

*DATABASE AND MANAGEMENT SYSTEM[CT-261]*

## *PROJECT REPORT*

# ***LIBRARY MANAGEMENT SYSTEM***

### ***GROUP MEMBERS :***

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# 1. PROBLEM PLANNING:

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Our system revolves around a comprehensive library management and book-keeping system. The "Library Management System" project includes data related to the books available in the library, which can be lent to customers, with all relevant details maintained by the staff. In addition to managing the system, we also keep records of the issue statuses and the publishers of the books.

# 2. PROBLEM DISCRIPTION:

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This project is designed to manage a library's operations including managing books, authors, publishers, staff, branches, customers, and issue statuses. The system will allow for:

- Tracking which books are available or issued.
- Managing book details including title, author, publisher, and branch.
- Managing customer information and the books they have issued.
- Managing staff details and their roles within the library.
- Managing branch details.
- Ensuring secure login through an authentication system.

# 3. NORMALIZATION

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## 1. 1NF (First Normal Form):

1NF (First Normal Form)																			
branch_id	branch_address	customer_id	book_id	issue_date	customer_name	customer_address	registration_date	branch_id_2	login_id	password	publisher_id	category	retail_price	publish_year	book_title	author_name	staff_id	staff_name	staff_salary
101	123 Main St	1	Book A	Alice	456 Elm St	2022-01-01		101	1	pass123	201	Fiction	15	2020	Book A	Author X	301	John	3000
102	789 Oak St	2	Book B	Bob	789 Pine St	2022-02-01		102	2	pass456	202	Non-Fiction	20	2019	Book B	Author Y	302	Jane	3200
103	101 Maple St	3	Book C	Charlie	101 Birch	2022-03-01		103	3	pass789	203	Science	25	2018	Book C	Author Z	303	Jim	3400
104	202 Cedar St	4	Book D	Diana	202 Spruce	2022-04-01		104	4	pass012	204	History	30	2017	Book D	Author W	304	Jake	3600
105	303 Birch St	5	Book E	Eva	303 Cedar	2022-05-01		105	5	pass345	205	Technology	35	2016	Book E	Author V	305	Julia	3800

## 2. 2NF (Second Normal Form):

2NF (Second Normal Form)														
BRANCH			Customer Table					Publisher Table				updates Table		
branch_id	manager_id	Address	customer	book_issu	name	address	reg_date	branch_id	publisher_id	category	retail_price	publish_year	login_id	book_id
1	1	123 Main St	100	Data Struc	Alice Smith	456 Oak St	1/1/2023	1	200	Tech	50	2022	1	1000
2	1	123 Main St	101	Algorithm	Bob Johns	789 Pine St	1/2/2023	1	201	Science	60	2023	2	1001
			102	Databases	Charlie Br	321 Maple	1/3/2023	1	202	Fiction	40	2021	1	1002
			103	Networkin	David Wilk	654 Cedar	1/4/2023	2	203	Non-Fiction	55	2020	2	1003
			104	AI Basics	Emma The	987 Birch	1/5/2023	2					1	1004
Staff Table			Book Table					Author Table						
staff_id	name	salary	branch_id	login_id	customer	login_id	password	book_id	branch_id	publisher_id	title	author_name		
1	John Doe	50000	1	1	100	11	pas1	1000	1	200	Data Structures	Mark Twain		
2	Jane Smith	60000	2	2	101	22	pas2	1001	1	201	Algorithms	Jane Austen		
3	Mike Brown	55000	1	1	102	33	pas3	1002	1	200	Databases	Charles Drake		
4	Sarah Green	58000	2	2	103	44	pas4	1003	2	202	Networking	George Orwell		
5	Lisa White	53000	1	1	104	55	pas5	1004	2	203	AI Basics	Isaac Asimov		
Issue_Status Table														
issue_id	issue_date	status	customer	book_id										
1	1/1/2023	Issued	100	1000										
2	1/2/2023	Issued	101	1001										
3	1/3/2023	Issued	102	1002										
4	1/4/2023	Issued	103	1003										
5	1/5/2023	Issued	104	1004										

## 3. 3NF(Third Normal Form):

3NF (Third Normal Form)

In 3NF, there is only staff table where transitive dependency is present because *staff\_id* -> *login\_id*, *login\_id* -> *password*, *staff\_id* -> *password*

