EXPERIMENT 9

AIM :

To perform Case study - 3: on **Library Management System** - ER diagram as well as SQL queries.

Introduction :

A library is a collection of organised information and resources which is made accessible to a well-defined community for borrowing or reference sake. The collection of the resources and information are provided in digital or physical format in either a building/room or in a virtual space or even both. Library's resources and collections may include newspapers, books, films, prints, maps, CDs, tapes, videotapes, microform, database etc. The main aim of this system is to develop a new programmed system that will conveying ever lasting solution to the manual base operations and to make available a channel through which staff can maintain the record easily and customers can access the information about the library at whatever place they might find themselves.

Library Management System allows the user to store the book details and the customer details. The system is strong enough to withstand regressive yearly operations under conditions where the database is maintained and cleared over a certain time of span. The implementation of the system in the organisation will considerably reduce data entry, time and also provide readily calculated reports.

It keeps track of all the information about the books in the library, their cost, status and total number of books available in the Library. The user will find it easy in this automated system rather than using the manual writing system. The system contains a database where all the information will be stored safely.

We will be needing the following main entities in this system :

1. Books
2. Branch
3. Employee
4. Customer
5. Issue status
6. Return status

These will make the entities in the rectangular boxes and all of them will have some attributes associated with it which will be represented in the oval boxes connected to them,

Those Attributes are given as follows :

1. Books
    - ISBN(Book ID)
    - Book name
    - Rental price
    - Status
    - Author
    - Publisher

2. Branch
    - Branch no.
    - Manager ID
    - Branch address
    - Contact no.

3. Employee
    - Employ ID
    - Employ name

4. Customer
    - Customer ID
    - Customer name
    - Customer address
    - Registration date

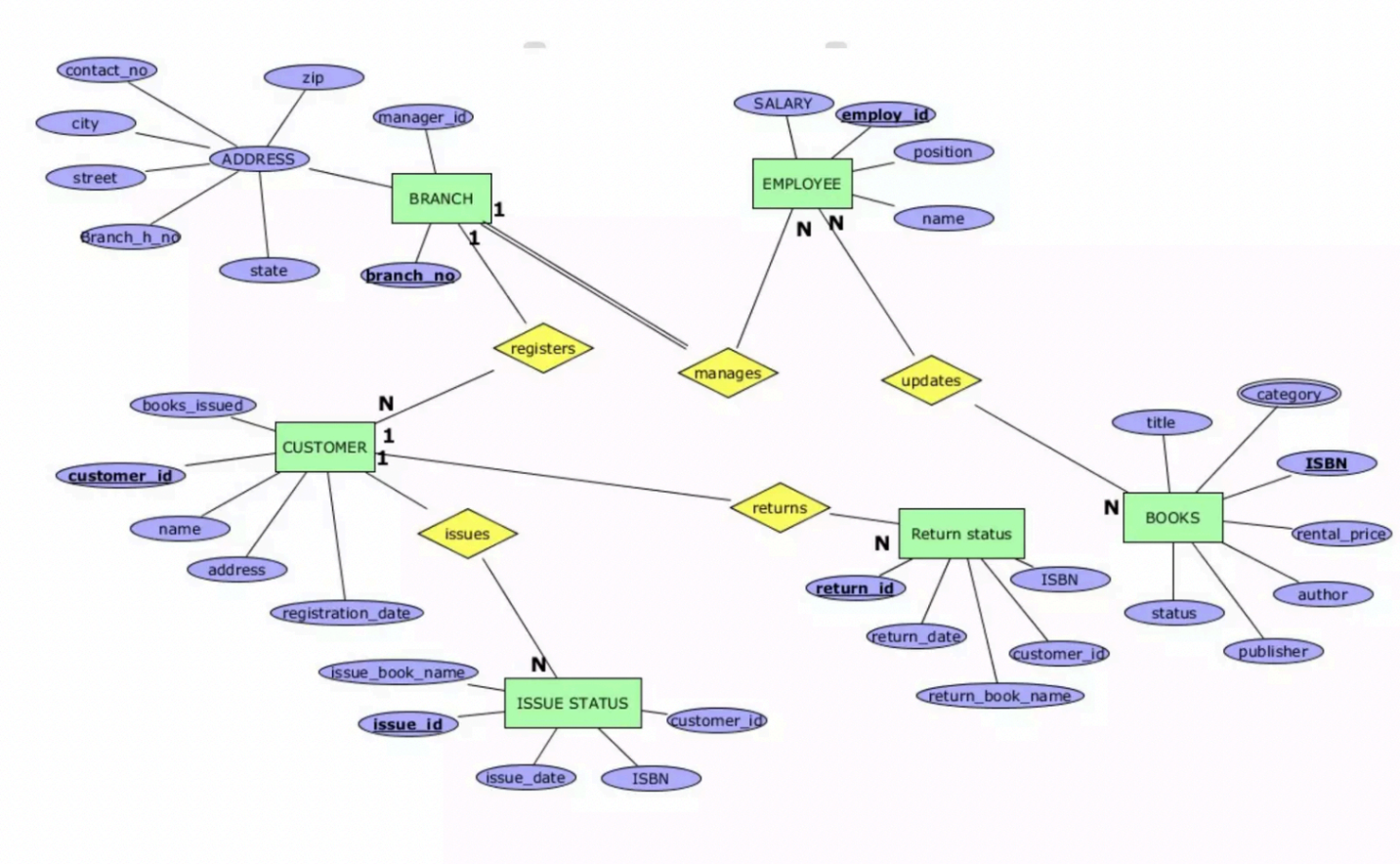
5. Issue status
    - Issue ID
    - Issue customer
    - Issued book name
    - Issue date
    - ISBN book

