

# LibraryManagement Database

## Task 1

База даних "LibraryManagement" містить наступні таблиці:

- **authors** - інформація про авторів книг
- **genres** - жанри літератури
- **books** - інформація про книги з посиланнями на авторів та жанри
- **users** - користувачі бібліотеки
- **borrowed\_books** - записи про позичені книги

## Task 2

Всі таблиці містять тестові дані для демонстрації роботи системи.

### Скріншоти таблиць:

#### Таблиця authors

1 • `SELECT * FROM LibraryManagement.authors;`

The screenshot shows the MySQL Workbench interface with the 'Result Grid' tab selected. The query `SELECT * FROM LibraryManagement.authors;` has been run. The results are displayed in a grid with two rows. The first row contains the column headers `author_id` and `author_name`. The second row contains the data: `1 J.K. Rowling` and `2 George R.R. Martin`. There are also two additional columns at the bottom of the grid labeled `HULL`.

author_id	author_name
1	J.K. Rowling
2	George R.R. Martin

## Таблиця genres

```
1 • SELECT * FROM LibraryManagement.genres;
```

100% 1:1

Result Grid Filter Rows: Search Edit: Export/Import: Result Grid Form Editor

genre_id	genre_name
1	Fantasy
2	Science Fiction
NULL	NULL

## Таблиця books

```
1 • SELECT * FROM LibraryManagement.books;
```

100% 1:1

Result Grid Filter Rows: Search Edit: Export/Import: Result Grid Form Editor

book_id	title	publication_ye...	author_id	genre_id
1	Harry Potter and the Philosopher's Stone	1997	1	1
2	A Game of Thrones	1996	2	1
NULL	NULL	NULL	NULL	NULL

## Таблиця users

```
1 • SELECT * FROM LibraryManagement.users;
```

100% 1:1

Result Grid Filter Rows: Search Edit: Export/Import: Result Grid Form Editor

user_id	username	email
1	john_doe	john.doe@email.com
2	jane_smith	jane.smith@email.com
NULL	NULL	NULL

## Таблиця borrowed\_books

```
1 • | SELECT * FROM LibraryManagement.borrowed_books;
```

The screenshot shows a database management interface with a results grid. The grid has columns: borrow\_id, book\_id, user\_id, borrow\_date, and return\_date. There are two rows of data:

borrow_id	book_id	user_id	borrow_date	return_date
1	1	1	2024-01-15	2024-02-15
2	2	2	2024-01-20	HULL
			HULL	HULL

## Task 3

Запит, що об'єднує всі таблиці бази даних e-commerce системи за допомогою операторів FROM та INNER JOIN:

```
SELECT
    o.id as order_id,
    o.date as order_date,
    c.name as customer_name,
    c.country as customer_country,
    CONCAT(e.first_name, ' ', e.last_name) as employee_name,
    s.name as shipper_name,
    p.name as product_name,
    p.price as product_price,
    p.unit as product_unit,
    od.quantity,
    cat.name as category_name,
    sup.name as supplier_name,
    sup.country as supplier_country
FROM orders o
INNER JOIN customers c ON o.customer_id = c.id
INNER JOIN employees e ON o.employee_id = e.employee_id
INNER JOIN shippers s ON o.shipper_id = s.id
INNER JOIN order_details od ON od.order_id = o.id
INNER JOIN products p ON od.product_id = p.id
INNER JOIN categories cat ON p.category_id = cat.id
INNER JOIN suppliers sup ON p.supplier_id = sup.id;
```

Limit to 1000 rows

```

11     od.quantity,
12     cat.name as category_name,
13     sup.name as supplier_name,
14     sup.country as supplier_country
15   FROM orders o
16   INNER JOIN customers c ON o.customer_id = c.id
17   INNER JOIN employees e ON o.employee_id = e.employee_id
18   INNER JOIN shippers s ON o.shipper_id = s.id
19   INNER JOIN order_details od ON od.order_id = o.id

```

Result Grid | Filter Rows:  Search | Export:

order\_id order\_date customer\_name customer\_country employee\_name shipper\_name product\_name product\_pri... product\_unit quantity category\_name supplier\_name supplier\_coun...

