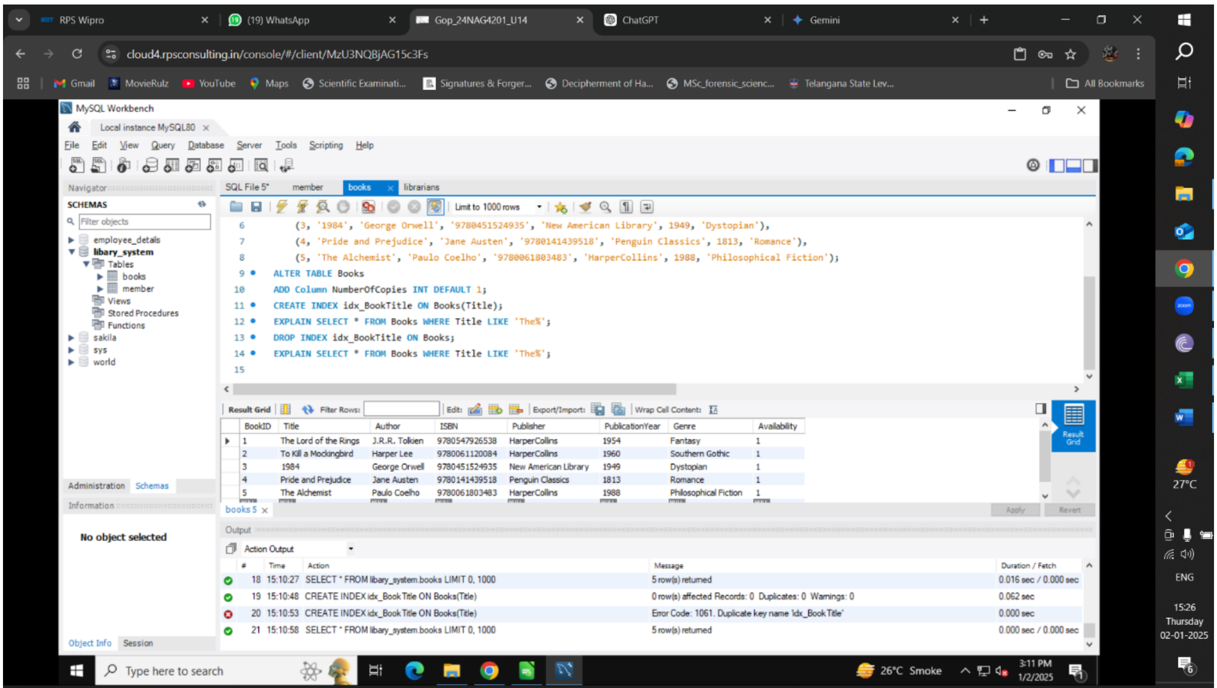
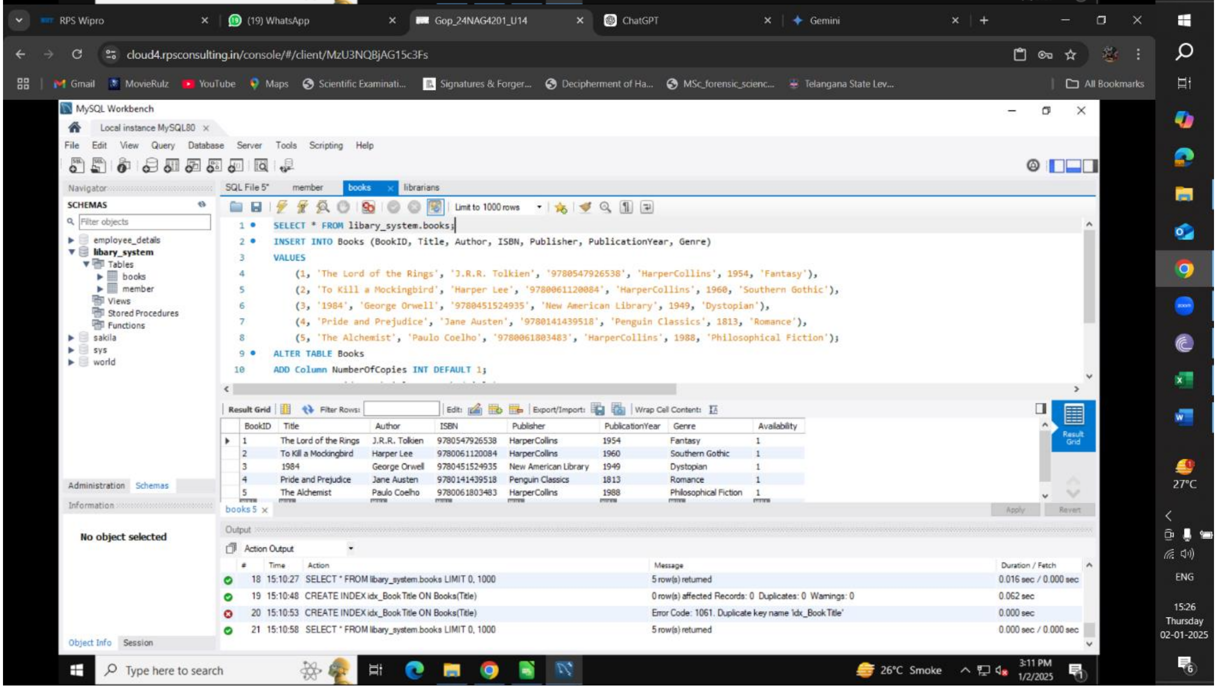
Demonstrate the creation of an index on a table and discuss how it improves query performance. Use a DROP INDEX statement to remove the index and analyze the impact on query execution.



```sql
    (3, '1984', 'George Orwell', '9780451524935', 'New American Library', 1949, 'Dystopian'),
    (4, 'Pride and Prejudice', 'Jane Austen', '9780141439518', 'Penguin Classics', 1813, 'Romance'),
    (5, 'The Alchemist', 'Paulo Coelho', '9780061803483', 'HarperCollins', 1988, 'Philosophical Fiction');
ALTER TABLE Books
ADD Column NumberOfCopies INT DEFAULT 1;
CREATE INDEX idx_BookTitle ON Books(Title);
EXPLAIN SELECT * FROM Books WHERE Title LIKE 'The%';
DROP INDEX idx_BookTitle ON Books;
EXPLAIN SELECT * FROM Books WHERE Title LIKE 'The%';
```