6. Return status
    - Return ID
    - Return customer
    - Returned book name
    - Return date
    - ISBN book

And the following relationships and cardinalities :

1. MANAGER manages the BRANCH (1 - N)
2. CUSTOMER registers in the respective BRANCH (N - 1)
3. CUSTOMER issues BOOKS (1 - N)
4. CUSTOMER returns BOOKS (N- 1)
5. EMPLOYEE updates BOOKS (N - N)

ER - Diagram :

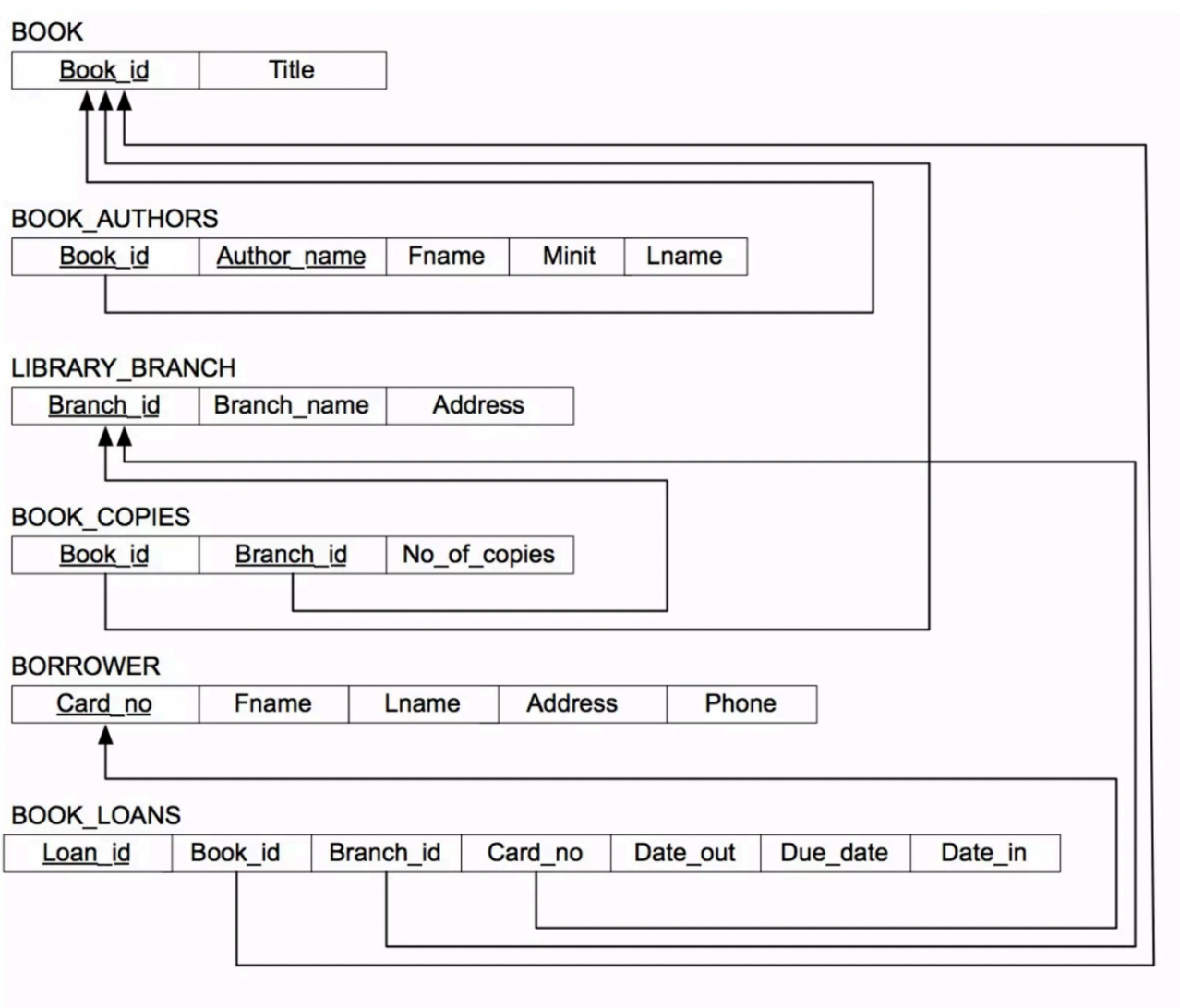


Above is the Entity - Relationship model for the system we ought to design in order create a fully functional Library management system. Now we will write the code for each of the given aspect in mySql and then make some sample entries in order run some of the basic queries from mysql.

Schema Diagram :

A schema is the structure behind data organisation. It is a visual representation of how different table relationships enable the schema's underlying mission business rules for which the database is created. Database schema defines its entities and the relationship among them.

It contains a descriptive detail of the database, which can be depicted by means of schema diagrams. It's the database designers who design the schema to help programmers understand the database and make it useful. Schema diagrams have an important function because they force database developers to transpose ideas to paper. This provides an overview of the entire database, while facilitating future database administrator work.



CODE/OUTPUTS :

