

Database Technologies (Assignment – 2)

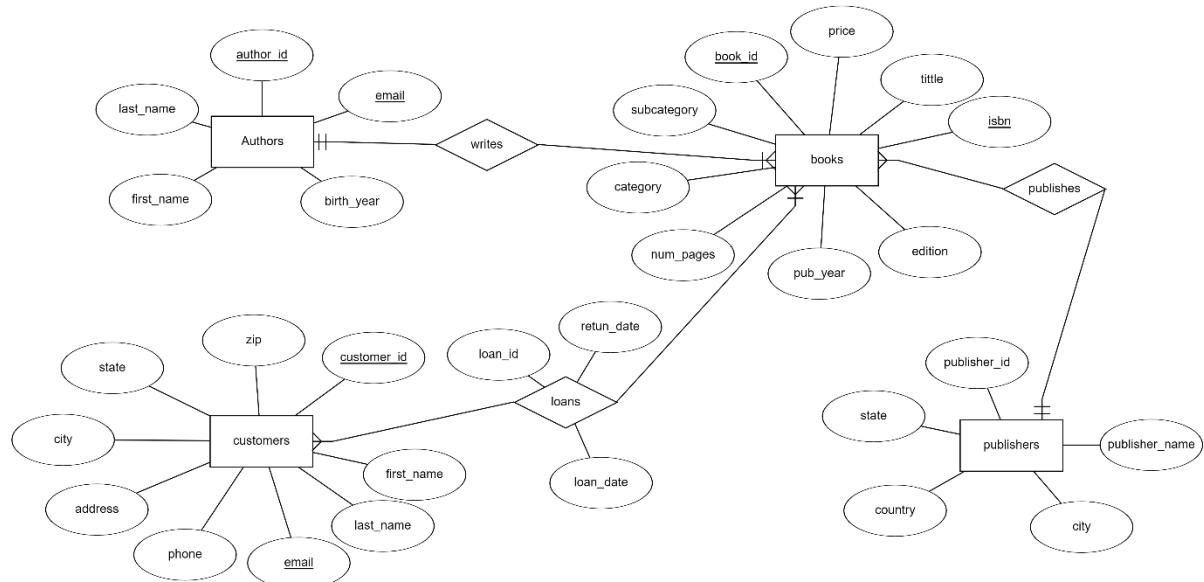
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SRN:	PES1UG20CS634
Section:	K

Details of the Database:

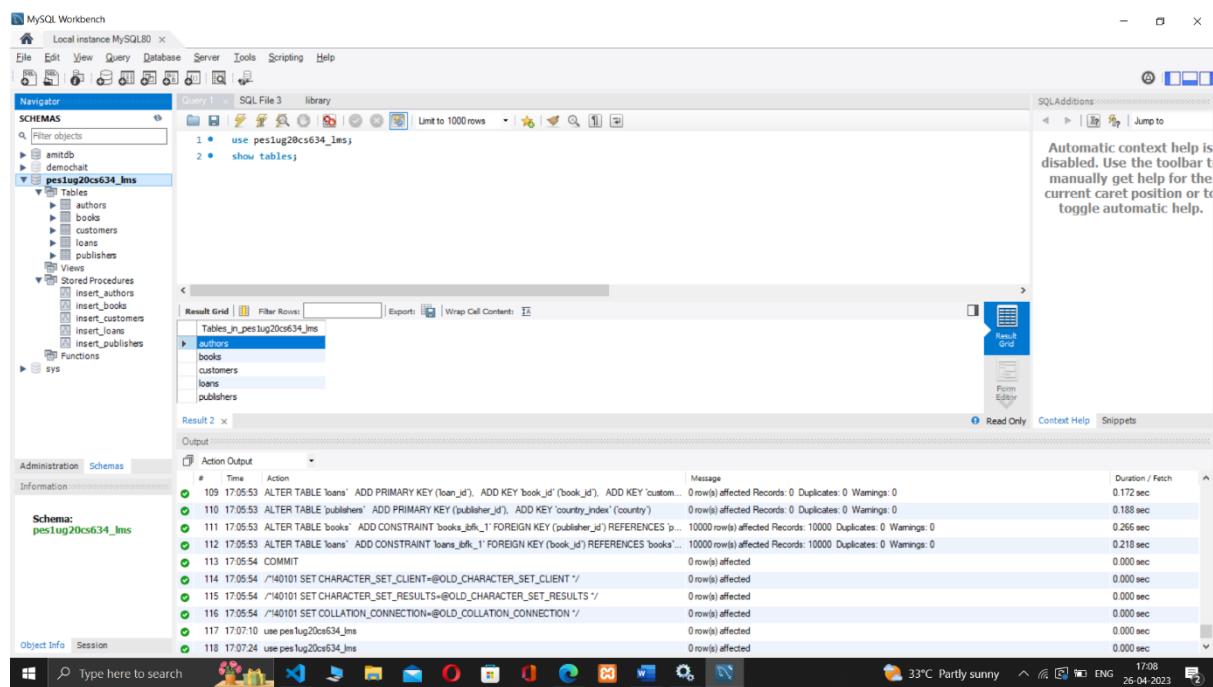
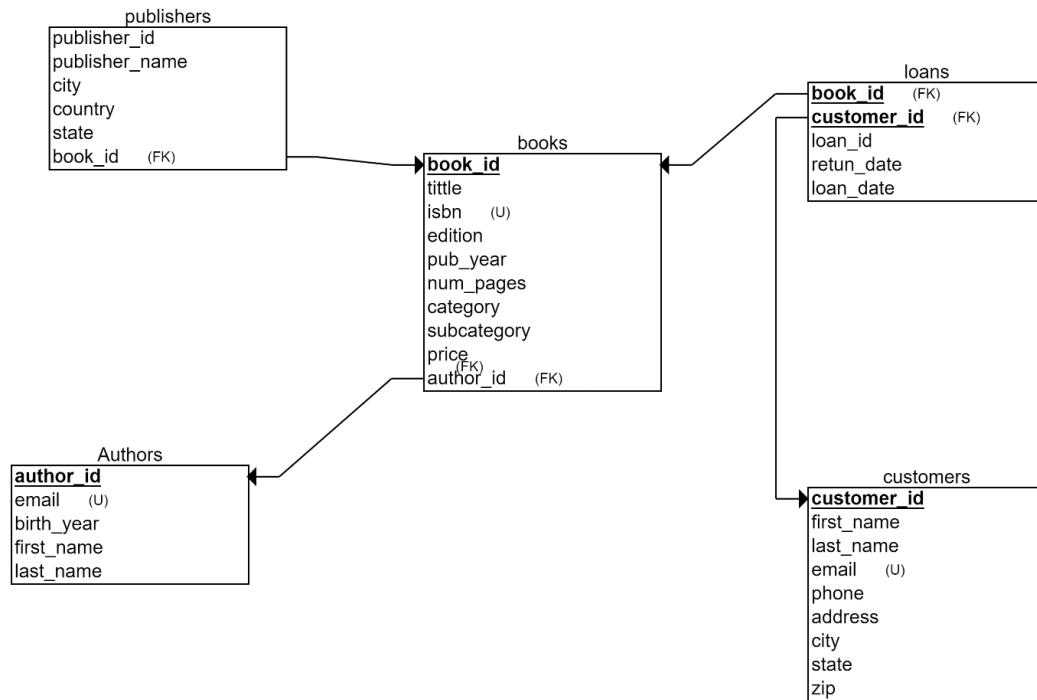
Database Used: Library Management System

Screenshots: Database(Schema) Is Named As “pes1ug20cs634_lms”

ER DIAGRAM:-



RELATIONAL SCHEMA:-



```

MariaDB [library]> create index country_index on publishers(country);
ERROR 1061 (42000): Duplicate key name 'country_index'
MariaDB [library]> select count(*) from books;
+-----+
| count(*) |
+-----+
|    10000 |
+-----+
1 row in set (0.003 sec)

MariaDB [library]> select count(*) from authors;
+-----+
| count(*) |
+-----+
|    10001 |
+-----+
1 row in set (0.002 sec)

MariaDB [library]> select count(*) from customers;
+-----+
| count(*) |
+-----+
|    10000 |
+-----+
1 row in set (0.003 sec)

MariaDB [library]> select count(*) from loans;
+-----+
| count(*) |
+-----+
|    10000 |
+-----+
1 row in set (0.003 sec)

MariaDB [library]> select count(*) from publishers;
+-----+
| count(*) |
+-----+
|     9950 |
+-----+
1 row in set (0.003 sec)

```

a). Execute Explain/Analyze plan a select query that has a multi (>2) table join of min. of 3 tables. Repeat this with 2 or more different sets of tables.

```

select first_name, last_name, title, loan_date from customers c join loans lo on
c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id limit 10;

```

MySQL Workbench

Local instance MySQL80

Query 1 | SQL File 3 | library | Limit to 1000 rows | Filter Rows | Export | Wrap Cell Content | Fetch Rows | Result Grid | Filter Rows | Export | Wrap Cell Content | Fetch Rows | Read Only | Context Help | Snippets

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Schemas

- amitdb
- demochat
- peslug20cs634_lms**
 - Tables: authors, books, customers, loans, publishers
 - Stored Procedures: insert_authors, insert_books, insert_customers, insert_loans, insert_publishers
 - Functions: sys