BookID	Title	Author	ISBN	Publisher	PublicationYear	Genre	Availability
1	The Lord of the Rings	J.R.R. Tolkien	9780547926538	HarperCollins	1954	Fantasy	1
2	To Kill a Mockingbird	Harper Lee	9780061120084	HarperCollins	1960	Southern Gothic	1
3	1984	George Orwell	9780451524935	New American Library	1949	Dystopian	1
4	Pride and Prejudice	Jane Austen	9780141439518	Penguin Classics	1813	Romance	1
5	The Alchemist	Paulo Coelho	9780061803483	HarperCollins	1988	Philosophical Fiction	1

```
 #   Time      Action                                          Message                                                      Duration / Fetch
 18  15:10:27  SELECT * FROM libary_system.books LIMIT 0, 1000  5 row(s) returned                                            0.016 sec / 0.000 sec
 19  15:10:48  CREATE INDEX idx_BookTitle ON Books(Title)      0 row(s) affected Records: 0  Duplicates: 0  Warnings: 0     0.062 sec
 20  15:10:53  CREATE INDEX idx_BookTitle ON Books(Title)      Error Code: 1061. Duplicate key name 'idx_BookTitle'         0.000 sec
 21  15:10:58  SELECT * FROM libary_system.books LIMIT 0, 1000  5 row(s) returned                                            0.000 sec / 0.000 sec
```



```sql
SELECT * FROM libary_system.books;
INSERT INTO Books (BookID, Title, Author, ISBN, Publisher, PublicationYear, Genre)
VALUES
    (1, 'The Lord of the Rings', 'J.R.R. Tolkien', '9780547926538', 'HarperCollins', 1954, 'Fantasy'),
    (2, 'To Kill a Mockingbird', 'Harper Lee', '9780061120084', 'HarperCollins', 1960, 'Southern Gothic'),
    (3, '1984', 'George Orwell', '9780451524935', 'New American Library', 1949, 'Dystopian'),
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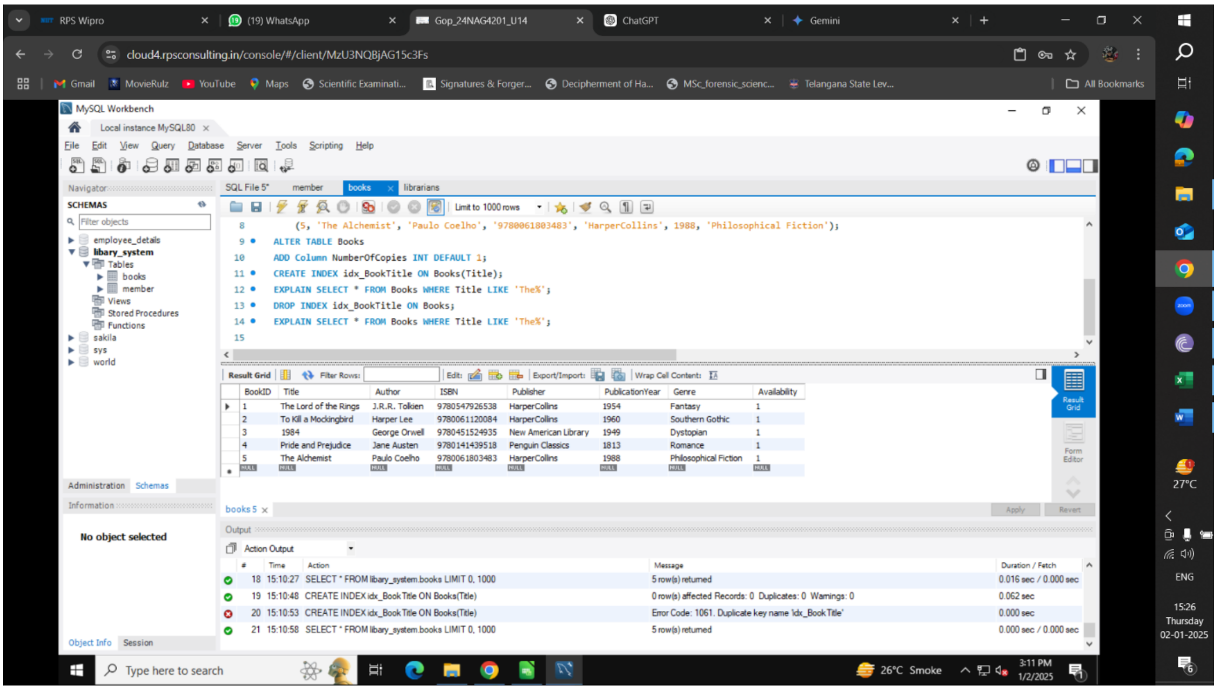

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NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