- **Firstly creating the whole database system.**

```
//Creation of a new database.
mysql> CREATE DATABASE Librarymngsys;

//Viewing all the databases.
mysql> SHOW DATABASES;

//Bringing the created database in use.
mysql> USE Librarymngsys;

//Creation of the table BOOKS
mysql> CREATE TABLE BOOKS (ISBN INT(100) NOT NULL, Book_name VARCHAR(50)
NOT NULL, Rental_price INT(10) NOT NULL, Status VARCHAR(50),  Author
VARCHAR(50) NOT NULL, Publisher VARCHAR(50) NOT NULL, PRIMARY
KEY (ISBN));

//Describing the table BOOKS
mysql> DESCRIBE BOOKS;
```

Field	Type	Null	Key	Default	Extra
ISBN	int	NO	PRI	NULL	
Book_name	varchar(50)	NO		NULL	
Rental_price	int	NO		NULL	
Status	varchar(50)	YES		NULL	
Author	varchar(50)	NO		NULL	
Publisher	varchar(50)	NO		NULL	

```
//Creation of the table BRANCH
mysql> CREATE TABLE BRANCH (Branch_no INT(10) NOT NULL, Manager_id
INT(10) NOT NULL, Branch_address VARCHAR(100) NOT NULL, Contact_no
INT(10) NOT NULL, PRIMARY KEY (Branch_no));

//Describing the table BRANCH
mysql> DESCRIBE BRANCH;
```

Field	Type	Null	Key	Default	Extra
Branch_no	int	NO	PRI	NULL	
Manager_id	int	NO		NULL	
Branch_address	varchar(100)	NO		NULL	
Contact_no	int	NO		NULL	

```
//Creation of the table EMPLOYEE
mysql> CREATE TABLE EMPLOYEE (Employ_id INT(10) NOT NULL, Employ_name
VARCHAR(50) NOT NULL, Position VARCHAR(30) NOT NULL, Salary INT(10) NOT
NULL, PRIMARY KEY (Employ_id));

//Describing the table EMPLOYEE
mysql> DESCRIBE EMPLOYEE;
```