BRANCH		
branch_id	manager_id	Address
1	1	123 Main St
2	1	123 Main St

Customer Table					
customer	book_id	name	address	reg_date	branch_id
100	Data Structures	Alice Smith	456 Oak St	1/1/2023	1
101	Algorithms	Bob Johnson	789 Pine St	1/2/2023	1
102	Databases	Charlie Brown	321 Maple St	1/3/2023	1
103	Networking	David Wilson	654 Cedar St	1/4/2023	2
104	AI Basics	Emma Thompson	987 Birch St	1/5/2023	2

Authentication_system Table	
login_id	password
1	password1
2	password2

Publisher Table			
publisher_id	category	retail_price	publish_year
200	Tech	50	2022
201	Science	60	2023
202	Fiction	40	2020
203	Non-Fiction	55	2021

Author Table	
title	author_name
Data Structures	Mark Twain
Algorithms	Jane Austen
Databases	Charles Dickens
Networking	George Orwell
AI Basics	Isaac Asimov

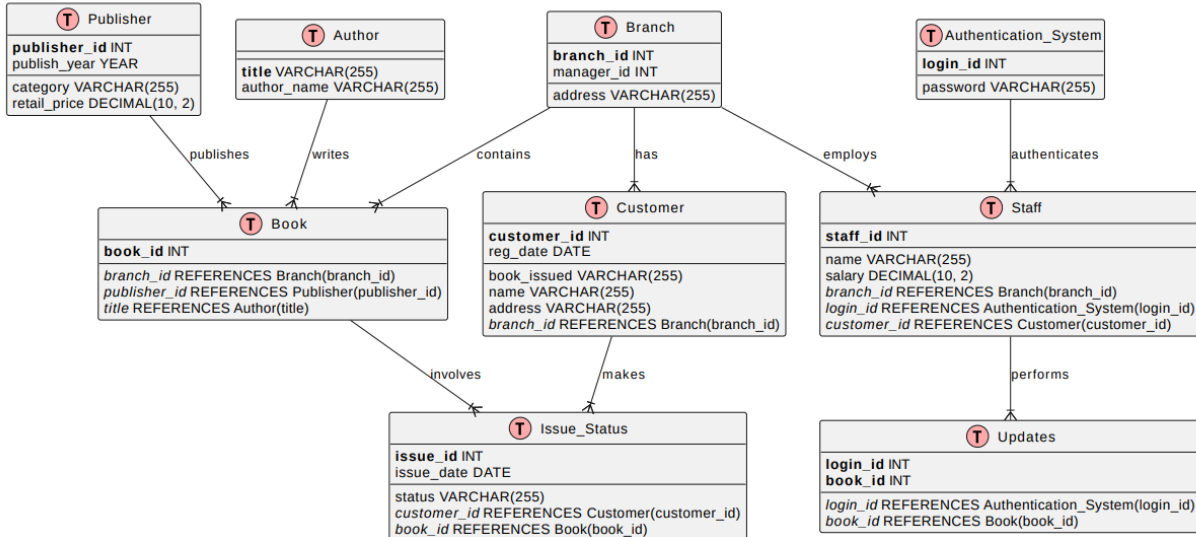
Staff Table					
staff_id	name	salary	branch_id	login_id	customer_id
1	John Doe	50000	1	1	100
2	Jane Smith	60000	2	2	101
3	Mike Brown	55000	1	1	102
4	Sarah Green	58000	2	2	103
5	Lisa White	53000	1	1	104

updates Table	
login_id	book_id
1	1000
2	1001
1	1002
2	1003
1	1004

Book Table			
book_id	branch_id	publisher_id	title
1000	1	200	Data Structures
1001	1	201	Algorithms
1002	1	200	Databases
1003	2	202	Networking
1004	2	203	AI Basics

Issue_Status Table				
issue_id	issue_date	status	customer	book_id
1	1/1/2023	Issued	100	1000
2	1/2/2023	Issued	101	1001
3	1/3/2023	Issued	102	1002
4	1/4/2023	Issued	103	1003
5	1/5/2023	Issued	104	1004

