName);
}
Console.WriteLine();
int i = 0;
Console.WriteLine("   Name - Country - Hobby - Occupation");
foreach (var frd in frds)
{
    i++;
    Console.WriteLine(i + ". " + frd.userName + " - " + frd.country + " - " + frd.hobby + " - " + frd.occupation);
}
Console.ReadLine();
```

**FIGURE 80 : SEARCH FOLLOWINGS ACCORDING TO USER NAME**

## Search followers according to user name

The screenshot shows the Visual Studio IDE interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and Search (Ctrl+Q). The title bar says "Socialnetwork2". The main code editor window displays C# code for a "Program.cs" file. The code uses Entity Framework to query the database for users named Shamika and prints their details to the console. The output window shows the results for Shamika's followers. The bottom status bar indicates the current time as 1:55 PM on 6/6/2021.

```
ctx.SaveChanges();

var frds = shamika.friends;

Console.WriteLine("Followers of Shamika and their details");
Console.WriteLine(" ");
int k = 0;
Console.WriteLine("   Name   ");
foreach (var frd in frds)
{
    k++;
    Console.WriteLine(k + ". " + frd.userName);
}
Console.WriteLine();
Console.WriteLine();
int count = 0;
Console.WriteLine("   Name - Country - Hobby - Occupation");
foreach (var frd in frds)
{
    count++;
    Console.WriteLine(count + ". " + frd.userName + " - " + frd.country + " - " + frd.hobby + " - " + frd.occupation);
}
Console.ReadLine();
```

**FIGURE 81 : SEARCH FOLLOWERS ACCORDING TO USER NAME**

## Display all followings

The screenshot shows the Microsoft Visual Studio IDE interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and Search (Ctrl+Q). The solution explorer on the left shows files like Socialnetwork2.csproj, MyEntityContext.tt, Program.cs, and user.cs. The code editor window displays C# code for a program named Socialnetwork2. The output window at the bottom right shows the results of running the program, which lists all followings in the system. The command window at the bottom also shows the results.

```
ansan.friend.Add(emma);
ctx.SaveChanges();

var Persons = ctx.users.ToList();
Console.WriteLine("All followings");
Console.WriteLine(" ");
int i = 0;

foreach (var Person in Persons)
{
    i++;
    Console.WriteLine(i + " " + Person.UserName + " ");

    var frds = Person.friend;
    int k = 0;
    foreach (var frd in frds)
    {
        k++;
        Console.Write(" - " + frd.UserName);
    }
    Console.WriteLine();
    Console.WriteLine();
}

1) Shamika
- Muzni - Ahsan - Amith
2) Ahsan
- Emma - Chris
3) Robert
- Shamika - Jackson - Hamni
4) Jackson
- Emma - Chris
5) Amith
- Robert - Muzni
6) Hamni
- Larson - Shamika - Ahsan - Amith
7) Chris
- Larson - Muzni - Amith
8) Emma
- Robert - Larson - Chris
9) Larson
- Chris - Ahsan
10) Muzni
- Robert - Ahsan - Hamni
```

**FIGURE 82 : DISPLAY ALL FOLLOWINGS**

## Display all followers

The screenshot shows the Microsoft Visual Studio IDE interface. The top menu bar includes File, Edit, View, Git, Project, Build, Debug, Test, Analyze, Tools, Extensions, Window, Help, and Search (Ctrl+Q). The solution explorer on the left shows files like Socialnetwork2.csproj, MyEntityContext.tt, Program.cs, and user.cs. The code editor window displays C# code for a program named Socialnetwork2. The output window at the bottom right shows the results of running the program, which lists all followers in the system. The command window at the bottom also shows the results.

```
muzni.friend.Add(robert);
amith.friend.Add(robert);

ahsan.friend.Add(chris);
ahsan.friend.Add(emma);

ctx.SaveChanges();

var Persons = ctx.users.ToList();
Console.WriteLine("All followers");
Console.WriteLine(" ");
int i = 0;

foreach (var Person in Persons)
{
    i++;
    Console.WriteLine(i + " " + Person.UserName + " ");

    var frds = Person.friends;
    int k = 0;
    foreach (var frd in frds)
    {
        k++;
        Console.Write(" - " + frd.UserName);
    }
    Console.WriteLine();
    Console.WriteLine();
}

1) Emma
- Jackson - Ahsan
2) Ahsan
- Hamni - Shamika - Larson - Muzni
3) Hamni
- Robert - Muzni
4) Shamika
- Robert - Hamni
5) Amith
- Hamni - Shamika - Chris
6) Larson
- Emma - Hamni - Chris
7) Chris
- Emma - Jackson - Ahsan - Larson
8) Muzni
- Shamika - Amith - Chris
9) Robert
- Emma - Amith - Muzni
10) Jackson
- Robert
```

**FIGURE 83 : DISPLAY ALL FOLLOWERS**