Result 8 | Output | Action Output | Read Only | Context Help | Snippets

Action Output

#	Time	Action	Message	Duration / Fetch
124	17:16:11	use peslug20cs634_lms	0 row(s) affected	0.000 sec
125	17:16:11	insert into publishers values('10001', 'publisher_10001', 'canada', 'brgr', 'karnataka')	1 row(s) affected	0.016 sec
126	17:16:11	select * from publishers LIMIT 0, 1000	1000 row(s) returned	0.000 sec / 0.000 sec
127	17:17:19	use peslug20cs634_lms	0 row(s) affected	0.000 sec
128	17:17:19	insert into publishers values('10001', 'publisher_10001', 'canada', 'brgr', 'karnataka')	Error Code: 1062. Duplicate entry '10001' for key 'publishers.PRIMARY'	0.000 sec
129	17:17:26	use peslug20cs634_lms	0 row(s) affected	0.000 sec
130	17:17:26	insert into publishers values('10001', 'publisher_10001', 'canada', 'brgr', 'karnataka')	Error Code: 1062. Duplicate entry '10001' for key 'publishers.PRIMARY'	0.000 sec
131	17:17:29	use peslug20cs634_lms	0 row(s) affected	0.000 sec
132	17:17:29	insert into publishers values('10001', 'publisher_10001', 'canada', 'brgr', 'karnataka')	Error Code: 1062. Duplicate entry '10001' for key 'publishers.PRIMARY'	0.000 sec
133	17:19:43	use peslug20cs634_lms	0 row(s) affected	0.000 sec
134	17:19:43	select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec

Object Info | **Session**

Type here to search | Windows Taskbar | System Tray

EXPLAIN PLAN:

MySQL Workbench

Local instance MySQL80

Query 1 | library | Limit to 1000 rows | Filter Rows | Export | Wrap Cell Content | Result Grid | Filter Rows | Export | Wrap Cell Content | Fetch Rows | Read Only | Context Help | Snippets

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Schemas

- amitdb
- demochat
- peslug20cs634_lms**
 - Tables: authors, books, customers, loans, publishers
 - Views
 - Stored Procedures: insert_authors, insert_books, insert_customers, insert_loans, insert_publishers
 - Functions: sys

Result 72 | Output | Action Output | Read Only | Context Help | Snippets

Action Output

#	Time	Action	Message	Duration / Fetch
259	18:43:59	use peslug20cs634_lms	0 row(s) affected	0.000 sec
260	18:43:59	EXPLAIN select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
261	18:44:22	use peslug20cs634_lms	0 row(s) affected	0.000 sec
262	18:44:22	EXPLAIN SELECT authors.first_name, authors.last_name, customers.email FROM loans INNER JOIN (SELECT book_id, customer_id, title, loan_date FROM customers c join loans lo on c.customer_id = lo.customer_id limit 10) AS t ON loans.book_id = t.book_id	4 row(s) returned	0.000 sec / 0.000 sec
263	18:51:43	use peslug20cs634_lms	0 row(s) affected	0.000 sec
264	18:51:43	EXPLAIN select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id limit 10;	3 row(s) returned	0.000 sec / 0.000 sec

Object Info | **Session**

Type here to search | Windows Taskbar | System Tray

COST OF QUERY:

```

use peslug20cs634_lms;
select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id limit 1;
show status like "%last_query_cost";

```

Result Grid | Filter Rows | Export | Wrap Cell Content | Fetch rows: 1000

Variable_name	Value
Last_query_cost	8118.262281

Action Output

#	Time	Action	Message	Duration / Fetch
152	17:36:18	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec
153	17:36:18	analyze format + JSON select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id limit 1;	Error Code: 1064 You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'analyze format + JSON select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id limit 1' at line 1	0.000 sec / 0.000 sec
154	17:38:07	use peslug20cs634_lms	0 row(s) affected	0.000 sec
155	17:38:07	EXPLAIN select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id limit 1;	3 row(s) returned	0.015 sec / 0.000 sec
156	17:38:07	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec
157	17:38:23	EXPLAIN select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id limit 1;	Error Code: 1064 You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'EXPLAIN select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id limit 1' at line 1	0.000 sec / 0.000 sec
158	17:38:52	EXPLAIN select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id limit 1;	3 row(s) returned	0.000 sec / 0.000 sec
159	17:41:25	use peslug20cs634_lms	0 row(s) affected	0.000 sec
160	17:41:25	select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id limit 1;	10 row(s) returned	0.000 sec / 0.000 sec
161	17:41:25	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec

Note: In this Query we joined tables loans, customers, publishers and authors This query gives first name ,last name ,title , email ,book id and date of birth of authors of books which are borrowed from library.

```

select * from authors
INNER JOIN books ON authors.author_id = author_id
INNER JOIN loans ON loans.book_id = books.book_id
INNER JOIN customers ON loans.customer_id = customers.customer_id
INNER JOIN publishers ON books.publisher_id = publishers.publisher_id
where customers.last_name = 'J';

```

Result Grid | Filter Rows | Export | Wrap Cell Content | Fetch rows: 1000

author_id	first_name	last_name	email	birth_year	book_id	title	isbn	edition	publisher_id	pub_year	num_pages	category	s
0	1	1	author1@example.com	1971	1	1	978-3-16-1	1	1	2022	200	Fiction	S
1	1	author1@example.com	1971	1	1	978-3-16-1	1	1	2022	200	Fiction	S	
2	2	author2@example.com	1972	1	1	978-3-16-1	1	1	2022	200	Fiction	S	
3	3	author3@example.com	1973	1	1	978-3-16-1	1	1	2022	200	Fiction	S	
4	4	author4@example.com	1974	1	1	978-3-16-1	1	1	2022	200	Fiction	S	
5	5	author5@example.com	1975	1	1	978-3-16-1	1	1	2022	200	Fiction	S	
6	6	author6@example.com	1976	1	1	978-3-16-1	1	1	2022	200	Fiction	S	

Action Output

#	Time	Action	Message	Duration / Fetch
157	17:38:23	EXPLAIN select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id where customers.last_name = 'J';	Error Code: 1064 You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'EXPLAIN select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id where customers.last_name = 'J'' at line 1	0.000 sec / 0.000 sec
158	17:38:52	EXPLAIN select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id where customers.last_name = 'J';	3 row(s) returned	0.000 sec / 0.000 sec
159	17:41:25	use peslug20cs634_lms	0 row(s) affected	0.000 sec
160	17:41:25	select first_name, last_name, title, loan_date from customers c join loans lo on c.customer_id = lo.customer_id join books b on b.book_id = lo.book_id where customers.last_name = 'J';	10 row(s) returned	0.000 sec / 0.000 sec
161	17:41:25	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec
162	17:43:44	from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan_id where customers.last_name = 'J';	Error Code: 1064 You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan_id where customers.last_name = 'J'' at line 1	0.000 sec / 0.000 sec
163	17:47:23	FROM authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan_id where customers.last_name = 'J';	Error Code: 1064 You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'FROM authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan_id where customers.last_name = 'J'' at line 1	0.000 sec
164	17:48:14	FROM authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan_id where customers.last_name = 'J';	Error Code: 1064 You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'FROM authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan_id where customers.last_name = 'J'' at line 1	0.000 sec
165	17:51:26	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan_id where customers.last_name = 'J';	Error Code: 1064 You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan_id where customers.last_name = 'J'' at line 1	0.000 sec
166	17:52:48	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan_id where customers.last_name = 'J';	1000 row(s) returned	0.045 sec / 0.000 sec

COST OF QUERY:

The screenshot shows the MySQL Workbench interface with the following details:

- Query Editor:** Contains the following SQL code:


```

1 • select customers.first_name , customers.last_name , customers.email , birth_year , books.book_id , title
2   from authors
3   INNER JOIN books ON authors.author_id = author_id
4   INNER JOIN loans ON books.book_id = loans.book_id
5   INNER JOIN customers ON loans.customer_id = customers.customer_id
6   INNER JOIN publishers ON books.publisher_id = publishers.publisher_id
7   where customers.last_name = 'j'
8 • show status like "last_query_cost";
            
```
- Result Grid:** Shows a single row of results for the `show status` command:

Variable_name	Value
Last_query_cost	998740.805363
- Output Window:** Displays the execution log with the following entries:

#	Time	Action	Message	Duration / Fetch
162	17:43:44	from authors	INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan...	0.000 sec
163	17:47:23	FROM authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan...	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
164	17:48:14	FROM authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan...	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
165	17:51:26	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan...	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
166	17:52:48	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan...	1000 row(s) returned	0.045 sec / 0.000 sec
167	17:56:21	select customers.first_name , customers.last_name , customers.email , birth_year , books.book_id , title from au...	1000 row(s) returned	0.032 sec / 0.000 sec
168	17:56:21	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec

EXPLAIN PLAN:

The screenshot shows the MySQL Workbench interface with the following details:

- Query Editor:** Contains the following SQL code:


```

1 • use peslug20cs634_lms;
2 • EXPLAIN select customers.first_name , customers.last_name , customers.email , birth_year , books.book_id , title from authors
3   INNER JOIN books ON authors.author_id = author_id
4   INNER JOIN loans ON books.book_id = loans.book_id
5   INNER JOIN customers ON loans.customer_id = customers.customer_id
6   INNER JOIN publishers ON books.publisher_id = publishers.publisher_id where customers.last_name = 'j';
            
```
- Result Grid:** Shows the EXPLAIN output for the query, detailing the execution plan with columns: id, select_type, table, partitions, type, possible_keys, key, key_len, ref, rows, filtered, Extra.