10249	1996-07-05	Tradicao Hipermercados	Brazil	Michael Suyama	Speedy Express	Tofu	23.25	40 - 100 g pkgs.	9	Produce	Mayumis	Japan
10249	1996-07-05	Tradicao Hipermercados	Brazil	Michael Suyama	Speedy Express	Manjimup Dried Apples	53.00	50 - 300 g pkgs.	40	Produce	Gday, Mate	Australia
10251	1996-07-08	Virtualles en stock	France	Janet Leverling	Speedy Express	Gustafs Knackebrod	21.00	24 - 500 g pkgs.	6	Grains/Cereals	PB Knackebrod AB	Sweden
10251	1996-07-08	Virtualles en stock	France	Janet Leverling	Speedy Express	Ravoli Angelo	19.50	24 - 250 g pkgs.	15	Grains/Cereals	Pasta Buttini s.r.l.	Italy
10251	1996-07-08	Virtualles en stock	France	Janet Leverling	Speedy Express	Louisiana Fiery Hot Pepper Sauce	21.05	32 - 8 oz bottles	20	Condiments	New Orleans Cajun Delights	USA
10258	1996-07-17	Ernst Handel	Austria	Nancy Davolio	Speedy Express	Chang	19.00	24 - 12 oz bottles	50	Beverages	Exotic Liquid	UK
10258	1996-07-17	Ernst Handel	Austria	Nancy Davolio	Speedy Express	Chef Anton's Gumbo Mix	21.35	36 boxes	65	Condiments	New Orleans Cajun Delights	USA
10258	1996-07-17	Ernst Handel	Austria	Nancy Davolio	Speedy Express	Mascarpone Fabioli	32.00	24 - 200 g pkgs.	6	Dairy Products	Formaggi Fortini s.r.l.	Italy
10260	1996-07-19	Old World Delicatessen	USA	Margaret Peacock	Speedy Express	Jacks New England Clam Chowder	9.65	12 - 12 oz cans	16	Seafood	New England Seafood Cannery	USA
10260	1996-07-19	Old World Delicatessen	USA	Margaret Peacock	Speedy Express	Revoli Angelo	19.50	24 - 250 g pkgs.	50	Grains/Cereals	Pasta Buttini s.r.l.	Italy
10260	1996-07-19	Old World Delicatessen	USA	Margaret Peacock	Speedy Express	Tarte au sucre	49.30	48 pies	15	Confections	Foires dérables	Canada
10260	1996-07-19	Old World Delicatessen	USA	Margaret Peacock	Speedy Express	Outback Lager	15.00	24 - 355 ml bottles	21	Beverages	Pavlova, Ltd.	Australia
10265	1996-07-25	Blondel pere et fils	France	Andrew Fuller	Speedy Express	Alice Mutton	39.00	20 - 1 kg tins	30	Meat/Poultry	Pavlova, Ltd.	Australia
10265	1996-07-25	Blondel pere et fils	France	Andrew Fuller	Speedy Express	Outback Lager	15.00	24 - 355 ml bottles	20	Beverages	Pavlova, Ltd.	Australia
10267	1996-07-29	Frankenversand	Germany	Margaret Peacock	Speedy Express	Boston Crab Meat	18.40	24 - 4 oz tins	50	Seafood	New England Seafood Cannery	USA
10267	1996-07-29	Frankenversand	Germany	Margaret Peacock	Speedy Express	Raclette Courdavault	55.00	5 kg pkgs.	70	Dairy Products	Gai pâturage	France
10267	1996-07-29	Frankenversand	Germany	Margaret Peacock	Speedy Express	Lakkalikkoori	18.00	500 ml	15	Beverages	Karkki Oy	Finland
10269	1996-07-31	White Clover Markets	USA	Steven Buchanan	Speedy Express	Geitost	2.50	500 g	60	Dairy Products	Norske Meierier	Norway
10269	1996-07-31	White Clover Markets	USA	Steven Buchanan	Speedy Express	Mozzarella di Giovanni	34.80	24 - 200 g pkgs.	20	Dairy Products	Formaggi Fortini s.r.l.	Italy
10270	1996-08-01	Wartian Herkku	Finland	Nanou Davulin	Snappy Ervares	Inlandt Sill	19.00	24 - 250 g jars	20	Seafood	Suomen Siirtovarita O.R.	Sweden

