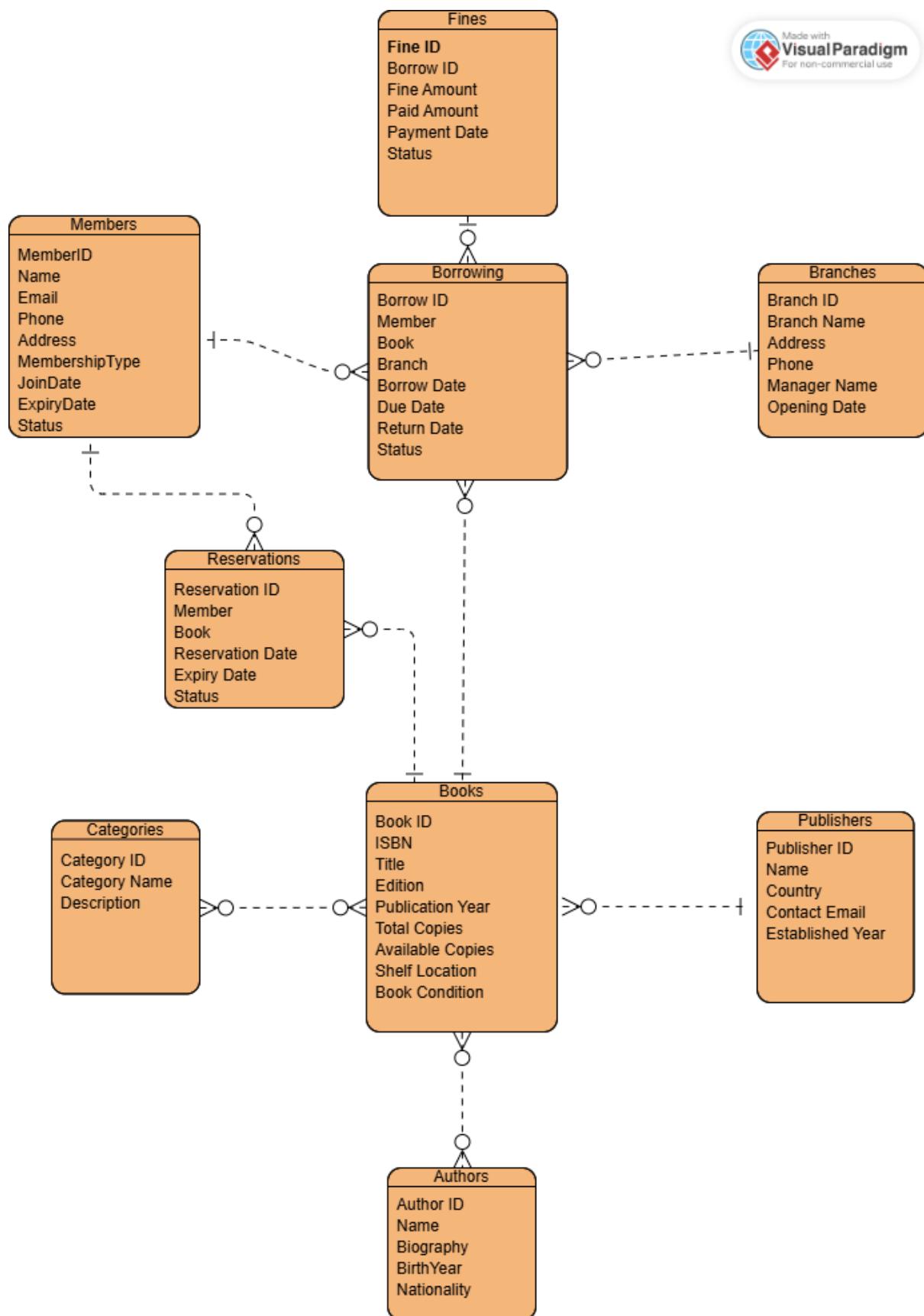


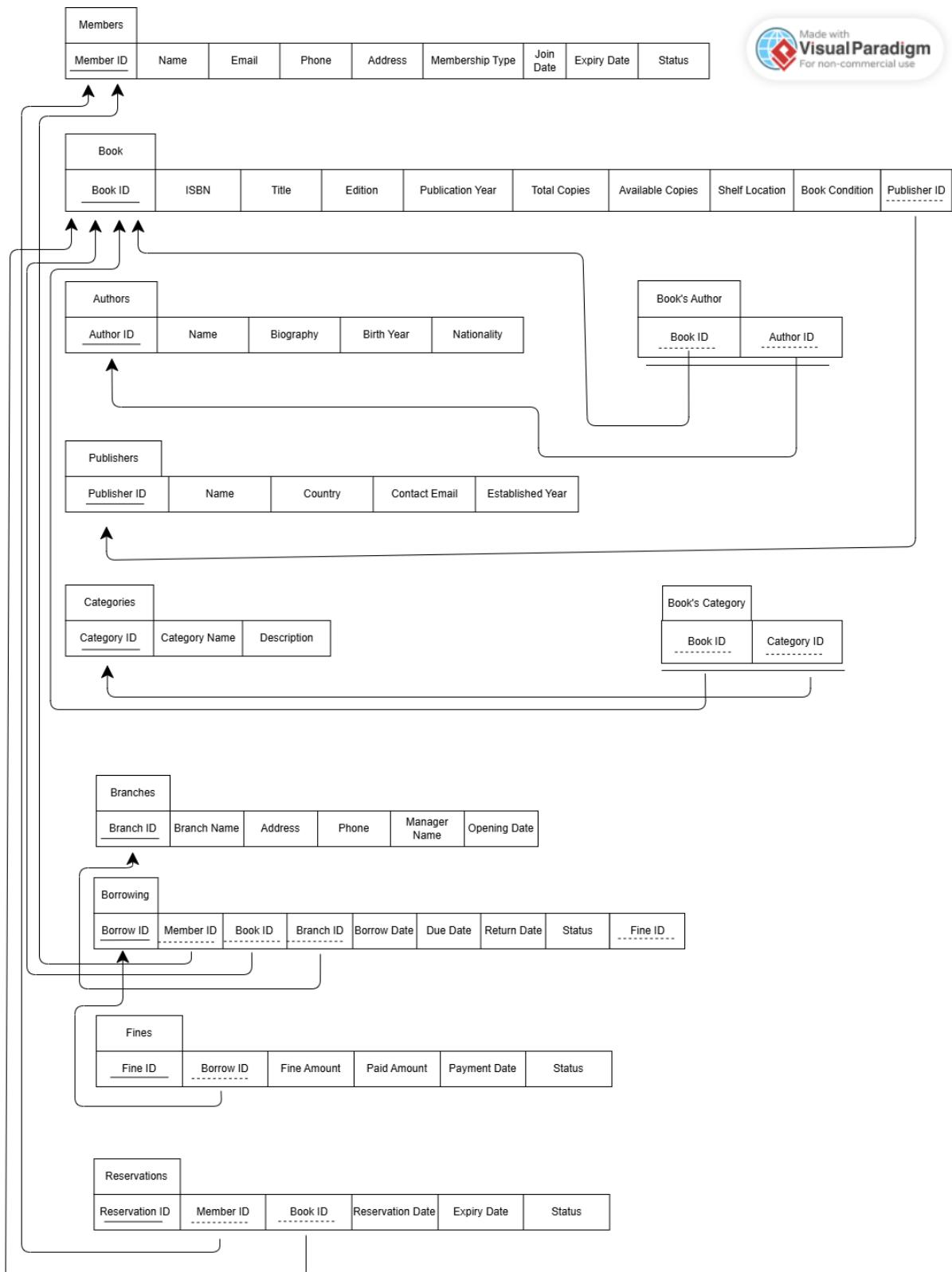
Task 1: ERD Design



Task 2: Normalization

	Issues	Example
1NF	repeating values	author_names = "Alice Smith, Bob Jones" → two authors in one cell categories = "Fiction, Drama" → two genres in one cell
2NF	Partial dependency	member_name depends only on member_id
3NF	transitive dependencies	publisher_country depends on publisher_name, not on the table key.

Task 3: Database Mapping



Task 6: SQL DQL - Basic Queries

1. List all books published after 2020

```
Object Explorer    SQLQuery14.sql - H...\JUFAIL\gakha (63)    SQLQuery2.sql - H...\JUFAIL\gakha (69)*
SELECT * FROM Books WHERE publication_year > 2020
```