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	loans	NULL	ALL	book_id,customer_id	NULL	NULL	NULL	9807	100.00	Using where
1	SIMPLE	customers	NULL	eq_ref	PRIMARY	PRIMARY	4	peslug20cs634_lms.loans.customer_id	1	10.00	Using where
1	SIMPLE	books	NULL	eq_ref	PRIMARY_publisher_id	PRIMARY	4	peslug20cs634_lms.loans.book_id	1	100.00	Using where
1	SIMPLE	publishers	NULL	eq_ref	PRIMARY_publisher_id	PRIMARY	4	peslug20cs634_lms.books.publisher_id	1	100.00	Using index
1	SIMPLE	authors	NULL	ALL	PRIMARY	NULL	NULL	NULL	10046	100.00	Using join buffer (hash join)
- Output Window:** Displays the execution log with the following entries:

#	Time	Action	Message	Duration / Fetch
263	18:51:43	use peslug20cs634_lms	0 row(s) affected	0.000 sec
264	18:51:43	EXPLAIN select first_name , last_name , title , loan_date from customers c join loans l on c.customer_id = l.cus...	3 row(s) returned	0.000 sec / 0.000 sec
265	18:55:37	use peslug20cs634_lms	0 row(s) affected	0.000 sec
266	18:55:37	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loan...	1000 row(s) returned	0.031 sec / 0.000 sec
267	19:30:23	use peslug20cs634_lms	0 row(s) affected	0.000 sec
268	19:30:23	EXPLAIN select customers.first_name , customers.last_name , customers.email , birth_year , books.book_id , tit...	5 row(s) returned	0.000 sec / 0.000 sec

Note: In this Query we joined tables loans, customers, publishers and authors. This query gives first name ,last name ,title , email and book id of books which are borrowed from library.

MySQL Workbench

Query 1

```

1 • select authors.first_name, authors.last_name, customers.email, books.title
2   from authors
3   INNER JOIN books ON authors.author_id = books.book_id
4   INNER JOIN loans ON books.book_id = loans.book_id
5   INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;
6

```

Result Grid

first_name	last_name	email	title
1	1	customer1@example.com	1
2	2	customer2@example.com	2
3	3	customer3@example.com	3
4	4	customer4@example.com	4
5	5	customer5@example.com	5
6	6	customer6@example.com	6
7	7	customer7@example.com	7
8	8	customer8@example.com	8
9	9	customer9@example.com	9
10	10	customer10@example.com	10

Action Output

#	Time	Action	Message	Duration / Fetch
163	17:47:23	FROM authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
164	17:48:14	FROM authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
165	17:51:26	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
166	17:52:48	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	1000 row(s) returned	0.046 sec / 0.000 sec
167	17:56:21	select customers.first_name , customers.last_name , customers.email , birth_year , books.book_id , title from au...	1000 row(s) returned	0.032 sec / 0.000 sec
168	17:56:21	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec
169	17:59:58	select authors.first_name, authors.last_name, customers.email, books.title from authors INNER JOIN books O...	10 row(s) returned	0.000 sec / 0.000 sec

Output

Action Output

#	Time	Action	Message	Duration / Fetch
165	17:51:26	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
166	17:52:48	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	1000 row(s) returned	0.046 sec / 0.000 sec
167	17:56:21	select customers.first_name , customers.last_name , customers.email , birth_year , books.book_id , title from au...	1000 row(s) returned	0.032 sec / 0.000 sec
168	17:56:21	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec
169	17:59:58	select authors.first_name, authors.last_name, customers.email, books.title from authors INNER JOIN books O...	10 row(s) returned	0.000 sec / 0.000 sec
170	18:02:00	select authors.first_name, authors.last_name, customers.email, books.title from authors INNER JOIN books O...	10 row(s) returned	0.000 sec / 0.000 sec
171	18:02:00	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec

Information

Object Info

Session

Type here to search

33°C Partly sunny 18:02 ENG 26-04-2023

COST OF QUERY:

MySQL Workbench

Query 1

```

1 • select authors.first_name, authors.last_name, customers.email, books.title
2   from authors
3   INNER JOIN books ON authors.author_id = books.book_id
4   INNER JOIN loans ON books.book_id = loans.book_id
5   INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;
6
7 • show status like "last_query_cost";

```

Result Grid

Variable_name	Value
Last_query_cost	18961.037281

Action Output

#	Time	Action	Message	Duration / Fetch
165	17:51:26	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
166	17:52:48	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	1000 row(s) returned	0.046 sec / 0.000 sec
167	17:56:21	select customers.first_name , customers.last_name , customers.email , birth_year , books.book_id , title from au...	1000 row(s) returned	0.032 sec / 0.000 sec
168	17:56:21	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec
169	17:59:58	select authors.first_name, authors.last_name, customers.email, books.title from authors INNER JOIN books O...	10 row(s) returned	0.000 sec / 0.000 sec
170	18:02:00	select authors.first_name, authors.last_name, customers.email, books.title from authors INNER JOIN books O...	10 row(s) returned	0.000 sec / 0.000 sec
171	18:02:00	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec

Output

Action Output

#	Time	Action	Message	Duration / Fetch
165	17:51:26	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
166	17:52:48	select * from authors INNER JOIN books ON authors.author_id = author_id INNER JOIN loans ON books.book_id = loans.book_id	1000 row(s) returned	0.046 sec / 0.000 sec
167	17:56:21	select customers.first_name , customers.last_name , customers.email , birth_year , books.book_id , title from au...	1000 row(s) returned	0.032 sec / 0.000 sec
168	17:56:21	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec
169	17:59:58	select authors.first_name, authors.last_name, customers.email, books.title from authors INNER JOIN books O...	10 row(s) returned	0.000 sec / 0.000 sec
170	18:02:00	select authors.first_name, authors.last_name, customers.email, books.title from authors INNER JOIN books O...	10 row(s) returned	0.000 sec / 0.000 sec
171	18:02:00	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec

Information

Object Info

Session

Type here to search

33°C Partly sunny 18:02 ENG 26-04-2023

EXPLAIN PLAN:

The screenshot shows the MySQL Workbench interface. In the top-left pane, the Navigator displays the schema 'pes1ug20cs634_lms' with tables like authors, books, customers, loans, and publishers. The main pane contains a SQL editor with the following code:

```

1 • use pes1ug20cs634_lms;
2 • EXPLAIN select authors.first_name, authors.last_name, customers.email, books.title from authors
   INNER JOIN books ON authors.author_id = books.book_id
   INNER JOIN loans ON books.book_id = loans.book_id
   INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;
3
4
5
6
7
8
9

```

The results grid shows the execution plan with 10 rows returned. Below the results, the 'Action Output' pane shows the execution log with various SQL statements and their execution times.

(b) Change the join order of the tables in the queries above, at least 3 times, recording performance differences by comparing the execution plans and actual execution performance. Variety of joins need to be used like outer joins, subqueries, etc.

1)

A) one format of the first query.

Here This join take more time as we can see first we joined tables loans and books because of more number of tuples like 10000 and 10000 and then we joined with 10000 tuples customer table.

The screenshot shows the MySQL Workbench interface. The Navigator displays the schema 'pes1ug20cs634_lms'. The main pane contains a SQL editor with the following code:

```

1 • use pes1ug20cs634_lms;
2 • SELECT c.first_name, c.last_name, b.title, lo.loan_date
   FROM ( SELECT customer_id, first_name, last_name FROM customers ) c
   INNER JOIN loans lo ON c.customer_id = lo.customer_id
   INNER JOIN (SELECT book_id, title FROM books) b ON lo.book_id = b.book_id limit 10;
3
4
5
6

```

The results grid shows 10 rows returned. Below the results, the 'Action Output' pane shows the execution log with various SQL statements and their execution times.

COST OF QUERY:

The screenshot shows the MySQL Workbench interface with the following details:

- Query Editor:** Contains the following SQL code:


```

1 • use peslug20cs634_lms;
2 • Select * FROM customers c
3     INNER JOIN loans lo ON c.customer_id = lo.customer_id
4     INNER JOIN (SELECT book_id, title FROM books) b ON lo.book_id = b.book_id limit 10;
5 • show status like "last_query_cost";
6

```
- Result Grid:** Shows a single row of results:

Variable_name	Value
Last_query_cost	8118.262281
- Action Output:** Displays the execution log with the following entries:

#	Time	Action	Message	Duration / Fetch
174	18:07:25	use peslug20cs634_lms;	0 row(s) affected	0.000 sec
175	18:07:25	SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, last_name FROM customers) c INNER JOIN loans lo ON c.customer_id = lo.customer_id INNER JOIN (SELECT book_id, title FROM books) b ON lo.book_id = b.book_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
176	18:07:14	use peslug20cs634_lms;	0 row(s) affected	0.000 sec
177	18:10:14	ANALYZE FORMAT + JSON SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, last_name FROM customers) c INNER JOIN loans lo ON c.customer_id = lo.customer_id INNER JOIN (SELECT book_id, title FROM books) b ON lo.book_id = b.book_id limit 10;	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
178	18:10:42	use peslug20cs634_lms;	0 row(s) affected	0.000 sec
179	18:10:42	Select * FROM (SELECT customer_id, first_name, last_name FROM customers) c INNER JOIN loans lo ON c.customer_id = lo.customer_id INNER JOIN (SELECT book_id, title FROM books) b ON lo.book_id = b.book_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
180	18:10:42	show status like "last_query_cost";	1 row(s) returned	0.000 sec / 0.000 sec

B) second format of the first query.