Result Grid | Form Editor | Field Types | Query Stats | Execution Plan

## Task 4

### 1. Підрахунок кількості рядків у базовому запиті

```

SELECT COUNT(*) as total_rows
FROM orders o
INNER JOIN customers c ON o.customer_id = c.id
INNER JOIN employees e ON o.employee_id = e.employee_id
INNER JOIN shippers s ON o.shipper_id = s.id
INNER JOIN order_details od ON od.order_id = o.id
INNER JOIN products p ON od.product_id = p.id
INNER JOIN categories cat ON p.category_id = cat.id
INNER JOIN suppliers sup ON p.supplier_id = sup.id;

```

```
1 •  SELECT COUNT(*) as total_rows
2   FROM orders o
3   INNER JOIN customers c ON o.customer_id = c.id
4   INNER JOIN employees e ON o.employee_id = e.employee_id
5   INNER JOIN shippers s ON o.shipper_id = s.id
6   INNER JOIN order_details od ON od.order_id = o.id
7   INNER JOIN products p ON od.product_id = p.id
8   INNER JOIN categories cat ON p.category_id = cat.id
9   INNER JOIN suppliers sup ON p.supplier_id = sup.id;
10
```

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Result Grid



Filter Rows:



Search

Export:



total_rows
518

## 2. Зміна INNER JOIN на LEFT/RIGHT JOIN

```
SELECT COUNT(*) as total_rows
FROM orders o
INNER JOIN customers c ON o.customer_id = c.id
LEFT JOIN employees e ON o.employee_id = e.employee_id
RIGHT JOIN shippers s ON o.shipper_id = s.id
LEFT JOIN order_details od ON od.order_id = o.id
RIGHT JOIN products p ON od.product_id = p.id
LEFT JOIN categories cat ON p.category_id = cat.id
INNER JOIN suppliers sup ON p.supplier_id = sup.id;
```

```
1 •  SELECT COUNT(*) as total_rows_with_left_join
2   FROM orders o
3   INNER JOIN customers c ON o.customer_id = c.id
4   LEFT JOIN employees e ON o.employee_id = e.employee_id
5   RIGHT JOIN shippers s ON o.shipper_id = s.id
6   LEFT JOIN order_details od ON od.order_id = o.id
7   RIGHT JOIN products p ON od.product_id = p.id
8   LEFT JOIN categories cat ON p.category_id = cat.id
9   INNER JOIN suppliers sup ON p.supplier_id = sup.id;
10
```

100% 52:9

**Result Grid**



Filter Rows:

Search

Export:



total_rows_with_left_j...
518

**Пояснення:** Кількість рядків залишається такою ж, як і при INNER JOIN, тому що всі записи в таблицях мають відповідні зв'язки (немає NULL значень у зовнішніх ключах). LEFT та RIGHT JOIN показують той самий результат, що й INNER JOIN, коли всі дані повністю відповідають один одному.

### 3. Фільтрація за employee\_id > 3 та ≤ 10

SELECT

```

o.id as order_id,
o.date as order_date,
c.name as customer_name,
c.country as customer_country,
CONCAT(e.first_name, ' ', e.last_name) as employee_name,
s.name as shipper_name,
p.name as product_name,
p.price as product_price,
p.unit as product_unit,
od.quantity,
cat.name as category_name,
sup.name as supplier_name,
sup.country as supplier_country

FROM orders o
INNER JOIN customers c ON o.customer_id = c.id
INNER JOIN employees e ON o.employee_id = e.employee_id
INNER JOIN shippers s ON o.shipper_id = s.id
INNER JOIN order_details od ON od.order_id = o.id
INNER JOIN products p ON od.product_id = p.id
INNER JOIN categories cat ON p.category_id = cat.id
INNER JOIN suppliers sup ON p.supplier_id = sup.id
WHERE e.employee_id > 3 AND e.employee_id <= 10;