Field	Type	Null	Key	Default	Extra
Employ_id	int	NO	PRI	NULL	
Employ_name	varchar(50)	NO		NULL	
Position	varchar(30)	NO		NULL	
Salary	int	NO		NULL	

```
//Creation of the table CUSTOMER
mysql> CREATE TABLE CUSTOMER (Customer_id INT(10) NOT NULL,
Customer_name VARCHAR(50) NOT NULL, Customer_address VARCHAR(100),
Registeration_date DATE NOT NULL, PRIMARY KEY (Customer_id));

//Describing the table CUSTOMER
mysql> DESCRIBE CUSTOMER;
```

Field	Type	Null	Key	Default	Extra
Customer_id	int	NO	PRI	NULL	
Customer_name	varchar(50)	NO		NULL	
Customer_address	varchar(100)	YES		NULL	
Registeration_date	date	NO		NULL	

```
//Creation of the table ISSUE_STATUS
mysql> CREATE TABLE ISSUE_STATUS (Issue_id INT(10) NOT NULL, Issued_cust
INT(10) NOT NULL, Issued_book_name VARCHAR(50) NOT NULL, Issue_date DATE
NOT NULL, ISBN_book INT(10) NOT NULL, PRIMARY KEY (Issue_id), CONSTRAINT
FOREIGN KEY(ISBN_book) REFERENCES BOOKS(ISBN), CONSTRAINT FOREIGN KEY
(ISBN_book) REFERENCES BOOKS(ISBN),  CONSTRAINT FOREIGN KEY
(Issued_cust) REFERENCES CUSTOMER(Customer_id));

//Describing the table ISSUE_STATUS
mysql> DESCRIBE ISSUE_STATUS;
```

Field	Type	Null	Key	Default	Extra
Issue_id	int	NO	PRI	NULL	
Issued_cust	int	NO	MUL	NULL	
Issued_book_name	varchar(50)	NO		NULL	
Issue_date	date	NO		NULL	
ISBN_book	int	NO	MUL	NULL	

```
//Creation of the table RETURN_STATUS
mysql> CREATE TABLE RETURN_STATUS (Return_id INT(10) NOT NULL,
Return_cust INT(10) NOT NULL, Returned_book_name VARCHAR(50) NOT NULL,
Return_date DATE NOT NULL, ISBN_book2 INT(10) NOT NULL, PRIMARY KEY
(Return_id), CONSTRAINT FOREIGN KEY(ISBN_book2) REFERENCES BOOKS(ISBN),
CONSTRAINT FOREIGN KEY(Return_cust) REFERENCES
ISSUE_STATUS(Issued_cust));

//Describing the table RETURN_STATUS
mysql> DESCRIBE RETURN_STATUS;
```

Field	Type	Null	Key	Default	Extra
Return_id	int	NO	PRI	NULL	
Return_cust	int	NO	MUL	NULL	
Returned_book_name	varchar(50)	NO		NULL	
Return_date	date	NO		NULL	
ISBN_book2	int	NO	MUL	NULL	

```
//Viewing all the tables created
mysql> SHOW TABLES;
```

Tables_in_librarymngsys
BOOKS
BRANCH
CUSTOMER
EMPLOYEE
ISSUE_STATUS
RETURN_STATUS

```
//Inserting values into table BOOKS
mysql> INSERT INTO BOOKS VALUES (1000, 'Diary of a wimpy kid', 5,
'available', 'Jeff Kinney', 'Penguin books’)
mysql> INSERT INTO BOOKS VALUES (1001, 'Cosmos : A universe journey', 3,
'available', 'Carl Sagan', 'Discovery publishers’);
mysql> INSERT INTO BOOKS VALUES (1002, 'It ends with us', 1,
'unavailable', 'Colleen Hoover', 'Manhattan press’);
mysql> INSERT INTO BOOKS VALUES (1003, 'Murder on the orient express',
7, 'available', 'Agatha Christie', 'Penguin books');

//Displaying the table BOOKS
mysql> SELECT*FROM BOOKS;
```