The screenshot shows the Object Explorer on the left with the Books table selected. The Results pane on the right displays the query results:

book_id	isbn	title	edition	publication_year	total_copies	available_copies	shelf_location	book_condition	publisher_id	rating
1	9780000000001	The Great Novel	1st	2022	5	0	FIC-1	Good	3	4
2	9780000000002	Advanced Databases	2nd	2021	3	2	TECH-3	Good	4	5
3	9780000000003	Wireless 5G Basics	1st	2023	4	4	TECH-4	New	4	5
4	9780000000004	AI for Everyone	1st	2024	5	5	TECH-1	New	3	5
5	9780000000005	Digital Signal Processing	3rd	2021	5	5	TECH-6	Good	4	5
6	9780000000011	Machine Learning Essentials	2nd	2023	6	6	TECH-7	New	3	5
7	9780000000014	Ocean Mysteries	1st	2022	3	3	MYS-3	Good	7	4
8	9780000000015	Inspiring Leaders	1st	2021	4	4	BIO-4	Good	5	5
9	9780000000016	Quantum Physics Simplified	1st	2024	5	5	SCI-1	New	3	5
10	9780000000018	Fictional Worlds	2nd	2022	6	6	FIC-2	Good	3	5
11	9780000000020	Smart Cities	1st	2023	4	4	TECH-9	New	4	5
12	9780000000021	Artificial Intelligence Ethics	1st	2024	4	4	TECH-10	New	3	5
13	9780000000026	Cultural Heritage of Oman	1st	2021	5	5	HIS-5	Good	5	5
14	9780000000027	Cloud Computing 101	1st	2023	5	5	TECH-11	New	4	5
15	9780000000029	Renewable Energy Systems	1st	2022	5	5	SCI-4	New	4	5

2. Find all members whose membership expires in the next 30 days

```
Object Explorer    SQLQuery14.sql - H...\JUFAIL\gakha (63)    SQLQuery2.sql - H...\JUFAIL\gakha (69)*
SELECT *
FROM Members
WHERE expiry_date BETWEEN GETDATE() AND DATEADD(DAY, 30, GETDATE());
```

The screenshot shows the Object Explorer on the left with the Members table selected. The Results pane on the right displays the query results:

member_id	name	email	phone	address	membership_type	join_date	expiry_date	status	last_login
1	Ali Hassan	ali.hassan@email.com	900-0003	103 Elm St	Premium	2024-12-01	2025-11-30	Active	NULL

3. Show all overdue borrowings (return_date IS NULL AND due_date < CURDATE())

The screenshot shows the SQL Server Management Studio interface. The Object Explorer on the left lists database objects like Graph Tables, Authors, BookAuthors, BookCategories, Books, Borrowing, Branches, Categories, Fines, Members, Publishers, and their respective columns and constraints. The central pane displays a query window with the following SQL code:

```
SELECT borrow_id, member_id, book_id, due_date, status
FROM Borrowing
WHERE return_date IS NULL
AND due_date < CAST(GETDATE() AS DATE);
```

The results pane below shows a table with 12 rows of data, each representing a borrowing record. The columns are borrow_id, member_id, book_id, due_date, and status. The status column contains values 'Overdue' or 'Borrowed'. The due_date column shows dates ranging from 2025-08-24 to 2025-10-29.

	borrow_id	member_id	book_id	due_date	status
1	1	1	2	2025-10-09	Overdue
2	3	3	4	2025-10-24	Borrowed
3	5	5	6	2025-08-24	Overdue
4	8	8	9	2025-11-01	Borrowed
5	10	10	11	2025-10-19	Overdue
6	12	12	13	2025-10-04	Borrowed
7	15	15	16	2025-10-25	Borrowed
8	16	16	17	2025-09-03	Overdue
9	17	17	18	2025-10-21	Borrowed
10	19	19	20	2025-10-01	Overdue
11	20	20	21	2025-10-29	Borrowed
12	25	10	26	2025-10-09	Overdue

A green checkmark at the bottom indicates "Query executed successfully."

4. List books that have never been borrowed

The screenshot shows the SQL Server Management Studio interface. The Object Explorer on the left lists database objects like BookCategories, Books, Borrowing, Branches, Categories, Fines, Members, Publishers, and their respective columns and constraints. The central pane displays a query window with the following SQL code:

```
SELECT *
FROM Books b LEFT JOIN Borrowing br ON b.book_id = br.book_id
WHERE br.book_id IS NULL;
```

The results pane below shows a table with 5 rows of data, each representing a book record. The columns are book_id, isbn, title, edition, publication_year, total_copies, available_copies, shelf_location, book_condition, publisher_id, rating, borrow_id, member_id, book_id, branch_id, borrow_date, due_date, and return. The book_id column has values 27, 28, 29, 30, and 31. The book_id column in the borrow_id column is null for all rows.