```

```

17 INNER JOIN customers c ON o.customer_id = c.id
18 INNER JOIN employees e ON o.employee_id = e.employee_id
19 INNER JOIN shippers s ON o.shipper_id = s.id
20 INNER JOIN order_details od ON od.order_id = o.id
21 INNER JOIN products p ON od.product_id = p.id
22 INNER JOIN categories cat ON p.category_id = cat.id
23 INNER JOIN suppliers sup ON p.supplier_id = sup.id
24 WHERE e.employee_id > 3 AND e.employee_id <= 10;
25

```

The screenshot shows a database result grid with the following structure:

order_id	order_date	customer_name	customer_country	employee_id	employee_name	shipper_name	product_name	product_price	product_unit	quantity	category_name	supplier_name	supplier_country
10249	1996-07-05	Tradicao Hipermercados	Brazil	6	Michael Suyama	Speedy Express	Tofu	23.25	40 - 100 g pkgs.	9	Produce	Mayumis	Japan
10249	1996-07-05	Tradicao Hipermercados	Brazil	6	Michael Suyama	Speedy Express	Manjimup Dried Apples	53.00	50 - 300 g pkgs.	40	Produce	Gday, Mata	Australia
10260	1996-07-19	Old World Delicatessen	USA	4	Margaret Peacock	Speedy Express	Jacks New England Clam Chowder	9.65	12 - 12 oz cans	16	Seafood	New England Seafood Cannery	USA
10260	1996-07-19	Old World Delicatessen	USA	4	Margaret Peacock	Speedy Express	Ravoli Angelo	19.50	24 - 250 g pkgs.	50	Grains/Cereals	Pasta Buttini s.r.l.	Italy
10260	1996-07-19	Old World Delicatessen	USA	4	Margaret Peacock	Speedy Express	Tarte au sucre	49.30	48 pies	15	Confections	Forsets derables	Canada
10260	1996-07-19	Old World Delicatessen	USA	4	Margaret Peacock	Speedy Express	Outback Lager	15.00	24 - 355 ml bottles	21	Beverages	Pavlova, Ltd.	Australia
10267	1996-07-29	Frankenversand	Germany	4	Margaret Peacock	Speedy Express	Boston Crab Meat	18.40	24 - 4 oz tins	50	Seafood	New England Seafood Cannery	USA
10267	1996-07-29	Frankenversand	Germany	4	Margaret Peacock	Speedy Express	Ratatouille Courdavault	55.00	5 kg pkgs.	70	Dairy Products	Ola paturage	France
10267	1996-07-29	Frankenversand	Germany	4	Margaret Peacock	Speedy Express	Lakkalikkoori	18.00	500 ml	15	Beverages	Karkki Oy	Finland
10269	1996-07-31	White Clover Markets	USA	5	Steven Buchanan	Speedy Express	Gelbst	2.50	500 g	60	Dairy Products	Norske Meierier	Norway
10269	1996-07-31	White Clover Markets	USA	5	Steven Buchanan	Speedy Express	Mozzarella di Giovanni	34.80	24 - 200 g pkgs.	20	Dairy Products	Formaggi Fortini s.r.l.	Italy
10274	1996-08-06	Vins et alcools Chevalier	France	6	Michael Suyama	Speedy Express	Fletemysot	21.50	10 - 500 g pkgs.	20	Dairy Products	Norske Meierier	Norway
10274	1996-08-06	Vins et alcools Chevalier	France	6	Michael Suyama	Speedy Express	Mozzarella di Giovanni	34.80	24 - 200 g pkgs.	7	Dairy Products	Formaggi Fortini s.r.l.	Italy
10281	1996-08-14	Romero y tomillo	Spain	4	Margaret Peacock	Speedy Express	Teatime Chocolate Biscuits	9.20	10 boxes x 12 pl...	1	Confections	Specialty Biscuits, Ltd.	UK
10281	1996-08-14	Romero y tomillo	Spain	4	Margaret Peacock	Speedy Express	Guarana Fantastica	4.50	12 - 355 ml cans	6	Beverages	Refreros Americanas LTDA	Brazil
10281	1996-08-14	Romero y tomillo	Spain	4	Margaret Peacock	Speedy Express	Steeleye Stout	18.00	24 - 12 oz bottles	4	Beverages	Bigfoot Breweries	USA
10282	1996-08-15	Romero y tomillo	Spain	4	Margaret Peacock	Speedy Express	Nord-Ost Matjesherring	25.89	10 - 200 g glasses	6	Seafood	Nord-Ost-Fisch Handelsgesell...	Germany
10282	1996-08-15	Romero y tomillo	Spain	4	Margaret Peacock	Speedy Express	Ravoli Angelo	19.50	24 - 250 g pkgs.	2	Grains/Cereals	Pasta Buttini s.r.l.	Italy
10284	1996-08-18	Lehmanns Marktstand	Germany	4	Margaret Peacock	Speedy Express	Schoon Schokolade	43.00	100 - 100 g pieces	15	Confections	Haus Suewzen GmbH und C	Germany