```
#   Time      Action                                         Message                                                    Duration / Fetch
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```

CREATE INDEX idx_BookTitle ON Books(Title); creates an index named idx_BookTitle on the Title column of the Books table. This index will help the database system efficiently locate books based on their titles.
Query with Index:

EXPLAIN SELECT * FROM Books WHERE Title LIKE 'The%'; This query retrieves all books whose titles begin with "The".
With the idx_BookTitle index, the database system can quickly locate books matching the Title LIKE 'The%' condition by using the index to efficiently search through the sorted list of book titles. This will likely result in faster query execution.
Drop Index:

DROP INDEX idx_BookTitle ON Books; removes the idx_BookTitle index from the Books table.
Query without Index:

EXPLAIN SELECT * FROM Books WHERE Title LIKE 'The%'; This query again retrieves books whose titles begin with "The", but without the idx_BookTitle index.
Without the index, the database system will likely need to perform a full table scan, examining the Title column of every book in the table to find the matching ones. This can be significantly slower than using the index, especially for large tables.
How Indexes Improve Query Performance in this Case

Faster Searches: The idx_BookTitle index allows the database system to quickly locate books based on their titles using a binary search or similar efficient algorithms. This significantly reduces the time spent searching through the entire table.
Improved Query Selectivity: The index helps the database system quickly identify the most relevant books, reducing the amount of data that needs to be processed.
Impact of Dropping the Index

Slower Queries: Without the idx_BookTitle index, queries that involve searching for books by title will likely become significantly slower, especially as the number of books in the library increases.
Increased Resource Utilization: Full table scans require more CPU and I/O resources, which can impact the overall performance of the database system