## 4. ENTITY RELATIONAL DIAGRAM:



## 5. RELATIONAL SCHEMA:

Branch(branch\_id, manager\_id, address)  
 Customer(customer\_id, name, address, reg\_date, branch\_id)  
 Authentication\_System(login\_id, password)  
 Publisher(publisher\_id, category, retail\_price, publish\_year)  
 Author(title, author\_name)  
 Staff(staff\_id, name, salary, branch\_id, login\_id, customer\_id)  
 Book(book\_id, branch\_id, publisher\_id, title)  
 Updates(login\_id, book\_id)  
 Issue\_Status(issue\_id, issue\_date, status, customer\_id, book\_id)

## 6. *QUERIES AND OUTPUTS:*

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- **SQL CODE:**

```
CREATE TABLE Branch
(
    manager_id INT NOT NULL,
    branch_id INT NOT NULL,
    Address VARCHAR(255) NOT NULL,
    PRIMARY KEY (branch_id)
);

CREATE TABLE Customer
(
    customer_id INT NOT NULL,
    book_issued VARCHAR(255) NOT NULL,
    name VARCHAR(255) NOT NULL,
    address VARCHAR(255) NOT NULL,
    reg_date VARCHAR(255) NOT NULL,
    branch_id INT NOT NULL,
    PRIMARY KEY (customer_id),
    FOREIGN KEY (branch_id) REFERENCES Branch(branch_id)
);

CREATE TABLE Authentication_system
(
    login_id INT NOT NULL,
    password VARCHAR(255) NOT NULL,
    PRIMARY KEY (login_id)
);

CREATE TABLE Publisher
(
    publisher_id INT NOT NULL,
    category VARCHAR(255) NOT NULL,
    retail_price INT NOT NULL,
    publish_year INT NOT NULL,
    PRIMARY KEY (publisher_id)
);

CREATE TABLE Author
(
    title VARCHAR(255) NOT NULL,
```

```
author_name VARCHAR(255) NOT NULL,  
PRIMARY KEY (title)  
);
```

```
CREATE TABLE Staff  
(  
    staff_id INT NOT NULL,  
    name VARCHAR(255) NOT NULL,  
    salary INT NOT NULL,  
    branch_id INT NOT NULL,  
    login_id INT NOT NULL,  
    customer_id INT NOT NULL,  
    PRIMARY KEY (staff_id),  
    FOREIGN KEY (branch_id) REFERENCES Branch(branch_id),  
    FOREIGN KEY (login_id) REFERENCES Authentication_system(login_id),  
    FOREIGN KEY (customer_id) REFERENCES Customer(customer_id)  
);
```

```
CREATE TABLE Book  
(  
    book_id INT NOT NULL,  
    branch_id INT NOT NULL,  
    publisher_id INT NOT NULL,  
    title VARCHAR(255) NOT NULL,  
    PRIMARY KEY (book_id),  
    FOREIGN KEY (branch_id) REFERENCES Branch(branch_id),  
    FOREIGN KEY (publisher_id) REFERENCES Publisher(publisher_id),  
    FOREIGN KEY (title) REFERENCES Author(title)  
);
```

```
CREATE TABLE updates  
(  
    login_id INT NOT NULL,  
    book_id INT NOT NULL,  
    PRIMARY KEY (login_id, book_id),  
    FOREIGN KEY (login_id) REFERENCES Authentication_system(login_id),  
    FOREIGN KEY (book_id) REFERENCES Book(book_id)  
);
```

```
CREATE TABLE Issue_Status  
(  
    issue_id INT NOT NULL,  
    issue_date VARCHAR(255) NOT NULL,  
    status VARCHAR(255) NOT NULL,
```

```

customer_id INT NOT NULL,
book_id INT NOT NULL,
PRIMARY KEY (issue_id),
FOREIGN KEY (customer_id) REFERENCES Customer(customer_id),
FOREIGN KEY (book_id) REFERENCES Book(book_id)
);

```

```

1 SELECT table_name FROM user_tables;
2

```

TABLE_NAME
AUTHENTICATION_SYSTEM
AUTHOR
BOOK
BRANCH
CUSTOMER
ISSUE_STATUS
PUBLISHER
STAFF
UPDATES

### • **INSERTION QUERIES:**

```

INSERT INTO Branch (branch_id, manager_id, address)
VALUES (1, 101, 'Main Branch, Karachi');

```

```

INSERT INTO Branch (branch_id, manager_id, address)
VALUES (2, 102, 'Gulshan Branch, Karachi');