## 4. Групування за категорією з підрахунком та середньою кількістю

SELECT

```
cat.name as category_name,
COUNT(*) as row_count,
AVG(od.quantity) as avg_quantity
FROM orders o
INNER JOIN customers c ON o.customer_id = c.id
INNER JOIN employees e ON o.employee_id = e.employee_id
INNER JOIN shippers s ON o.shipper_id = s.id
INNER JOIN order_details od ON od.order_id = o.id
INNER JOIN products p ON od.product_id = p.id
INNER JOIN categories cat ON p.category_id = cat.id
INNER JOIN suppliers sup ON p.supplier_id = sup.id
WHERE e.employee_id > 3 AND e.employee_id <= 10
GROUP BY cat.name;
```

```
1 • SELECT
2     cat.name as category_name,
3     COUNT(*) as row_count,
4     AVG(od.quantity) as avg_quantity
5     FROM orders o
6     INNER JOIN customers c ON o.customer_id = c.id
7     INNER JOIN employees e ON o.employee_id = e.employee_id
8     INNER JOIN shippers s ON o.shipper_id = s.id
9     INNER JOIN order_details od ON od.order_id = o.id
10    INNER JOIN products p ON od.product_id = p.id
11    INNER JOIN categories cat ON p.category_id = cat.id
12    INNER JOIN suppliers sup ON p.supplier_id = sup.id
13    WHERE e.employee_id > 3 AND e.employee_id <= 10
14    GROUP BY cat.name;
15
```

100% 1:15

Result Grid Filter Rows: Search Export:

category_name	row_count	avg_quantity
Produce	21	25.2381
Seafood	40	22.7000
Grains/Cereals	24	20.7083
Conffections	51	23.8627
Beverages	62	25.1290
Dairy Products	58	27.4655
Condiments	30	26.9000
Meat/Poultry	31	21.5806

Result Grid Form Editor Field Types

## 5. Фільтрація за середньою кількістю > 21

SELECT

```
cat.name as category_name,
COUNT(*) as row_count,
AVG(od.quantity) as avg_quantity
FROM orders o
INNER JOIN customers c ON o.customer_id = c.id
INNER JOIN employees e ON o.employee_id = e.employee_id
INNER JOIN shippers s ON o.shipper_id = s.id
INNER JOIN order_details od ON od.order_id = o.id
INNER JOIN products p ON od.product_id = p.id
INNER JOIN categories cat ON p.category_id = cat.id
INNER JOIN suppliers sup ON p.supplier_id = sup.id
WHERE e.employee_id > 3 AND e.employee_id <= 10
GROUP BY cat.name
HAVING AVG(od.quantity) > 21;
```

The screenshot shows the MySQL Workbench interface with the query results. The results grid displays the following data:

category_name	row_count	avg_quantity
Produce	21	25.2381
Seafood	40	22.7000
Confectons	51	23.8627
Beverages	62	25.1290
Dairy Products	58	27.4655
Condiments	30	26.9000
Meat/Poultry	31	21.5806