	book_id	isbn	title	edition	publication_year	total_copies	available_copies	shelf_location	book_condition	publisher_id	rating	borrow_id	member_id	book_id	branch_id	borrow_date	due_date	return
1	27	9780000002606	Cultural Heritage of Oman	1st	2021	5	5	HIB-5	Good	5	5	NULL	NULL	NULL	NULL	NULL	NULL	NULL
2	28	9780000002627	Cloud Computing 101	1st	2023	5	5	TECH-11	New	4	5	NULL	NULL	NULL	NULL	NULL	NULL	NULL
3	29	9780000002608	Stories for Children	1st	2018	7	7	CH-3	Good	6	5	NULL	NULL	NULL	NULL	NULL	NULL	NULL
4	30	9780000002628	Renewable Energy Systems	1st	2022	5	5	SC-4	New	4	5	NULL	NULL	NULL	NULL	NULL	NULL	NULL
5	31	9780000000303	Global Biographies	1st	2020	3	3	BIO-5	Good	5	4	NULL	NULL	NULL	NULL	NULL	NULL	NULL

A green checkmark at the bottom indicates "Query executed successfully."

5. Find members with pending fines greater than \$10

```

SELECT m.member_id, m.name, SUM(f.fine_amount - f.paid_amount) AS pending_balance
FROM Fines f
JOIN Borrowing br ON f.borrow_id = br.borrow_id
JOIN Members m ON br.member_id = m.member_id
WHERE f.status = 'Pending'
GROUP BY m.member_id, m.name
HAVING SUM(f.fine_amount - f.paid_amount) >= 10;

```

The screenshot shows the Object Explorer on the left with the library_db database selected. The Results pane on the right displays the output of the query:

	member_id	name	pending_balance
1	5	Omar Saleh	10.00

A green status bar at the bottom indicates "Query executed successfully."

6. Show all books in 'Fiction' category

```

SELECT * FROM Books b
JOIN Categories c ON category_name='Fiction'
JOIN BookCategories bc ON b.book_id=bc.book_id And c.category_id=bc.category_id

```

The screenshot shows the Object Explorer on the left with the library_db database selected. The Results pane on the right displays the output of the query:

book_id	isbn	title	edition	publication_year	total_copies	available_copies	shelf_location	book_condition	publisher_id	rating	category_id	category_name	description	book_id	category_id
1	9780000000001	The Great Novel	1st	2022	5	0	FIC-1	Good	3	4	1	Fiction	General fiction	2	1
2	9780000000018	Fictional Worlds	2nd	2022	6	6	FIC-2	Good	3	5	1	Fiction	General fiction	19	1

A green status bar at the bottom indicates "Query executed successfully." and "HJUFAILI (15.0 RTM) HJUFAILI\gakha (69) library_db 00:00:00 2 rows"

7. Display books with less than 2 available copies

The screenshot shows the Object Explorer on the left with the library_db database selected. In the center, there are three tabs: SQLQuery21.sql, SQLQuery20.sql, and SQLQuery2.sql. The SQLQuery2.sql tab contains the query:

```
SELECT * FROM Books WHERE available_copies < 2
```

The Results tab displays the following table:

book_id	isbn	title	edition	publication_year	total_copies	available_copies	shelf_location	book_condition	publisher_id	rating
1	9780000000001	The Great Novel	1st	2022	5	0	FIC-1	Good	3	4
2	9780000000004	Modern History	3rd	2019	2	1	HIS-2	Fair	5	3
3	9780000000013	World War Chronicles	1st	2019	2	1	HIS-3	Fair	5	4

A status bar at the bottom indicates "Query executed successfully."

8. List all authors from 'USA' or 'UK'

The screenshot shows the Object Explorer on the left with the library_db database selected. In the center, there are three tabs: SQLQuery22.sql, SQLQuery20.sql, and SQLQuery2.sql. The SQLQuery2.sql tab contains the query:

```
SELECT * FROM Authors WHERE nationality = 'UK' OR nationality = 'USA'
```

The Results tab displays the following table:

author_id	name	biography	birth_year	nationality
1	Bob Jones	NULL	1968	UK

A status bar at the bottom indicates "Query executed successfully."