```

```

INSERT INTO Branch (branch_id, manager_id, address)
VALUES (3, 103, 'Defence Branch, Karachi');

```

```

INSERT INTO Branch (branch_id, manager_id, address)
VALUES (4, 104, 'Lahore Branch, Lahore');

```

1	Select * from branch
---	----------------------

MANAGER_ID	BRANCH_ID	ADDRESS
101	1	Main Branch, Karachi
102	2	Gulshan Branch, Karachi
103	3	Defence Branch, Karachi
104	4	Lahore Branch, Lahore
105	5	Johar Town Branch, Lahore
106	6	Model Town Branch, Lahore
107	7	Blue Area Branch, Islamabad
108	8	F-10 Branch, Islamabad
109	9	G-11 Branch, Islamabad
110	10	Peshawar Branch, Peshawar

### • **UPDATE QUERIES:**

UPDATE Branch  
 SET address = 'New Address, Gulshan Maymar, Karachi'  
 WHERE branch\_id = 2;

MANAGER_ID	BRANCH_ID	ADDRESS
102	2	Gulshan Branch, Karachi

MANAGER_ID	BRANCH_ID	ADDRESS
102	2	New Address, Gulshan Maymar, Karachi

UPDATE Customer  
 SET name = 'Furqan Patel'  
 WHERE customer\_id = 1;



CUSTOMER_ID	BOOK_ISSUED	NAME	ADDRESS	REG_DATE	BRANCH_ID
1	The Reluctant Fundamentalist	Ali Raza	Karachi	2023-01-01	1

CUSTOMER_ID	BOOK_ISSUED	NAME	ADDRESS	REG_DATE	BRANCH_ID
1	The Reluctant Fundamentalist	Furqan Patel	Karachi	2023-01-01	1

### • **DELETE QUERIES:**

```
DELETE
FROM Publisher
WHERE publisher_id = 11;
```

PUBLISHER_ID	CATEGORY	RETAIL_PRICE	PUBLISH_YEAR
11	Non-Fiction	600	2022

```
1 select * from publisher where publisher_id=11
```

no data found

### • **JOIN STATEMENTS:**

```
SELECT
Customer.customer_id,
Customer.name AS customer_name,
Branch.manager_id,
Branch.address AS branch_address
FROM
Customer
JOIN
Branch ON Customer.branch_id = Branch.branch_id;
```

CUSTOMER_ID	CUSTOMER_NAME	MANAGER_ID	BRANCH_ADDRESS
1	Furqan Patel	101	Main Branch, Karachi
2	Sara Ahmed	102	New Address, Gulshan Maymar, Karachi
3	Hamza Khan	103	Defence Branch, Karachi
4	Ayesha Malik	104	Lahore Branch, Lahore
5	Zainab Anwar	105	Johar Town Branch, Lahore

```
SELECT staff.name,authentication_system.password
FROM staff
LEFT JOIN authentication_system
ON staff.login_id = authentication_system.login_id;
```

NAME	PASSWORD
Ahmed Ali	password123
Sana Farooq	password123
Hassan Raza	password123
Maria Khan	password123

### • **AGGREGATE STATEMENTS:**

```
SELECT COUNT(*) AS total_customers
FROM Customer;
```

TOTAL_CUSTOMERS
10

```
SELECT SUM(salary) AS total_salary
FROM Staff;
```

TOTAL_SALARY
447000

- ***SUB-QUERY STATEMENTS:***

```
SELECT *  
FROM publisher  
WHERE publish_year  
IN (  
SELECT publish_year  
FROM publisher  
WHERE retail_price > 700  
);
```

PUBLISHER_ID	CATEGORY	RETAIL_PRICE	PUBLISH_YEAR
7	Fiction	700	2023
8	Non-Fiction	800	2023
2	Fiction	600	2021
5	Non-Fiction	450	2021
9	Fiction	750	2021

```
SELECT *  
FROM publisher  
WHERE publish_year  
IN (  
SELECT publish_year  
FROM publisher  
WHERE publish_year > 2021  
);
```

PUBLISHER_ID	CATEGORY	RETAIL_PRICE	PUBLISH_YEAR
3	Fiction	700	2022
6	Non-Fiction	650	2022
10	Non-Fiction	600	2022
7	Fiction	700	2023
8	Non-Fiction	800	2023