## 6. Сортування за спаданням кількості рядків

SELECT

```
cat.name as category_name,
COUNT(*) as row_count,
AVG(od.quantity) as avg_quantity
FROM orders o
INNER JOIN customers c ON o.customer_id = c.id
INNER JOIN employees e ON o.employee_id = e.employee_id
INNER JOIN shippers s ON o.shipper_id = s.id
INNER JOIN order_details od ON od.order_id = o.id
INNER JOIN products p ON od.product_id = p.id
INNER JOIN categories cat ON p.category_id = cat.id
INNER JOIN suppliers sup ON p.supplier_id = sup.id
WHERE e.employee_id > 3 AND e.employee_id <= 10
GROUP BY cat.name
HAVING AVG(od.quantity) > 21
ORDER BY row_count DESC;
```

```
1 • SELECT
2     cat.name as category_name,
3     COUNT(*) as row_count,
4     AVG(od.quantity) as avg_quantity
5 FROM orders o
6 INNER JOIN customers c ON o.customer_id = c.id
7 INNER JOIN employees e ON o.employee_id = e.employee_id
8 INNER JOIN shippers s ON o.shipper_id = s.id
9 INNER JOIN order_details od ON od.order_id = o.id
10 INNER JOIN products p ON od.product_id = p.id
11 INNER JOIN categories cat ON p.category_id = cat.id
12 INNER JOIN suppliers sup ON p.supplier_id = sup.id
13 WHERE e.employee_id > 3 AND e.employee_id <= 10
14 GROUP BY cat.name
15 HAVING AVG(od.quantity) > 21
16 ORDER BY row_count DESC;
```

Result Grid Filter Rows:  Search Export:

category_name	row_count	avg_quantity
Beverages	62	25.1290
Dairy Products	58	27.4655
Confections	51	23.8627
Seafood	40	22.7000
Meat/Poultry	31	21.5806
Condiments	30	26.0000
Produce	21	25.2381

Result Grid Form Editor Report Views

## 7. Вибірка чотирьох рядків з пропуском першого

SELECT

```
cat.name as category_name,
COUNT(*) as row_count,
AVG(od.quantity) as avg_quantity
FROM orders o
INNER JOIN customers c ON o.customer_id = c.id
INNER JOIN employees e ON o.employee_id = e.employee_id
INNER JOIN shippers s ON o.shipper_id = s.id
INNER JOIN order_details od ON od.order_id = o.id
INNER JOIN products p ON od.product_id = p.id
INNER JOIN categories cat ON p.category_id = cat.id
INNER JOIN suppliers sup ON p.supplier_id = sup.id
WHERE e.employee_id > 3 AND e.employee_id <= 10
GROUP BY cat.name
HAVING AVG(od.quantity) > 21
ORDER BY row_count DESC
LIMIT 4 OFFSET 1;
```

```
2     cat.name as category_name,
3     COUNT(*) as row_count,
4     AVG(od.quantity) as avg_quantity
5   FROM orders o
6   INNER JOIN customers c ON o.customer_id = c.id
7   INNER JOIN employees e ON o.employee_id = e.employee_id
8   INNER JOIN shippers s ON o.shipper_id = s.id
9   INNER JOIN order_details od ON od.order_id = o.id
10  INNER JOIN products p ON od.product_id = p.id
11  INNER JOIN categories cat ON p.category_id = cat.id
12  INNER JOIN suppliers sup ON p.supplier_id = sup.id
13 WHERE e.employee_id > 3 AND e.employee_id <= 10
14 GROUP BY cat.name
15 HAVING AVG(od.quantity) > 21
16 ORDER BY row_count DESC
17 LIMIT 4 OFFSET 1;
18 |
```

100% 1:18

Result Grid Filter Rows: Search Export: Fetch rows:

category_name	row_count	avg_quantity
Dairy Products	58	27.4655
Confectionery	51	23.8627
Seafood	40	22.7000
Meat/Poultry	31	21.5806

Result Grid Form Editor