

LIBRARY MANAGEMENT SYSTEM

in

MySQL

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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

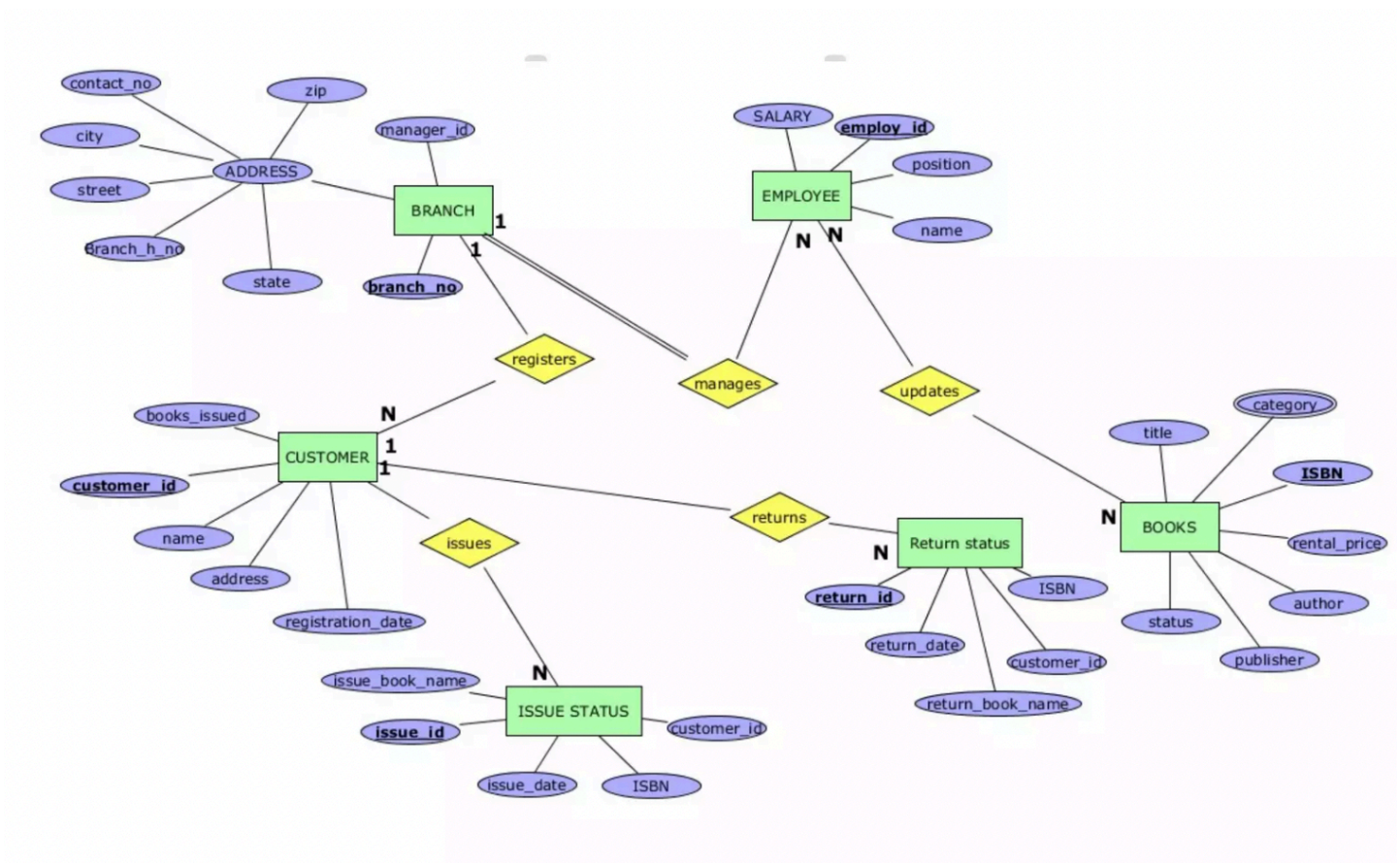
6. Return status

- 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 :