ISBN	Book_name	Rental_price	Status	Author	Publisher
1000	Diary of a wimpy kid	5	available	Jeff Kinney	Penguin books
1001	Cosmos : A universe journey	3	available	Carl Sagan	Discovery publishers
1002	It ends with us	1	unavailable	Colleen Hoover	Manhattan press
1003	Murder on the orient express	7	available	Agatha Christie	Penguin books

```
//Inserting values into table BRANCH
mysql> INSERT INTO BRANCH VALUES (1, 991, 'Laxmi Nagar Road No. 2, Jail
road, Ghaziabaad', 987654321);
mysql> INSERT INTO BRANCH VALUES (2, 992, 'F4-256, Hudson Lane, Guru
tegh bahadur nagar', 923147865);
mysql> INSERT INTO BRANCH VALUES (3, 993, 'B3-33, Shree krishna enclave,
rohini sector-17', 983544891);

//Displaying the table BRANCH
mysql> SELECT*FROM BRANCH;
```

Branch_no	Manager_id	Branch_address	Contact_no
1	991	Laxmi Nagar Road No. 2, Jail road, Ghaziabaad	987654321
2	992	F4-256, Hudson Lane, Guru tegh bahadur nagar	923147865
3	993	B3-33, Shree krishna enclave, rohini sector-17	983544891

```
//Inserting values into table EMPLOYEE
mysql> INSERT INTO EMPLOYEE VALUES (991, 'Aditya Goyal', 'Manager',
30000);
mysql> INSERT INTO EMPLOYEE VALUES (992, 'Ayushya Prasoon', 'Worker',
10000);
mysql> INSERT INTO EMPLOYEE VALUES (993, 'Harsh Tiwari', 'Worker',
10000);
mysql> INSERT INTO EMPLOYEE VALUES (994, 'Divyansh Sinha', 'Reader',
20000);
mysql> INSERT INTO EMPLOYEE VALUES (995, 'Divyansh Bansal', 'Assist',
20000);

//Displaying the table EMPLOYEE
mysql> SELECT*FROM EMPLOYEE;
```

Employ_id	Employ_name	Position	Salary
991	Aditya Goyal	Manager	30000
992	Ayushya Prasoon	Worker	10000
993	Harsh Tiwari	Worker	10000
994	Divyansh Sinha	Reader	20000
995	Divyansh Bansal	Assist	20000

```
//Inserting values into table CUSTOMER
mysql> INSERT INTO CUSTOMER VALUES (11, 'Ishank Dabas', 'F-256, Axis
bank, Shadhara, New Delhi', '2023-08-31');
mysql> INSERT INTO CUSTOMER VALUES (12, 'Saksham Verma', 'Tagore boys
hostel, Ber sarai', '2023-09-01');
mysql> INSERT INTO CUSTOMER VALUES (13, 'Aditya Upadhyay', 'D-250 Fuzz
town, Mathuranagari', '2023-09-30')
mysql> INSERT INTO CUSTOMER VALUES (14, 'Rajat Raj', 'G-489 Pedanovas
inn, Mathuranagari', '2023-12-29');
```

```
/Displaying the table CUSTOMER
mysql> SELECT*FROM CUSTOMER
```

Customer_id	Customer_name	Customer_address	Registeration_date
11	Ishank Dabas	F-256, Axis bank, Shadhara, New Delhi	2023-08-31
12	Saksham Verma	Tagore boys hostel, Ber sarai	2023-09-01
13	Aditya Upadhyay	D-250 Fuzz town, Mathuranagari	2023-09-30
14	Rajat Raj	G-489 Pedanovas inn, Mathuranagari	2023-12-29

```
//Inserting values into table ISSUE_STATUS
mysql> INSERT INTO ISSUE_STATUS VALUES (51, 12, 'Diary of a wimpy kid',
‘2023-10-23’,1000);
mysql> INSERT INTO ISSUE_STATUS VALUES (52, 14, 'Murder on the orient
express', ‘2024-02-17',1003);

//Displaying the table ISSUE_STATUS
mysql> SELECT*FROM ISSUE_STATUS;
```