Here This join take intermediate time as we can see first we joined tables customers and loans because of more number of tuples like 10000 and 10000 and then we joined with 10000 tuples books table

The screenshot shows the MySQL Workbench interface with the following details:

- Query Editor:** Contains the following SQL code:


```

1 • use peslug20cs634_lms;
2 • SELECT c.first_name, c.last_name, b.title, lo.loan_date
3     FROM customers c
4     JOIN loans lo ON c.customer_id = lo.customer_id
5     JOIN books b ON lo.book_id = b.book_id
6     LIMIT 10;

```
- Result Grid:** Shows 10 rows of results:

first_name	last_name	title	loan_date
1	1	1	2023-03-06
2	2	2	2023-03-06
3	3	3	2023-03-06
4	4	4	2023-03-06
5	5	5	2023-03-06
6	6	6	2023-03-06
7	7	7	2023-03-06
8	8	8	2023-03-06
9	9	9	2023-03-06
10	10	10	2023-03-06
- Action Output:** Displays the execution log with the following entries:

#	Time	Action	Message	Duration / Fetch
176	18:10:14	use peslug20cs634_lms;	0 row(s) affected	0.000 sec
177	18:10:14	ANALYZE FORMAT + JSON SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, last_name FROM customers) c JOIN loans lo ON c.customer_id = lo.customer_id JOIN books b ON lo.book_id = b.book_id limit 10;	Error Code: 1064. You have an error in your SQL syntax; check the manual that corresponds to your MySQL se...	0.000 sec
178	18:10:42	use peslug20cs634_lms;	0 row(s) affected	0.000 sec
179	18:10:42	Select * FROM (SELECT customer_id, first_name, last_name FROM customers) c JOIN loans lo ON c.customer_id = lo.customer_id JOIN books b ON lo.book_id = b.book_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
180	18:10:42	show status like "last_query_cost";	1 row(s) returned	0.000 sec / 0.000 sec
181	18:12:42	use peslug20cs634_lms;	0 row(s) affected	0.000 sec
182	18:12:42	SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM customers c JOIN loans lo ON c.customer_id = lo.customer_id JOIN books b ON lo.book_id = b.book_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec

Cost of query:

The screenshot shows the MySQL Workbench interface with the following details:

- Navigator:** Shows the schema `peslug20cs634_lms` with tables `authors`, `books`, `customers`, `loans`, and `publishers`.
- Query Editor (Query 1):**

```

1 • use peslug20cs634_lms;
2 • SELECT c.first_name, c.last_name, b.title, lo.loan_date
3   FROM customers c
4   JOIN loans lo ON c.customer_id = lo.customer_id
5   JOIN books b ON lo.book_id = b.book_id
6   LIMIT 10;
7 • show status like "last_query_cost";
    
```
- Result Grid:** Shows the result of the `show status like "last_query_cost";` command:

Variable_name	Value
Last_query_cost	8118.262281
- Output (Action Output):** Shows the history of actions taken during the session, including the execution of the query and the `show status` command.

EXPLAIN PLAN:

The screenshot shows the MySQL Workbench interface with the following details:

- Navigator:** Shows the schema `peslug20cs634_lms` with tables `authors`, `books`, `customers`, `loans`, and `publishers`.
- Query Editor (Query 1):**

```

1 • use peslug20cs634_lms;
2 • EXPLAIN SELECT c.first_name, c.last_name, b.title, lo.loan_date
3   FROM customers c
4   JOIN loans lo ON c.customer_id = lo.customer_id
5   JOIN books b ON lo.book_id = b.book_id
6   LIMIT 10;
7
8
9
    
```
- Result Grid:** Shows the EXPLAIN output for the query:

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	c		ALL	PRIMARY				10028	100.00	
1	SIMPLE	lo		ref	book_id,customer_id	customer_id	5	peslug20cs634_lms.c.customer_id	1	100.00	Using where
1	SIMPLE	b		eq_ref	PRIMARY			peslug20cs634_lms.lo.book_id	1	100.00	
- Output (Action Output):** Shows the history of actions taken during the session, including the execution of the `EXPLAIN` command and other related queries.

C) third format of the first query.(less time and high performance)

Here This join take less time as we can see first we joined tables customers and books because of more number of tuples like 10000 and 4000 and then we joined with 5000 tuples loans table.

MySQL Workbench

Local instance MySQL80

Query 1

```

1 • use peslug20cs634_lms;
2 • SELECT c.first_name, c.last_name, b.title, lo.loan_date
3   FROM (
4     SELECT customer_id, first_name, last_name
5       FROM customers) c
6     INNER JOIN loans lo ON c.customer_id = lo.customer_id
7     INNER JOIN (
8       SELECT book_id, title
9         FROM books)

```

Result Grid

first_name	last_name	title	loan_date
1	1	1	2023-03-06
2	2	2	2023-03-06
3	3	3	2023-03-06
4	4	4	2023-03-06
5	5	5	2023-03-06
6	6	6	2023-03-06
7	7	7	2023-03-06
8	8	8	2023-03-06
9	9	9	2023-03-06
10	10	10	2023-03-06

Result 38

Action Output

#	Time	Action	Message	Duration / Fetch
184	18:13:33	SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM customers c JOIN loans lo ON c.customer_id = ...	10 row(s) returned	0.000 sec / 0.000 sec
185	18:13:33	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec
186	18:16:35	use peslug20cs634_lns	0 rows affected	0.000 sec
187	18:16:35	SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, last_name	10 row(s) returned	0.000 sec / 0.000 sec
188	18:16:35	show status like "last_query_cost"	1 row(s) returned	0.016 sec / 0.000 sec
189	18:17:00	use peslug20cs634_lns	0 rows affected	0.000 sec
190	18:17:00	SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, last_name	10 row(s) returned	0.000 sec / 0.000 sec

Object Info **Session**

Type here to search

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COST OF QUERY:

MySQL Workbench

Local instance MySQL80

Query 1

```

3 • FROM (
4   SELECT customer_id, first_name, last_name
5     FROM customers) c
6     INNER JOIN loans lo ON c.customer_id = lo.customer_id
7     INNER JOIN (
8       SELECT book_id, title
9         FROM books) b ON lo.book_id = b.book_id LIMIT 10;
10 • show status like "last_query_cost"

```

Result 36

Result 37

Action Output

#	Time	Action	Message	Duration / Fetch
182	18:12:42	SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM customers c JOIN loans lo ON c.customer_id = ...	10 row(s) returned	0.000 sec / 0.000 sec
183	18:13:33	use peslug20cs634_lns	0 rows affected	0.000 sec
184	18:13:33	SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM customers c JOIN loans lo ON c.customer_id = ...	10 row(s) returned	0.000 sec / 0.000 sec
185	18:13:33	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec
186	18:16:35	use peslug20cs634_lns	0 rows affected	0.000 sec
187	18:16:35	SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, last_name	10 row(s) returned	0.000 sec / 0.000 sec
188	18:16:35	show status like "last_query_cost"	1 row(s) returned	0.016 sec / 0.000 sec

Object Info **Session**

Type here to search

33°C Partly sunny 18:16 26.04.2023

EXPLAIN PLAN:

MySQL Workbench - Local instance MySQL80

Query 1 | library

```

1 • use peslug20cs634_lms;
2 • EXPLAIN SELECT c.first_name, c.last_name, b.title, lo.loan_date
3   FROM (
4     SELECT customer_id, first_name, last_name
5     FROM customers) c
6     INNER JOIN loans lo ON c.customer_id = lo.customer_id
7     INNER JOIN (
8       SELECT book_id, title
9       FROM books) b ON lo.book_id = b.book_id LIMIT 10;
  
```

Result Grid | Filter Rows | Export | Wrap Cell Content | SQLAdditions

ID	Select_Type	Table	Partitions	Type	Possible_Keys	Key	Key_len	Ref	Rows	Filtered	Extra
1	SIMPLE	customers	1	ALL	PRIMARY	customer_id	4	peslug20cs634_lms.customers.customer_id	10028	100.00	Using where
1	SIMPLE	lo	1	ref	book_id,customer_id	customer_id	5	peslug20cs634_lms.lo.customer_id	1	100.00	Using where
1	SIMPLE	books	1	eq_ref	PRIMARY	PRIMARY	4	peslug20cs634_lms.lo.book_id	1	100.00	

Administration | Schemas | Information | Object Info | Session

Result 78 | Read Only | Context Help | Snippets

Action Output | # Time Action | Message | Duration / Fetch

- 271 19:43:23 use peslug20cs634_lms 0 rows affected 0.000 sec
- 272 19:43:23 EXPLAIN SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM customers c JOIN loans lo ON c.cust... 3 rows returned 0.000 sec / 0.000 sec
- 273 19:46:28 use peslug20cs634_lms 0 rows affected 0.000 sec
- 274 19:46:28 SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, last_name F... 10 rows(is) returned 0.000 sec / 0.000 sec
- 275 19:46:35 use peslug20cs634_lms 0 rows affected 0.000 sec
- 276 19:46:35 EXPLAIN SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, la... 3 rows(is) returned 0.000 sec / 0.000 sec

2)

A) first format of the second query.