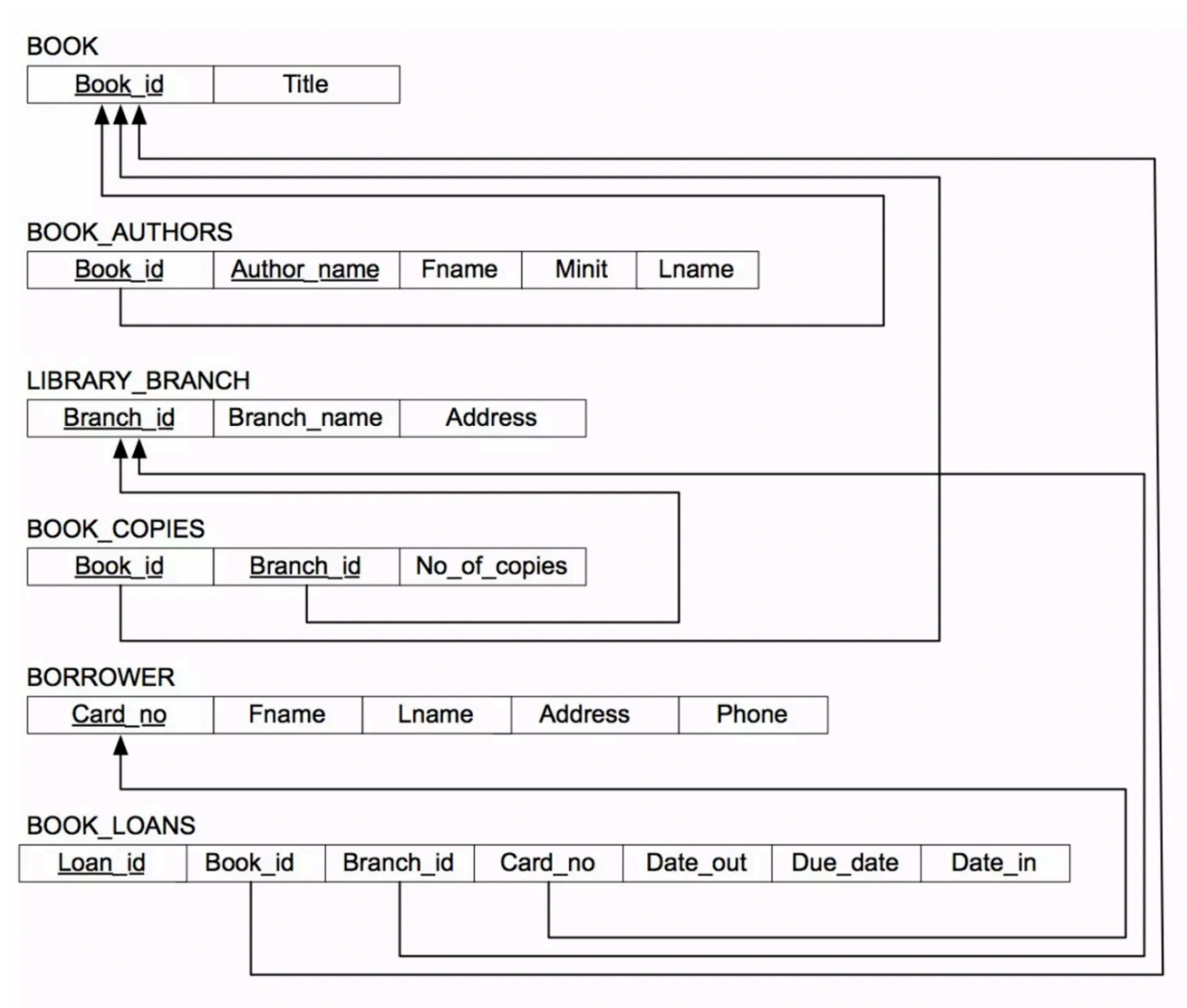


Above is the Entity - Relationship model for the system we ought to design in order to create a fully functional Library management system. Now we will write the code for each of the given aspects in MySQL and then make some sample entries in order to run some of the basic queries from MySQL.

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),
Registration_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 | |
| Registration_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 | Registration_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, Ghaziabad'. 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,
      Ghaziabad';
```

| 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.Employee_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>