9. Find books published by 'Penguin Random House'

The screenshot shows the SQL Server Management Studio interface. The Object Explorer on the left shows the database structure with tables like Books, BookCategories, and Publishers. The main window displays a query result set:

```
SELECT * FROM Books b JOIN Publishers p ON p.name='Penguin Random House' AND b.publisher_id=p.publisher_id
```

book_id	isbn	title	edition	publication_year	total_copies	available_copies	shelf_location	book_condition	publisher_id	rating	name	country	contact_email	published_ye
1	978000000007	Mystery on the Hill	1st	2017	2	3	MHS-2	Good	7	4	Penguin Random House	Oman	fatma123@gmail.com	2025
2	978000000014	Ocean Mysteries	1st	2022	3	3	MHS-3	Good	7	4	Penguin Random House	Oman	fatma123@gmail.com	2025
3	978000000025	The Last Detective	1st	2016	4	3	MHS-4	Fair	7	4	Penguin Random House	Oman	fatma123@gmail.com	2025

Query executed successfully.

10. Show borrowings from last month using BETWEEN

The screenshot shows the SQL Server Management Studio interface. The Object Explorer on the left shows the database structure with tables like Books, BookCategories, and Borrowing. The main window displays a query result set:

```
SELECT *
FROM Borrowing
WHERE borrow_date BETWEEN
    DATEADD(MONTH, -1, DATEFROMPARTS(YEAR(GETDATE()), MONTH(GETDATE()), 1))
    AND DATEADD(DAY, -1, DATEFROMPARTS(YEAR(GETDATE()), MONTH(GETDATE()), 1))
```

borrow_id	member_id	book_id	branch_id	borrow_date	due_date	return_date	status
1	3	4	2	2025-10-10	2025-10-24	NULL	Borrowed
2	7	8	1	2025-10-15	2025-10-29	2025-10-31	Returned
3	8	9	2	2025-10-18	2025-11-01	NULL	Borrowed
4	10	10	4	2025-10-05	2025-10-19	NULL	Overdue
5	13	13	2	2025-10-01	2025-10-15	2025-10-14	Returned
6	15	15	4	2025-10-11	2025-10-25	NULL	Borrowed
7	17	17	1	2025-10-07	2025-10-21	NULL	Borrowed
8	20	20	4	2025-10-15	2025-10-29	NULL	Borrowed
9	22	4	23	2025-10-20	2025-11-03	NULL	Borrowed
10	23	6	24	2025-10-25	2025-11-08	NULL	Borrowed
11	24	8	25	2025-10-05	2025-10-19	2025-10-18	Returned

Query executed successfully.

Task 7: SQL Joins

INNER JOIN:

1. List all borrowed books with member names and book titles

The screenshot shows the SQL Server Management Studio interface. The Object Explorer on the left lists database objects like BookCategories, Books, Borrowing, and Publishers. The main pane displays a T-SQL query:

```
SELECT
    br.borrow_id,
    m.name AS member_name,
    b.title AS book_title,
    br.borrow_date,
    br.due_date,
    br.status
FROM Borrowing br
INNER JOIN Members m ON br.member_id = m.member_id
INNER JOIN Books b ON br.book_id = b.book_id
WHERE br.status='Borrowed'
```

The Results pane shows the output of the query:

borrow_id	member_name	book_title	borrow_date	due_date	status
1	Ali Hassan	Wireless 5G Basics	2025-10-10	2025-10-24	Borrowed
2	Mohammed Al-Balushi	Biography of a Pioneer	2025-10-18	2025-11-01	Borrowed
3	Salim Al-Harthy	Network Security Basics	2025-09-20	2025-10-04	Borrowed
4	Amal Al-Farsi	Inspiring Leaders	2025-10-11	2025-10-25	Borrowed
5	Talib Al-Rawahi	Drama of Dreams	2025-10-07	2025-10-21	Borrowed
6	Khalid Al-Mahrooqi	Smart Cities	2025-10-15	2025-10-29	Borrowed
7	Maryam Khan	Drama in the Storm	2025-10-20	2025-11-03	Borrowed
8	Sara Ahmed	Science Explorers	2025-10-25	2025-11-08	Borrowed

At the bottom, a message says "Query executed successfully."