Here This join take more time as we can see first we joined tables loans and books because of more number of tuples like 10000 and 5000 and then we joined with 4000 tuples customer table and then publisher with 5000 tuples

MySQL Workbench - Local instance MySQL80

Query 1 | SQL File 3 | library

```

1 • use peslug20cs634_lms;
2 • SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title
3   FROM customers
4     INNER JOIN loans ON customers.customer_id = loans.customer_id
5     INNER JOIN books ON loans.book_id = books.book_id
6     INNER JOIN authors ON books.book_id = authors.author_id
7     INNER JOIN publishers ON books.publisher_id = publishers.publisher_id
8     WHERE customers.last_name = 'JONES';
  
```

Result Grid | Filter Rows | Export | Wrap Cell Content | SQLAdditions

first_name	last_name	email	birth_year	book_id	title
John	JONES	customer1@example.com	1971	1	The Great Gatsby

Administration | Schemas | Information | Object Info | Session

Result 39 | Read Only | Context Help | Snippets

Action Output | # Time Action | Message | Duration / Fetch

- 186 18:16:35 use peslug20cs634_lms 0 rows affected 0.000 sec
- 187 18:16:35 SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, last_name F... 10 rows(is) returned 0.000 sec / 0.000 sec
- 188 18:16:35 show status like "last_query_cost" 1 rows(is) returned 0.016 sec / 0.000 sec
- 189 18:17:00 use peslug20cs634_lms 0 rows affected 0.000 sec
- 190 18:17:00 SELECT c.first_name, c.last_name, b.title, lo.loan_date FROM (SELECT customer_id, first_name, last_name F... 10 rows(is) returned 0.000 sec / 0.000 sec
- 191 18:20:32 use peslug20cs634_lms 0 rows affected 0.000 sec
- 192 18:20:32 SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title FROM c... 1 rows(is) returned 0.000 sec / 0.000 sec

Cost Of Query:

The screenshot shows the MySQL Workbench interface with the following details:

- Navigator:** Shows the schema `peslug20cs634_lms` selected.
- Query Editor:** Contains the following SQL code:


```

1 • use peslug20cs634_lms;
2 • SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title
   FROM customers
   INNER JOIN loans ON customers.customer_id = loans.customer_id
   INNER JOIN books ON loans.book_id = books.book_id
   INNER JOIN authors ON books.book_id = authors.author_id
   INNER JOIN publishers ON books.publisher_id = publishers.publisher_id
   WHERE customers.last_name = 'j';
9 • show status like 'last_query_cost';
      
```
- Result Grid:** Displays the result of the `show status like 'last_query_cost'` command:

Variable_name	Value
Last_query_cost	3972.311074
- Output Window:** Shows the execution log with various events and their times.
- System Tray:** Shows the date and time as 26-04-2023, 18:22, and the weather as 33°C Partly sunny.

EXPLAIN PLAN:

The screenshot shows the MySQL Workbench interface with the following details:

- Navigator:** Shows the schema `peslug20cs634_lms` selected.
- Query Editor:** Contains the following SQL code:


```

1 • use peslug20cs634_lms;
2 • EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title
   FROM customers
   INNER JOIN loans ON customers.customer_id = loans.customer_id
   INNER JOIN books ON loans.book_id = books.book_id
   INNER JOIN authors ON books.book_id = authors.author_id
   INNER JOIN publishers ON books.publisher_id = publishers.publisher_id
   WHERE customers.last_name = 'j';
9
      
```
- Result Grid:** Displays the EXPLAIN plan results:

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	customers		ALL	PRIMARY				10028	10.00	Using where
1	SIMPLE	loans		ref	book_id,customer_id	customer_id	5	peslug20cs634_lms.customers.customer_id	1	100.00	Using where
1	SIMPLE	books		eq_ref	PRIMARY	PRIMARY	4	peslug20cs634_lms.loans.book_id	1	100.00	Using where
1	SIMPLE	publishers		eq_ref	PRIMARY	PRIMARY	4	peslug20cs634_lms.books.publisher_id	1	100.00	Using index
1	SIMPLE	authors		eq_ref	PRIMARY	PRIMARY	4	peslug20cs634_lms.loans.book_id	1	100.00	
- Output Window:** Shows the execution log with various events and their times.
- System Tray:** Shows the date and time as 26-04-2023, 19:50, and the weather as 33°C Partly sunny.

b) second format of the second query.

Here This join take intermediate time as we can see first we joined tables loans and books and then with authors and publishers with number of tuples like 10000 and 10000 and then we joined with 10000 tuples customers table and then publishers.

```

MySQL Workbench
File Edit View Query Database Server Tools Scripting Help
Navigator SCHEMAS
Tables
Views
Stored Procedures
Functions
sys
Query 1 × SQL File 3 library
1 • use peslug20cs634_lms;
2 • SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title
   FROM loans
   INNER JOIN books ON loans.book_id = books.book_id
   INNER JOIN authors ON authors.author_id = books.book_id
   INNER JOIN customers ON loans.customer_id = customers.customer_id
   INNER JOIN publishers ON books.publisher_id = publishers.publisher_id WHERE customers.last_name = 'l';
Result Grid | Filter Rows: Export: Wrap Cell Content: 
first_name last_name email birth_year book_id title
customer1@example.com 1971 1 1
Result 44 ×
Output
Action Output
# Time Action Message Duration / Fetch
206 18:26:02 use peslug20cs634_lms 0 rows/affected 0.000 sec
207 18:26:02 SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title FROM loans 0 rows/affected 0.000 sec
Error Code: 1054. Unknown column 'books.book_id' in 'on clause'
208 18:26:12 use peslug20cs634_lms 0 rows/affected 0.000 sec
209 18:26:12 SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title FROM loans INNER JOIN authors ON authors.author_id = books.book_id 1 rows/returned 0.016 sec / 0.000 sec
210 18:26:19 use peslug20cs634_lms 0 rows/affected 0.000 sec
211 18:26:19 EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title FROM loans INNER JOIN authors ON authors.author_id = books.book_id 5 rows/returned 0.000 sec / 0.000 sec
212 18:26:26 use peslug20cs634_lms 0 rows/affected 0.000 sec
213 18:26:26 SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title FROM loans INNER JOIN authors ON authors.author_id = books.book_id 1 rows/returned 0.000 sec / 0.000 sec
Object Info Session

```

COST OF QUERY:

```

MySQL Workbench
File Edit View Query Database Server Tools Scripting Help
Navigator SCHEMAS
Tables
Views
Stored Procedures
Functions
sys
Query 1 × SQL File 3 library
1 • use peslug20cs634_lms;
2 • SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title
   FROM loans
   INNER JOIN books ON loans.book_id = books.book_id
   INNER JOIN authors ON authors.author_id = books.book_id
   INNER JOIN customers ON loans.customer_id = customers.customer_id
   INNER JOIN publishers ON books.publisher_id = publishers.publisher_id WHERE customers.last_name = 'l';
8 • show status like "last_query_coat";
Result 48 × Result 49 ×
Output
Action Output
# Time Action Message Duration / Fetch
214 18:26:46 use peslug20cs634_lms 0 rows/affected 0.000 sec
215 18:26:46 EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title FROM loans INNER JOIN books ON loans.book_id = books.book_id 5 rows/returned 0.000 sec / 0.000 sec
216 18:27:48 use peslug20cs634_lms 0 rows/affected 0.000 sec
217 18:27:48 SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title FROM loans INNER JOIN books ON loans.book_id = books.book_id 1 rows/returned 0.000 sec / 0.000 sec
218 18:27:48 show status like "last_query_coat" 0 rows/affected 0.000 sec / 0.000 sec
219 18:28:11 use peslug20cs634_lms 0 rows/affected 0.000 sec
220 18:28:11 SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title FROM loans INNER JOIN books ON loans.book_id = books.book_id 1 rows/returned 0.015 sec / 0.000 sec
221 18:28:11 show status like "last_query_coat" 0 rows/returned 0.000 sec / 0.000 sec
Object Info Session

```

EXPLAIN PLAN:

```

use peslug20cs634_lms;
EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title
FROM loans
INNER JOIN books ON loans.book_id = books.book_id
INNER JOIN authors ON authors.author_id = books.book_id
INNER JOIN customers ON loans.customer_id = customers.customer_id
INNER JOIN publishers ON books.publisher_id = publishers.publisher_id
WHERE customers.last_name = 'I';

```

Result Grid (10028 rows)

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	customers		ALL	PRIMARY	NULL	NULL	NULL	10028	10.00	Using where
2	SIMPLE	loans		ref	book_id, customer_id	customer_id	5	peslug20cs634_lms.customers.customer_id	1	100.00	Using where
3	SIMPLE	books		eq_ref	PRIMARY	PRIMARY	4	peslug20cs634_lms.loans.book_id	1	100.00	Using where
4	SIMPLE	authors		eq_ref	PRIMARY	PRIMARY	4	peslug20cs634_lms.books.publisher_id	1	100.00	Using index
5	SIMPLE	publishers		eq_ref	PRIMARY	PRIMARY	4	peslug20cs634_lms.books.publisher_id	1	100.00	Using where