Issue_id	Issued_cust	Issued_book_name	Issue_date	ISBN_book
51	12	Diary of a wimpy kid	2023-10-23	1000
52	14	Murder on the orient express	2024-02-17	1003

```
//Inserting values into table RETURN_STATUS
mysql> INSERT INTO RETURN_STATUS VALUES (61, 12, 'Diary of a wimpy kid',
‘2023-11-14',1000);

//Displaying the table RETURN_STATUS
mysql> SELECT*FROM RETURN_STATUS;
```

Return_id	Return_cust	Returned_book_name	Return_date	ISBN_book2
61	12	Diary of a wimpy kid	2023-11-14	1000

Thus we have successfully created all the tables and made the necessary entries in them. Now it is ready to face some queries. As we have created the necessary relations and schema as well.

- **Secondly we will run all the queries**

Some of the common queries which we use

1. Display the books available in the library.

```
mysql> SELECT ISBN, Book_name
       FROM BOOKS
       WHERE Status = 'available';
```

```
+------+----------------------------+
| ISBN | Book_name                  |
+------+----------------------------+
| 1000 | Diary of a wimpy kid       |
| 1001 | Cosmos : A universe journey |
| 1003 | Murder on the orient express |
+------+----------------------------+
```

2. Display the name of all the customers who have issued a book.

```
mysql> SELECT CUSTOMER.Customer_name
-> FROM CUSTOMER INNER JOIN ISSUE_STATUS
-> ON CUSTOMER.Customer_id = ISSUE_STATUS.Issued_cust;
```

```
+---------------+
| Customer_name |
+---------------+
| Saksham Verma |
| Rajat Raj     |
+---------------+
```

3. Display the name of the employee who manages the branch with branch address is 'Laxmi Nagar Road No. 2, Jail road, Ghaziabaad'. Display his salary & Manager id.

```
mysql> SELECT EMPLOYEE.Employ_name, BRANCH.Manager_id,
EMPLOYEE.Salary
-> FROM EMPLOYEE INNER JOIN BRANCH
-> ON EMPLOYEE.Employ_id = BRANCH.Manager_id
-> WHERE BRANCH.Branch_address = 'Laxmi Nagar Road No. 2, Jail road,
Ghaziabaad';
```

```
+--------------+------------+--------+
| Employ_name  | Manager_id | Salary |
+--------------+------------+--------+
| Aditya Goyal |        991 |  30000 |
+--------------+------------+--------+
```

4. Display the Issue date and return date of the book ‘The diary of a wimpy kid’.

```
mysql> SELECT ISSUE_STATUS.Issue_date, RETURN_STATUS.Return_date
-> FROM ISSUE_STATUS INNER JOIN RETURN_STATUS
-> ON ISSUE_STATUS.Issued_book_name = 'Diary of a wimpy kid';
```

Issue_date	Return_date
2023-10-23	2023-11-14

5. Display the Inner join of EMPLOYEE and BRANCH table.

```
mysql> SELECT*
-> FROM EMPLOYEE INNER JOIN BRANCH
-> ON EMPLOYEE.Employ_id = BRANCH.Manager_id;
```

Employ_id	Employ_name	Position	Salary	Branch_no	Manager_id	Branch_address	Contact_no
991	Aditya Goyal	Manager	30000	1	991	Laxmi Nagar Road No. 2, Jail road, Ghaziabaad	987654321
992	Ayushya Prasoon	Worker	10000	2	992	F4-256, Hudson Lane, Guru tegh bahadur nagar	923147865
993	Harsh Tiwari	Worker	10000	3	993	B3-33, Shree krishna enclave, rohini sector-17	983544891