2. Show all books with their author names (handle multiple authors)

The screenshot shows the Object Explorer on the left with the library_db database selected. In the center, a query window displays the following SQL code:

```

SELECT
    b.book_id,
    b.title,
    a.name AS author_name
FROM Books b
INNER JOIN BookAuthors ba ON b.book_id = ba.book_id
INNER JOIN Authors a ON ba.author_id = a.author_id
    
```

The results window below shows a list of books with their corresponding author names. The results are as follows:

book_id	title	author_name
1	3	Advanced Databases
2	25	Adventures in Space
3	7	AI for Everyone
4	22	Artificial Intelligence Ethics
5	9	Biography of a Pioneer
6	11	Children of Tomorrow
7	28	Cloud Computing 101
8	27	Cultural Heritage of Oman
9	10	Digital Signal Processing
10	23	Drama in the Storm
11	18	Drama of Dreams
12	6	Fairy Tales
13	19	Fictional Worlds
14	31	Global Biographies
15	20	Historical Moments
16	16	Inspiring Leaders
17	12	Maching Learning for Everyone

A message at the bottom indicates "Query executed successfully."

3. Display current borrowings with branch information

The screenshot shows the Object Explorer on the left with the library_db database selected. In the center, a query window displays the following SQL code:

```

SELECT * FROM Borrowing br
INNER JOIN Members m ON br.member_id = m.member_id
INNER JOIN Books b ON br.book_id = b.book_id
INNER JOIN Branches brn ON br.branch_id = brn.branch_id
WHERE br.status IN ('Borrowed', 'Overdue');
    
```

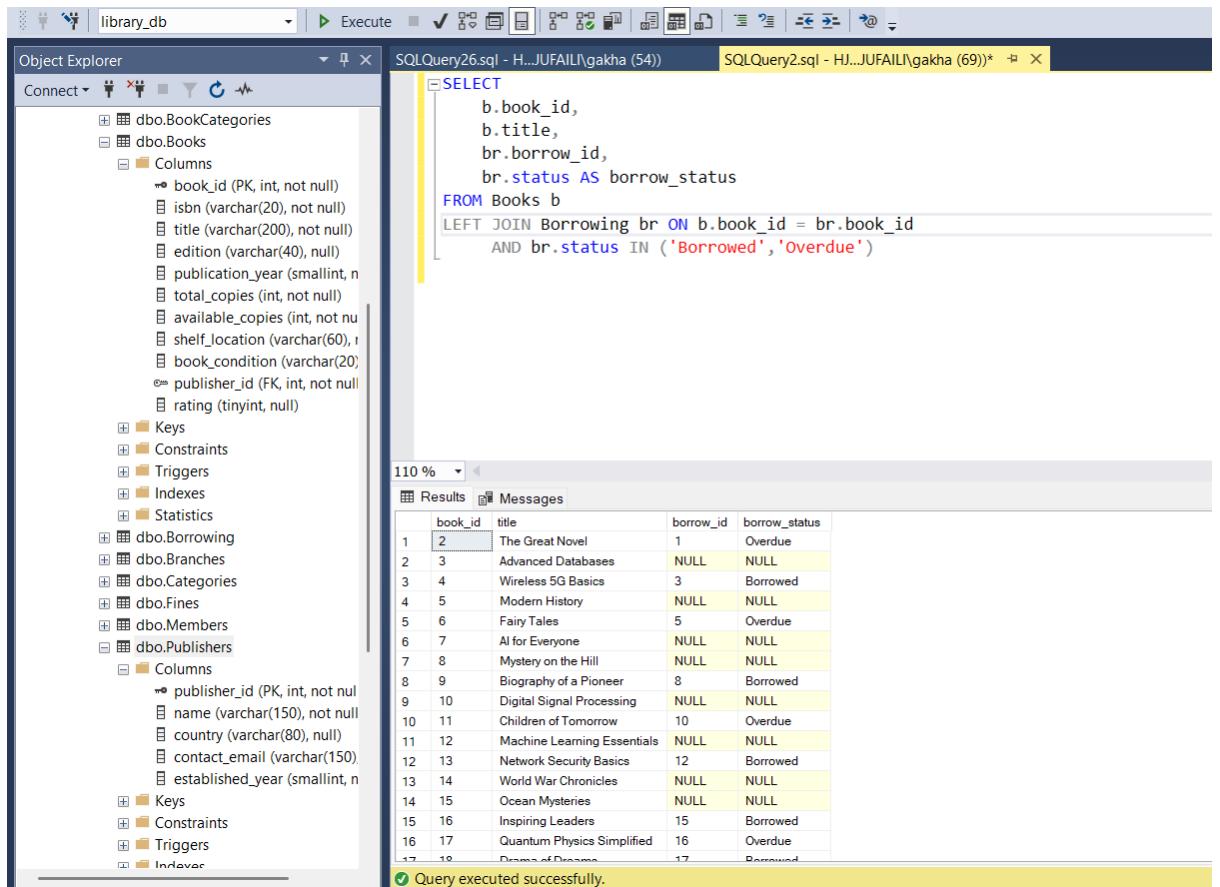
The results window below shows a list of borrowings with member details, book details, and branch information. The results are as follows:

borrow_id	member_id	book_id	branch_id	borrow_date	due_date	return_date	status	member_id	name	email	phone	address	membership_type	join_date	expiry_date	status	
1	1	2	1	2025-08-25	2025-09-09	NULL	Overdue	1	Alharith	hjufaili@gmail.com	987654321	23 Ibra	Standard	2025-01-01	2025-12-31	Active	
2	2	3	4	2025-08-26	2025-09-10	NULL	Borrowed	3	Ali Hassan	ali.hassan@email.com	908-0003	103 Elm St	Premium	2024-12-01	2025-05-30	Active	
3	5	5	4	2025-08-19	2025-09-24	NULL	Overdue	5	Uma Salih	umaisalih@email.com	909-0005	109 Elm St	Standard	2024-09-01	2024-09-30	Active	
4	8	8	9	2025-08-18	2025-11-01	NULL	Borrowed	8	Mohammed Al-Balushi	mohammed.balushi@email.com	900-0008	108 Elm St	Premium	2024-05-01	2024-05-01	Active	
5	10	10	11	2025-08-05	2025-10-04	NULL	Overdue	10	Aisha Said	aisha.said@email.com	900-0010	110 Elm St	Premium	2025-01-15	2026-01-14	Active	
6	12	12	13	2025-08-20	2025-10-04	NULL	Borrowed	12	Salim Al-Harthy	salim.harthy@email.com	900-0012	112 Elm St	Premium	2023-11-20	2024-11-20	Expiring	
7	15	15	16	2025-10-11	2025-10-25	NULL	Borrowed	15	Amal Al-Farsi	amal.farsi@email.com	900-0015	115 Elm St	Premium	2024-02-25	2025-02-25	Active	
8	16	16	17	2025-08-20	2025-09-03	NULL	Overdue	16	Huda Al-Shamsi	huda.shamsi@email.com	900-0016	116 Elm St	Standard	2025-05-01	2026-05-01	Active	
9	17	17	18	1	2025-10-07	2025-10-21	NULL	Borrowed	17	Talib Al-Rawahi	talib.rawahi@email.com	900-0017	117 Elm St	Premium	2024-07-05	2025-07-05	Active
10	19	19	20	3	2025-09-17	2025-10-01	NULL	Overdue	19	Muna Al-Rashdi	muna.rashdi@email.com	900-0019	119 Elm St	Premium	2023-09-01	2024-09-01	Suspending
11	20	20	21	4	2025-10-15	2025-10-29	NULL	Borrowed	20	Khalid Al-Mahrooqi	khalid.mahrooqi@email.com	900-0020	120 Elm St	Standard	2024-12-15	2025-12-12	Active
12	22	4	23	1	2025-10-20	2025-11-03	NULL	Borrowed	4	Maryam Khan	maryam.khan@email.com	900-0004	104 Elm St	Premium	2024-01-15	2025-01-14	Expiring
13	23	6	24	2	2025-10-25	2025-11-08	NULL	Borrowed	6	Sara Ahmed	sara.ahmed@email.com	900-0006	106 Elm St	Premium	2025-03-01	2026-02-28	Active
14	25	10	26	4	2025-09-25	2025-10-09	NULL	Overdue	10	Aisha Said	aisha.said@email.com	900-0010	110 Elm St	Premium	2025-01-15	2025-01-14	Active

A message at the bottom indicates "Query executed successfully."

LEFT JOIN:

4. List ALL books and show if they're currently borrowed (include books not borrowed)



The screenshot shows the SQL Server Management Studio interface. On the left, the Object Explorer pane displays the database schema, including tables like BookCategories, Books, Borrowing, and Publishers. The Books table is expanded, showing columns such as book_id, title, isbn, and borrow_id. On the right, the SQL Query window contains a query that performs a LEFT JOIN between the Books table and the Borrowing table. The Books table is aliased as 'b' and the Borrowing table as 'br'. The query retrieves the book_id, title, borrow_id, and status from the Books table, and the status from the Borrowing table where the book_ids match. The status is aliased as 'borrow_status'. The results grid shows 19 rows of book information, with the borrow_status column indicating whether each book is Borrowed or Overdue. A message at the bottom of the results grid states "Query executed successfully."