Action Output (5 rows)

#	Time	Action	Message	Duration / Fetch
208	18:26:12	use peslug20cs634_lms	0 row(s) affected	0.000 sec
209	18:26:12	SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title	1 row(s) returned	0.016 sec / 0.000 sec
210	18:26:19	use peslug20cs634_lms	0 row(s) affected	0.000 sec
211	18:26:19	EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title	5 row(s) returned	0.000 sec / 0.000 sec
212	18:26:26	use peslug20cs634_lms	0 row(s) affected	0.000 sec
213	18:26:26	SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title	1 row(s) returned	0.000 sec / 0.000 sec
214	18:26:46	use peslug20cs634_lms	0 row(s) affected	0.000 sec
215	18:26:46	EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, birth_year, books.book_id, title	5 row(s) returned	0.000 sec / 0.000 sec

c) Third format of the second query. (less time and high performance)

This join take less time as we can see first we joined tables loans and customers because of less number of tuples like 10000 and 10000 and then with books table which has 10000 tuples and then with publishers so cost is less here compare to rest query's

```

use peslug20cs634_lms;
SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year
FROM customers
INNER JOIN loans ON customers.customer_id = loans.customer_id
INNER JOIN books ON loans.book_id = books.book_id
INNER JOIN authors ON books.book_id = authors.author_id
INNER JOIN publishers ON books.publisher_id = publishers.publisher_id
WHERE customers.last_name = 'I';

```

Result Grid (1 row)

first_name	last_name	email	book_id	title	birth_year
I	I	customer1@example.com	1	I	1971

Action Output (225 rows)

#	Time	Action	Message	Duration / Fetch
218	18:27:48	show status like "last_query_cost"	0 row(s) returned	0.000 sec / 0.000 sec
219	18:28:11	use peslug20cs634_lms	0 row(s) affected	0.000 sec
220	18:28:11	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title	1 row(s) returned	0.015 sec / 0.000 sec
221	18:28:11	show status like "last_query_cost"	0 row(s) returned	0.000 sec / 0.000 sec
222	18:30:40	use peslug20cs634_lms	0 row(s) affected	0.000 sec
223	18:30:40	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year	Error Code: 1054. Unknown column 'birth' in field list'	0.000 sec
224	18:31:34	use peslug20cs634_lms	0 row(s) affected	0.000 sec
225	18:31:34	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year	1 row(s) returned	0.000 sec / 0.000 sec

COST OF QUERY:

MySQL Workbench

Local instance MySQL80

File Edit View Query Database Server Tools Scripting Help

Navigator: Schemas

SCHEMAS: **pestug20cs634_lms**

Tables: authors, books, customers, loans, publishers, views

Stored Procedures: insert_authors, insert_books, insert_customers, insert_loans, insert_publishers

Functions: sys

Query 1: SQL File 3 library

```

1 • use pestug20cs634_lms;
2 • SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year FROM customers
   INNER JOIN loans ON customers.customer_id = loans.customer_id
4 INNER JOIN books ON loans.book_id = books.book_id
5 INNER JOIN authors ON books.book_id = authors.author_id
6 INNER JOIN publishers ON books.publisher_id = publishers.publisher_id WHERE customers.last_name = 'l';
7 • show status like "last_query_cost";

```

Result Grid: Variable_name Value

Variable_name	Value
Last_query_cost	3972.311074

Result 51 Result 52

Output: Action Output

#	Time	Action	Message	Duration / Fetch
221	18:28:11	show status like "last_query_cost"	0 row(s) returned	0.000 sec / 0.000 sec
222	18:30:40	use pestug20cs634_lms	0 row(s) affected	0.000 sec
223	18:30:40	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year FROM customers	Error Code: 1054. Unknown column 'birth' in field list'	0.000 sec
224	18:31:34	use pestug20cs634_lms	0 row(s) affected	0.000 sec
225	18:31:34	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year FROM customers	1 row(s) returned	0.000 sec / 0.000 sec
226	18:32:07	use pestug20cs634_lms	0 row(s) affected	0.016 sec
227	18:32:07	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year FROM customers	1 row(s) returned	0.000 sec / 0.000 sec
228	18:32:07	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec

Administration Schemas

Information: Schema: pestug20cs634_lms

Object Info Session

Type here to search

33°C Partly sunny 18:32 26-04-2023

EXPLAIN PLAN:

MySQL Workbench

Local instance MySQL80

File Edit View Query Database Server Tools Scripting Help

Navigator: Schemas

SCHEMAS: **pestug20cs634_lms**

Tables: authors, books, customers, loans, publishers, views

Stored Procedures: insert_authors, insert_books, insert_customers, insert_loans, insert_publishers

Functions: sys

Query 1: SQL File 3 library

```

1 • use pestug20cs634_lms;
2 • EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year FROM customers
   INNER JOIN loans ON customers.customer_id = loans.customer_id
4 INNER JOIN books ON loans.book_id = books.book_id
5 INNER JOIN authors ON books.book_id = authors.author_id
6 INNER JOIN publishers ON books.publisher_id = publishers.publisher_id WHERE customers.last_name = 'l';
7

```

Result Grid: id select_type table partitions type possible_keys key key_len ref rows filtered Extra

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	customers	ALL	PRIMARY	customer_id	customer_id	5	pestug20cs634_lms.customers.customer_id	10008	10.00	Using where
1	SIMPLE	loans	ALL	ref	book_id,customer_id	customer_id	5	pestug20cs634_lms.loans.book_id	1	100.00	Using where
1	SIMPLE	books	ALL	eq_ref	PRIMARY,publisher_id	PRIMARY	4	pestug20cs634_lms.books.publisher_id	1	100.00	Using where
1	SIMPLE	publishers	ALL	PRIMARY	PRIMARY	PRIMARY	4	pestug20cs634_lms.publishers.publisher_id	1	100.00	Using index
1	SIMPLE	authors	ALL	eq_ref	PRIMARY	PRIMARY	4	pestug20cs634_lms.books.book_id	1	100.00	

Result 53

Output: Action Output

#	Time	Action	Message	Duration / Fetch
223	18:30:40	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year FROM customers	Error Code: 1054. Unknown column 'birth' in field list'	0.000 sec
224	18:31:34	use pestug20cs634_lms	0 row(s) affected	0.000 sec
225	18:31:34	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year FROM customers	1 row(s) returned	0.000 sec / 0.000 sec
226	18:32:07	use pestug20cs634_lms	0 row(s) affected	0.016 sec
227	18:32:07	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_year FROM customers	1 row(s) returned	0.000 sec / 0.000 sec
228	18:32:07	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec
229	18:32:33	use pestug20cs634_lms	0 row(s) affected	0.000 sec
230	18:32:33	EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_ye...	5 row(s) returned	0.000 sec / 0.000 sec

Administration Schemas

Information: Schema: pestug20cs634_lms

Object Info Session

Type here to search

33°C Partly sunny 18:32 26-04-2023

3)

a) first format of the third query.(less time and high performance)

This join take less time as we can see first we joined tables loans and customers because of less number of tuples like 10000 and 10000 and then with books table which has 10000 tuples and then with authors so cost is less here compare to rest query's

MySQL Workbench

Local instance MySQL80

File Edit View Query Database Server Tools Scripting Help

Navigator Schemas

SCHEMAS

- amitdb
- demonchat
- pes1ug20cs634_lms**
 - Tables
 - authors
 - books
 - customers
 - loans
 - publishers
 - views
 - Stored Procedures
 - insert_authors
 - insert_books
 - insert_customers
 - insert_loans
 - insert_publishers
 - Functions
- sys

Query 1 SQL File 3 library

```

1 • use pes1ug20cs634_lms;
2 • SELECT authors.first_name, authors.last_name, customers.email, books.title
   FROM authors
   INNER JOIN books ON authors.author_id = books.book_id
   INNER JOIN loans ON books.book_id = loans.book_id
   INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;
3
4
5
6
7
8
  
```

Result Grid Filter Rows Export Wrap Cell Contents Fetch rows

first_name	last_name	email	title
1	1	customer1@example.com	1
2	2	customer2@example.com	2
3	3	customer3@example.com	3
4	4	customer4@example.com	4
5	5	customer5@example.com	5
6	6	customer6@example.com	6
7	7	customer7@example.com	7
8	8	customer8@example.com	8
9	9	customer9@example.com	9
10	10	customer10@example.com	10

Result Grid Form Editor Field Types

Result 54 x Output

Action Output

#	Time	Action	Message	Duration / Fetch
225	18:31:34	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, birth_year FROM c...	1 row(s) returned	0.000 sec / 0.000 sec
226	18:32:07	use pes1ug20cs634_lms	0 row(s) affected	0.016 sec
227	18:32:07	SELECT customers.first_name, customers.last_name, customers.email, books.book_id, birth_year FROM c...	1 row(s) returned	0.000 sec / 0.000 sec
228	18:32:07	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec
229	18:32:33	use pes1ug20cs634_lms	0 row(s) affected	0.000 sec
230	18:32:33	EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_ye...	5 row(s) returned	0.000 sec / 0.000 sec
231	18:35:06	use pes1ug20cs634_lms	0 row(s) affected	0.000 sec
232	18:35:06	SELECT authors.first_name, authors.last_name, customers.email, books.title FROM authors INNER JOIN boo...	10 row(s) returned	0.000 sec / 0.000 sec
233	18:35:55	use pes1ug20cs634_lms	0 row(s) affected	0.000 sec
234	18:35:55	SELECT authors.first_name, authors.last_name, customers.email, books.title FROM authors INNER JOIN boo...	10 row(s) returned	0.000 sec / 0.000 sec
235	18:35:55	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec

Object Info Session

33°C Partly sunny 18:35 26-04-2023

COST OF QUERY:

MySQL Workbench

Local instance MySQL80

File Edit View Query Database Server Tools Scripting Help

Navigator Schemas

SCHEMAS

- amitdb
- demonchat
- pes1ug20cs634_lms**
 - Tables
 - authors
 - books
 - customers
 - loans
 - publishers
 - views
 - Stored Procedures
 - insert_authors
 - insert_books
 - insert_customers
 - insert_loans
 - insert_publishers
 - Functions
- sys

Query 1 SQL File 3 library

```

1 • use pes1ug20cs634_lms;
2 • SELECT authors.first_name, authors.last_name, customers.email, books.title
   FROM authors
   INNER JOIN books ON authors.author_id = books.book_id
   INNER JOIN loans ON books.book_id = loans.book_id
   INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;
3
4
5
6
7 • show status like "last_query_cost";
8
  
```

Result Grid Filter Rows Export Wrap Cell Contents Fetch rows

Variable_name	Value
Last_query_cost	18961.037281

Result Grid Form Editor Field Types

Result 55 Result 56 x Output

Action Output

#	Time	Action	Message	Duration / Fetch
230	18:32:33	EXPLAIN SELECT customers.first_name, customers.last_name, customers.email, books.book_id, title, birth_ye...	5 row(s) returned	0.000 sec / 0.000 sec
231	18:35:06	use pes1ug20cs634_lms	0 row(s) affected	0.000 sec
232	18:35:06	SELECT authors.first_name, authors.last_name, customers.email, books.title FROM authors INNER JOIN boo...	10 row(s) returned	0.000 sec / 0.000 sec
233	18:35:55	use pes1ug20cs634_lms	0 row(s) affected	0.000 sec
234	18:35:55	SELECT authors.first_name, authors.last_name, customers.email, books.title FROM authors INNER JOIN boo...	10 row(s) returned	0.000 sec / 0.000 sec
235	18:35:55	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec

Object Info Session

33°C Partly sunny 18:35 26-04-2023

EXPLAIN PLAN:

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Schemas: peslug20cs634_lms

Tables: authors, books, customers, loans, publishers

Stored Procedures: insert_authors, insert_books, insert_customers, insert_loans, insert_publishers

Functions: sys

Query 1: SQL File 3 library

```

1 • use peslug20cs634_lms;
2 • EXPLAIN SELECT authors.first_name, authors.last_name, customers.email, books.title
   FROM authors
   INNER JOIN books ON authors.author_id = books.book_id
   INNER JOIN loans ON books.book_id = loans.book_id
   INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;
3
4
5
6
7
8

```

Result Grid: Filter Rows | Export | Wrap Cell Content | Fetch rows

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	customers	ALL	PRIMARY					10028	100.00	
1	SIMPLE	books	ALL	ref	book_id,customer_id	5	peslug20cs634_lms.customers.customer_id	1	100.00	Using where	
1	SIMPLE	books	ALL	eq_ref	PRIMARY	4	peslug20cs634_lms.loans.book_id	1	100.00		
1	SIMPLE	authors	ALL	eq_ref	PRIMARY	4	peslug20cs634_lms.loans.book_id	1	100.00		

Result 57 x

Action Output

#	Time	Action	Message	Duration / Fetch
232	18:35:06	SELECT authors.first_name, authors.last_name, customers.email, books.title FROM authors INNER JOIN books ON authors.author_id = books.book_id INNER JOIN loans ON books.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
233	18:35:55	use peslug20cs634_lms	0 row(s) affected	0.000 sec
234	18:35:55	SELECT authors.first_name, authors.last_name, customers.email, books.title FROM authors INNER JOIN books ON authors.author_id = books.book_id INNER JOIN loans ON books.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
235	18:35:55	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec
236	18:36:20	use peslug20cs634_lms	0 row(s) affected	0.000 sec
237	18:36:20	EXPLAIN SELECT authors.first_name, authors.last_name, customers.email, books.title FROM authors INNER JOIN books ON authors.author_id = books.book_id INNER JOIN loans ON books.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	4 row(s) returned	0.000 sec / 0.000 sec
238	18:38:45	use peslug20cs634_lms	0 row(s) affected	0.000 sec
239	18:38:45	SELECT authors.first_name, authors.last_name, customers.email, title FROM authors INNER JOIN (SELECT books.title AS title, books.book_id AS book_id, books.publisher_id AS publisher_id, books.author_id AS author_id FROM books) AS books_subq ON authors.author_id = books_subq.author_id INNER JOIN loans ON books_subq.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec

Output: Action Output

Object Info Session

Type here to search

33°C Partly sunny 18:36 ENG 26-04-2023

b) second format of the third query.

This join take more time as we can see first we joined tables books and authors and then loan customer.

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Schemas: peslug20cs634_lms

Tables: authors, books, customers, loans, publishers

Stored Procedures: insert_authors, insert_books, insert_customers, insert_loans, insert_publishers

Functions: sys

Query 1: SQL File 3 library

```

1 • use peslug20cs634_lms;
2 • SELECT authors.first_name, authors.last_name, customers.email, title
   FROM authors
   INNER JOIN (SELECT book_id, title, publisher_id FROM books
   ) AS books_subq ON authors.author_id = books_subq.book_id
   INNER JOIN loans ON books_subq.book_id = loans.book_id
   INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;
3
4
5
6
7
8

```

Result Grid: Filter Rows | Export | Wrap Cell Content | Fetch rows

first_name	last_name	email	title
1	1	customer1@example.com	1
2	2	customer2@example.com	2
3	3	customer3@example.com	3
4	4	customer4@example.com	4
5	5	customer5@example.com	5
6	6	customer6@example.com	6
7	7	customer7@example.com	7
8	8	customer8@example.com	8
9	9	customer9@example.com	9
10	10	customer10@example.com	10

Result 58 x

Action Output

#	Time	Action	Message	Duration / Fetch
234	18:35:55	SELECT authors.first_name, authors.last_name, customers.email, title FROM authors INNER JOIN books ON authors.author_id = books.book_id INNER JOIN loans ON books.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
235	18:35:55	show status like 'last_query_cost'	1 row(s) returned	0.000 sec / 0.000 sec
236	18:36:20	use peslug20cs634_lms	0 row(s) affected	0.000 sec
237	18:36:20	EXPLAIN SELECT authors.first_name, authors.last_name, customers.email, title FROM authors INNER JOIN books ON authors.author_id = books.book_id INNER JOIN loans ON books.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	4 row(s) returned	0.000 sec / 0.000 sec
238	18:38:45	use peslug20cs634_lms	0 row(s) affected	0.000 sec
239	18:38:45	SELECT authors.first_name, authors.last_name, customers.email, title FROM authors INNER JOIN (SELECT books.title AS title, books.book_id AS book_id, books.publisher_id AS publisher_id, books.author_id AS author_id FROM books) AS books_subq ON authors.author_id = books_subq.author_id INNER JOIN loans ON books_subq.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec

Output: Action Output

Object Info Session

Type here to search

33°C Partly sunny 18:38 ENG 26-04-2023

COST OF QUERY:

MySQL Workbench

Local instance MySQL80

File Edit View Query Database Server Tools Scripting Help

Navigator

SCHEMAS

- amitdb
- demochat
- pesug20cs634_lms**
- Views
- Tables
- Stored Procedures
- Functions
- sys

Query 1 x SQL File 3 library

```

1 • use pesug20cs634_lms;
2 • SELECT authors.first_name, authors.last_name, customers.email, title
   FROM authors
   INNER JOIN (SELECT book_id, title, publisher_id FROM books
   ) AS books_subq ON authors.author_id = books_subq.book_id
   INNER JOIN loans ON books_subq.book_id = loans.book_id
   INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;
8 • show status like "last_query_cost";

```

Result Grid Filter Rows Export Wrap Cell Content

Variable_name	Value
Last_query_cost	18961.037281

Result 59 Result 60 x

Output

Action Output

#	Time	Action	Message	Duration / Fetch
237	18:36:20	EXPLAIN SELECT authors.first_name, authors.last_name, customers.email, books.title FROM authors INNER JOIN (SELECT book_id, title, publisher_id FROM books) AS books_subq ON authors.author_id = books_subq.book_id INNER JOIN loans ON books_subq.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	4 row(s) returned	0.000 sec / 0.000 sec
238	18:38:46	use pesug20cs634_lms	0 row(s) affected	0.000 sec
239	18:38:46	SELECT authors.first_name, authors.last_name, customers.email, title FROM authors INNER JOIN (SELECT book_id, title, publisher_id FROM books) AS books_subq ON authors.author_id = books_subq.book_id INNER JOIN loans ON books_subq.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
240	18:39:17	use pesug20cs634_lms	0 row(s) affected	0.000 sec
241	18:39:17	SELECT authors.first_name, authors.last_name, customers.email, title FROM authors INNER JOIN (SELECT book_id, title, publisher_id FROM books) AS books_subq ON authors.author_id = books_subq.book_id INNER JOIN loans ON books_subq.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
242	18:39:17	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec

Object Info Session

Type here to search

33°C Partly sunny 18:39 ENG 26-04-2023

EXPLAIN PLAN:

MySQL Workbench

Local instance MySQL80

File Edit View Query Database Server Tools Scripting Help

Navigator

SCHEMAS

- amitdb
- demochat
- pesug20cs634_lms**
- Views
- Tables
- Stored Procedures
- Functions
- sys

Query 1 x SQL File 3 library

```

1 • use pesug20cs634_lms;
2 • EXPLAIN SELECT authors.first_name, authors.last_name, customers.email, title
   FROM authors
   INNER JOIN (SELECT book_id, title, publisher_id FROM books
   ) AS books_subq ON authors.author_id = books_subq.book_id
   INNER JOIN loans ON books_subq.book_id = loans.book_id
   INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;
8

```

Result Grid Filter Rows Export Wrap Cell Content

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	Customers		ALL	PRIMARY		NULL	NULL	10028	100.00	Using where
1	SIMPLE	loans		ref	book_id,customer_id	customer_id	5	pesug20cs634_lms.customers.customer_id	1	100.00	Using where
1	SIMPLE	books		eq_ref	PRIMARY	4	pesug20cs634_lms.loans.book_id	1	100.00	NULL	
1	SIMPLE	authors		eq_ref	MARY	PRIMARY	4	pesug20cs634_lms.loans.book_id	1	100.00	NULL

Result 61 x

Output

Action Output

#	Time	Action	Message	Duration / Fetch
239	18:38:46	SELECT authors.first_name, authors.last_name, customers.email, title FROM authors INNER JOIN (SELECT book_id, title, publisher_id FROM books) AS books_subq ON authors.author_id = books_subq.book_id INNER JOIN loans ON books_subq.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
240	18:39:17	use pesug20cs634_lms	0 row(s) affected	0.000 sec
241	18:39:17	SELECT authors.first_name, authors.last_name, customers.email, title FROM authors INNER JOIN (SELECT book_id, title, publisher_id FROM books) AS books_subq ON authors.author_id = books_subq.book_id INNER JOIN loans ON books_subq.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
242	18:39:17	show status like "last_query_cost"	1 row(s) returned	0.000 sec / 0.000 sec
243	18:39:39	use pesug20cs634_lms	0 row(s) affected	0.000 sec
244	18:39:39	EXPLAIN SELECT authors.first_name, authors.last_name, customers.email, title FROM authors INNER JOIN (SELECT book_id, title, publisher_id FROM books) AS books_subq ON authors.author_id = books_subq.book_id INNER JOIN loans ON books_subq.book_id = loans.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	4 row(s) returned	0.000 sec / 0.000 sec

Object Info Session

Type here to search

33°C Partly sunny 18:39 ENG 26-04-2023

c) Third format of the third query.

This join take intermediate time as we can see first we joined tables loans, books and customers then books .

MySQL Workbench

Local instance MySQL80

File Edit View Query Database Server Tools Scripting Help

Navigator

SCHEMAS

- amitdb
- demochat
- pesug20cs634_lms
- sys

Tables

- authors
- books
- customers
- loans
- publishes
- views

Stored Procedures

- insert_authors
- insert_books
- insert_customers
- insert_loans
- insert_publishers

Functions

Administration Schemas

Information

Schema: pesug20cs634_lms

Object Info Session

Type here to search

Result 70

Output

Action Output

```

# Time Action Message Duration / Fetch
255 18:43:19 SELECT authors.first_name, authors.last_name, customers.email FROM loans INNER JOIN ( SELECT book_id, ... 100 row(s) returned 0.000 sec / 0.000 sec
256 18:43:19 show status like "last query cost" 0 row(s) returned 0.000 sec / 0.000 sec
257 18:43:39 use pesug20cs634_lms 0 row(s) affected 0.000 sec
258 18:43:39 SELECT authors.first_name, authors.last_name, customers.email FROM loans INNER JOIN ( SELECT book_id, ... 100 row(s) returned 0.000 sec / 0.000 sec
259 18:43:59 use pesug20cs634_lms 0 row(s) affected 0.000 sec
260 18:43:59 SELECT authors.first_name, authors.last_name, customers.email FROM loans INNER JOIN ( SELECT book_id, ... 10 row(s) returned 0.000 sec / 0.000 sec

```

33°C Partly sunny 18:44 ENG 26-04-2023

COST OF QUERY:

MySQL Workbench

Local instance MySQL80

File Edit View Query Database Server Tools Scripting Help

Navigator

SCHEMAS

- amitdb
- demochat
- pesug20cs634_lms
- sys

Tables

- authors
- books
- customers
- loans
- publishes
- views

Stored Procedures

- insert_authors
- insert_books
- insert_customers
- insert_loans
- insert_publishers

Functions

Administration Schemas

Information

Schema: pesug20cs634_lms

Object Info Session

Type here to search

Result 67 Result 68

Output

Action Output

```

# Time Action Message Duration / Fetch
251 18:42:55 use pesug20cs634_lms 0 row(s) affected 0.000 sec
252 18:42:55 SELECT authors.first_name, authors.last_name, customers.email FROM loans INNER JOIN ( SELECT book_id, ... 10 row(s) returned 0.000 sec / 0.000 sec
253 18:42:55 show status like "last query cost" 0 row(s) returned 0.000 sec / 0.000 sec
254 18:43:19 use pesug20cs634_lms 0 row(s) affected 0.000 sec
255 18:43:19 SELECT authors.first_name, authors.last_name, customers.email FROM loans INNER JOIN ( SELECT book_id, ... 100 row(s) returned 0.000 sec / 0.000 sec
256 18:43:19 show status like "last query cost" 0 row(s) returned 0.000 sec / 0.000 sec

```

33°C Partly sunny 18:43 ENG 26-04-2023

EXPLAIN PLAN:

MySQL Workbench

Local instance MySQL80

File Edit View Query Database Server Tools Scripting Help

Schemas

SCHEMAS

Filter objects

amitdb

deschait

pestlug20cs634_lms

Tables

authors

books

customers

loans

publishes

Views

Stored Procedures

insert_authors

insert_books

insert_customers

insert_loans

insert_publishes

Functions

sys

Query 1 x library

1 • use pestlug20cs634_lms;

2 • EXPLAIN SELECT authors.first_name, authors.last_name, customers.email

FROM loans

4 INNER JOIN (

5 SELECT book_id, publisher_id

FROM books

7) AS books_subq ON loans.book_id = books_subq.book_id

8 INNER JOIN authors ON authors.author_id = books_subq.book_id

9 INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;

Result Grid | Filter Rows | Export | Wrap Cell Content | Limit to 1000 rows | SQL Additions | < | > | ⏪ | ⏩ | Jump to

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

id	select_type	table	partitions	type	possible_keys	key	key_len	ref	rows	filtered	Extra
1	SIMPLE	customers		ALL	PRIMARY				10028	100.00	
1	SIMPLE	loans		ref	book_id,customer_id	customer_id	5	peslug20cs634_lms.customers.customer_id	1	100.00	Using where
1	SIMPLE	books		eq_ref	PRIMARY	4	peslug20cs634_lms.loans.book_id		1	100.00	Using index
1	SIMPLE	authors		eq_ref	PRIMARY	4	peslug20cs634_lms.loans.book_id		1	100.00	

Result 71 x

Output

Action Output

#	Time	Action	Message	Duration / Fetch
257	18:43:39	use pestlug20cs634_lms	0 row(s) affected	0.000 sec
258	18:43:39	SELECT authors.first_name, authors.last_name, customers.email FROM loans INNER JOIN (SELECT book_id, publisher_id FROM books) AS books_subq ON loans.book_id = books_subq.book_id INNER JOIN authors ON authors.author_id = books_subq.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	100 row(s) returned	0.000 sec / 0.000 sec
259	18:43:59	use pestlug20cs634_lms	0 row(s) affected	0.000 sec
260	18:43:59	SELECT authors.first_name, authors.last_name, customers.email FROM loans INNER JOIN (SELECT book_id, publisher_id FROM books) AS books_subq ON loans.book_id = books_subq.book_id INNER JOIN authors ON authors.author_id = books_subq.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	10 row(s) returned	0.000 sec / 0.000 sec
261	18:44:22	use pestlug20cs634_lms	0 row(s) affected	0.000 sec
262	18:44:22	EXPLAIN SELECT authors.first_name, authors.last_name, customers.email FROM loans INNER JOIN (SELECT book_id, publisher_id FROM books) AS books_subq ON loans.book_id = books_subq.book_id INNER JOIN authors ON authors.author_id = books_subq.book_id INNER JOIN customers ON loans.customer_id = customers.customer_id limit 10;	4 row(s) returned	0.000 sec / 0.000 sec

Result Grid | Form Editor | Field Types

Read Only | Context Help | Snippets

Administration Schemas

Information

Schema: pestlug20cs634_lms

Object Info Session

Type here to search

Windows Taskbar: 33°C Partly sunny, ENG, 18:44, 26-04-2023