6. Display the Cross join of EMPLOYEE and BRANCH table.

```
mysql> SELECT*FROM EMPLOYEE INNER JOIN BRANCH;
```

Employ_id	Employ_name	Position	Salary	Branch_no	Manager_id	Branch_address	Contact_no
991	Aditya Goyal	Manager	30000	3	993	B3-33, Shree krishna enclave, rohini sector-17	983544891
991	Aditya Goyal	Manager	30000	2	992	F4-256, Hudson Lane, Guru tegh bahadur nagar	923147865
991	Aditya Goyal	Manager	30000	1	991	Laxmi Nagar Road No. 2, Jail road, Ghaziabaad	987654321
992	Ayushya Prasoon	Worker	10000	3	993	B3-33, Shree krishna enclave, rohini sector-17	983544891
992	Ayushya Prasoon	Worker	10000	2	992	F4-256, Hudson Lane, Guru tegh bahadur nagar	923147865
992	Ayushya Prasoon	Worker	10000	1	991	Laxmi Nagar Road No. 2, Jail road, Ghaziabaad	987654321
993	Harsh Tiwari	Worker	10000	3	993	B3-33, Shree krishna enclave, rohini sector-17	983544891
993	Harsh Tiwari	Worker	10000	2	992	F4-256, Hudson Lane, Guru tegh bahadur nagar	923147865
993	Harsh Tiwari	Worker	10000	1	991	Laxmi Nagar Road No. 2, Jail road, Ghaziabaad	987654321
994	Divyansh Sinha	Reader	20000	3	993	B3-33, Shree krishna enclave, rohini sector-17	983544891
994	Divyansh Sinha	Reader	20000	2	992	F4-256, Hudson Lane, Guru tegh bahadur nagar	923147865
994	Divyansh Sinha	Reader	20000	1	991	Laxmi Nagar Road No. 2, Jail road, Ghaziabaad	987654321
995	Divyansh Bansal	Assist	20000	3	993	B3-33, Shree krishna enclave, rohini sector-17	983544891
995	Divyansh Bansal	Assist	20000	2	992	F4-256, Hudson Lane, Guru tegh bahadur nagar	923147865
995	Divyansh Bansal	Assist	20000	1	991	Laxmi Nagar Road No. 2, Jail road, Ghaziabaad	987654321

7. Calculate the average salary of the employees.

```
mysql> SELECT AVG(Salary)
-> AS AvgSal
-> FROM EMPLOYEE;
```

AvgSal
18000.0000

8. Count the number of books in the library.

```
mysql> SELECT COUNT(*)
-> AS Num_of_books
-> FROM BOOKS;
```

```
+--------------+
| Num_of_books |
+--------------+
|            4 |
+--------------+
```

9. Display the name of all the books and their authors.

```
mysql> SELECT BOOKS.Book_name, BOOKS.Author
-> FROM BOOKS;
```

```
+-----------------------------+-----------------+
| Book_name                   | Author          |
+-----------------------------+-----------------+
| Diary of a wimpy kid        | Jeff Kinney     |
| Cosmos : A universe journey | Carl Sagan      |
| It ends with us             | Colleen Hoover  |
| Murder on the orient express | Agatha Christie |
+-----------------------------+-----------------+
```

10. Display all the details of the book(s) which is/are unavailable.

```
mysql> SELECT*
-> FROM BOOKS
-> WHERE Status = 'unavailable';
```

```
+------+-----------------+--------------+-------------+----------------+
| ISBN | Book_name       | Rental_price | Status      | Author         |
+------+-----------------+--------------+-------------+----------------+
| 1002 | It ends with us |            1 | unavailable | Colleen Hoover |
+------+-----------------+--------------+-------------+----------------+
```

11. Display the average salary of each position of the employees.

```
mysql> SELECT Position, AVG(Salary) FROM EMPLOYEE GROUP BY Position;
```

```
+----------+-------------+
| Position | AVG(Salary) |
+----------+-------------+
| Manager  |  30000.0000 |
| Worker   |  10000.0000 |
| Reader   |  20000.0000 |
| Assist   |  20000.0000 |
+----------+-------------+
```

Conclusion

- SQL database management application which is very well used in the modern world in organising and manipulating a database.
- Though SQL doesn't have the GUI interface like Microsoft access is having and they all manage the database comfortable.
- Depending on the user or users, if an organisation has multiple users then they should go for SQL server based application.
- This project shows how to create tables in SQL and how to create simple data manipulation language and data definition language with how to execute them.
- It also shows how relationships are established with the concepts of primary and foreign key within a table.
- Lastly, the project shows how queries are created in SQL server, queries like the create command, view, update, alter etc.

References

- https://dev.mysql.com/doc/refman/8.3/en/aggregate-functions.html
- https://www.w3schools.com/MySQL/default.asp
- https://www.javatpoint.com/mysql-aggregate-functions