book_id	title	borrow_id	borrow_status
1	2	1	Overdue
2	3	NULL	NULL
3	4	3	Borrowed
4	5	NULL	NULL
5	6	5	Overdue
6	7	NULL	NULL
7	8	NULL	NULL
8	9	8	Borrowed
9	10	NULL	NULL
10	11	10	Overdue
11	12	NULL	NULL
12	13	12	Borrowed
13	14	NULL	NULL
14	15	NULL	NULL
15	16	15	Borrowed
16	17	16	Overdue
17	18	17	Borrowed

5. Show ALL members and their active borrowings (include members with no borrowings)

The screenshot shows the SQL Server Management Studio interface. On the left, the Object Explorer displays the database schema for 'library_db', including tables like 'Books', 'Members', and 'Borrowing'. The 'Books' table has columns such as book_id, isbn, title, edition, publication_year, total_copies, available_copies, shelf_location, book_condition, publisher_id, rating, and status. The 'Members' table has columns member_id, name, borrow_id, title, and status. The 'Borrowing' table has columns member_id, borrow_id, title, and status.

In the center, a query window contains the following SQL code:

```

SELECT
    m.member_id,
    m.name AS member_name,
    br.borrow_id,
    b.title AS borrowed_book,
    br.status
FROM Members AS m
LEFT JOIN Borrowing AS br ON m.member_id = br.member_id
    AND br.status IN ('Borrowed', 'Overdue')
LEFT JOIN Books AS b ON br.book_id = b.book_id
    
```

The results grid shows the following data:

	member_id	member_name	borrow_id	borrowed_book	status
1	9	Abdullah Rashid	NULL	NULL	NULL
2	10	Aisha Said	10	Children of Tomorrow	Overdue
3	10	Aisha Said	25	The Last Detective	Overdue
4	1	Alharith	1	The Great Novel	Overdue
5	3	Ali Hassan	3	Wireless 5G Basics	Borrowed
6	15	Amal Al-Farsi	15	Inspiring Leaders	Borrowed
7	7	Fatima Noor	NULL	NULL	NULL
8	11	Hassan Al-Lamki	NULL	NULL	NULL
9	16	Huda Al-Shamsi	16	Quantum Physics Simplified	Overdue
10	2	Jane Smith	NULL	NULL	NULL
11	20	Khalid Al-Mahrooqi	20	Smart Cities	Borrowed
12	13	Layla Al-Hinai	NULL	NULL	NULL
13	4	Maryam Khan	22	Drama in the Storm	Borrowed
14	8	Mohammed Al-Balushi	8	Biography of a Pioneer	Borrowed
15	19	Muna Al-Rashdi	19	Historical Moments	Overdue
16	14	Nasser Al-Kindi	NULL	NULL	NULL
17	5	Omar Salab	5	Science Fiction	Overdue

At the bottom of the results grid, a message states: "Query executed successfully."

RIGHT JOIN / FULL OUTER JOIN (if supported):

6. Show all categories and count of books (include categories with no books)

The screenshot shows the Object Explorer on the left with the library_db database selected. The Results pane on the right displays the output of the following query:

```

SELECT
    c.category_id,
    c.category_name,
    COUNT(bc.book_id) total_books
FROM Categories c
LEFT JOIN BookCategories bc ON c.category_id = bc.category_id
GROUP BY c.category_id, c.category_name
ORDER BY c.category_name;

```

The results table shows the following data:

	category_id	category_name	total_books
1	8	Biography	3
2	6	Children	3
3	2	Drama	3
4	1	Fiction	2
5	5	History	4
6	7	Mystery	3
7	3	Science	7
8	4	Technology	9

The screenshot shows the Object Explorer on the left with the library_db database selected. The Results pane on the right displays the output of the following query:

```

SELECT
    c.category_id,
    c.category_name,
    COUNT(bc.book_id) total_books
FROM Categories c
FULL OUTER JOIN BookCategories bc
    ON c.category_id = bc.category_id
GROUP BY c.category_id, c.category_name
ORDER BY c.category_name;

```

The results table shows the following data, identical to the first query:

	category_id	category_name	total_books
1	8	Biography	3
2	6	Children	3
3	2	Drama	3
4	1	Fiction	2
5	5	History	4
6	7	Mystery	3
7	3	Science	7
8	4	Technology	9